```
**********************************************************
   27841 Sat May 10 12:08:41 2014
new/exception_lists/packaging
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 26 #

 28 #
 29 # Exception List for validate_pkg
 30 #

 32 #
 33 # The following entries are built in the /proto area
 34 # but not included in any packages - this is intentional.
 35 #
 36 usr/include/auth_list.h
 37 usr/include/bsm/audit_door_infc.h
 38 usr/include/bsm/audit_private.h
 39 usr/include/bsm/devalloc.h
 40 usr/include/getxby_door.h
 41 usr/include/passwdutil.h
 42 usr/include/priv_utils.h
 43 usr/include/rpcsvc/daemon_utils.h
 44 usr/include/rpcsvc/svc_dg_priv.h
 45 usr/include/security/pam_impl.h
 46 usr/include/sys/clock_impl.h
 47 usr/include/sys/ieeefp.h
 47 usr/include/sys/winlockio.h
 48 usr/include/scsi/plugins/ses/vendor/sun_impl.h
 49 #
 50 # Private/Internal libraries of the Cryptographic Framework.
 51 #
 52 lib/libkcfd.so
 53 lib/llib-lelfsign
 54 lib/llib-lelfsign.ln
 55 lib/llib-lkcfd
 56 lib/llib-lkcfd.ln
 57 usr/include/libelfsign.h
 58 usr/lib/llib-lsoftcrypto
 59 usr/lib/llib-lsoftcrypto.ln
 60 usr/lib/amd64/llib-lsoftcrypto.ln       i386
```



```
 61 usr/lib/sparcv9/llib-lsoftcrypto.ln     sparc

 63 #
 64 # The following files are used by the DHCP service, the
 65 # standalone's DHCP implementation, and the kernel (nfs_dlboot).
 66 # They contain interfaces which are currently private.
 67 #
 68 usr/include/dhcp_svc_confkey.h
 69 usr/include/dhcp_svc_confopt.h
 70 usr/include/dhcp_svc_private.h
 71 usr/include/dhcp_symbol.h
 72 usr/include/sys/sunos_dhcp_class.h
 73 usr/lib/libdhcpsvc.so
 74 usr/lib/llib-ldhcpsvc
 75 usr/lib/llib-ldhcpsvc.ln
 76 #
 77 # Private MAC driver header files
 78 #
 79 usr/include/inet/iptun.h
 80 usr/include/sys/aggr_impl.h
 81 usr/include/sys/aggr.h
 82 usr/include/sys/dld_impl.h
 83 usr/include/sys/dld_ioc.h
 84 usr/include/sys/dls_impl.h
 85 usr/include/sys/dls.h
 86 usr/include/sys/mac_client_impl.h
 87 usr/include/sys/mac_client.h
 88 usr/include/sys/mac_flow_impl.h
 89 usr/include/sys/mac_impl.h
 90 usr/include/sys/mac_soft_ring.h
 91 usr/include/sys/mac_stat.h
 92 #
 93 # Private GLDv3 userland libraries and headers
 94 #
 95 usr/include/libdladm_impl.h
 96 usr/include/libdlaggr.h
 97 usr/include/libdlether.h
 98 usr/include/libdlflow_impl.h
 99 usr/include/libdlflow.h
100 usr/include/libdliptun.h
101 usr/include/libdlmgmt.h
102 usr/include/libdlsim.h
103 usr/include/libdlstat.h
104 usr/include/libdlvnic.h
105 usr/include/libdlwlan_impl.h
106 usr/include/libdlwlan.h
107 #
108 # Virtual Network Interface Card (VNIC)
109 #
110 usr/include/sys/vnic.h
111 usr/include/sys/vnic_impl.h
112 #
113 # Private libipadm lint library and header files
114 #
115 usr/include/ipadm_ipmgmt.h
116 usr/include/ipadm_ndpd.h
117 usr/include/libipadm.h
118 lib/llib-lipadm
119 lib/llib-lipadm.ln
120 lib/libipadm.so
121 #
122 # Private libsocket header file
123 #
124 usr/include/libsocket_priv.h
125 #
126 # IKE and IPsec support library exceptions.  The IKE support
```

```
# library contains exclusively private interfaces, as does
# libipsecutil.  My apologies for the glut of header files here.
#
usr/include/errfp.h
usr/include/ikedoor.h
usr/include/ipsec_util.h
usr/lib/libike.so
usr/lib/amd64/libike.so                 i386
usr/lib/sparcv9/libike.so               sparc
usr/lib/libipsecutil.so
usr/lib/amd64/libipsecutil.so           i386
usr/lib/sparcv9/libipsecutil.so         sparc
usr/lib/llib-like
usr/lib/llib-like.ln
usr/lib/amd64/llib-like.ln              i386
usr/lib/sparcv9/llib-like.ln            sparc
usr/lib/llib-lipsecutil
usr/lib/llib-lipsecutil.ln
usr/lib/amd64/llib-lipsecutil.ln        i386
usr/lib/sparcv9/llib-lipsecutil.ln      sparc
#
usr/include/inet/ip_impl.h
usr/include/inet/ip_ndp.h
usr/include/inet/ip2mac_impl.h
usr/include/inet/ip2mac.h
usr/include/inet/rawip_impl.h
usr/include/inet/tcp_impl.h
usr/include/inet/udp_impl.h
usr/include/libmail.h
usr/include/libnwam_priv.h
usr/include/protocols/ripngd.h
usr/include/s_string.h
usr/include/sys/logindmux_impl.h
usr/include/sys/vgareg.h
#
# Some IPsec headers can’t be shipped lest we hit export controls...
#
usr/include/inet/ipsec_impl.h
usr/include/inet/ipsec_info.h
usr/include/inet/ipsecah.h
usr/include/inet/ipsecesp.h
usr/include/inet/keysock.h
usr/include/inet/sadb.h
usr/include/sys/sha1_consts.h
usr/include/sys/sha2_consts.h
#
#
# Filtering out directories not shipped
#
usr/4lib                                i386
#
# These files contain definitions shared privately between the kernel
# and libc.  There is no reason for them to be part of a package that
# a customer should ever see.  They are installed in the proto area by
# the uts build because libc and and other components, like truss, are
# dependent upon their contents and should not have their own copies.
#
usr/include/sys/libc_kernel.h
usr/include/sys/synch32.h
#
# These files are installed in the proto area by the build of libproc for
# the benefit of the builds of cmd/truss, cmd/gcore and cmd/ptools, which
# use libproc as their common process-control library.  These are not
# interfaces for customer use, so the files are excluded from packaging.
#
lib/llib-lproc
```



```
lib/llib-lproc.ln
lib/amd64/llib-lproc.ln         i386
lib/sparcv9/llib-lproc.ln       sparc
usr/include/libproc.h
#
# Private interfaces for libdisasm
#
usr/include/libdisasm.h
usr/lib/llib-ldisasm
usr/lib/llib-ldisasm.ln
usr/lib/amd64/llib-ldisasm.ln           i386
usr/lib/sparcv9/llib-ldisasm.ln         sparc
#
# Private interfaces for libraidcfg
#
usr/include/raidcfg_spi.h
usr/include/raidcfg.h
usr/lib/libraidcfg.so
usr/lib/amd64/libraidcfg.so             i386
usr/lib/sparcv9/libraidcfg.so           sparc
usr/lib/llib-lraidcfg
usr/lib/llib-lraidcfg.ln
usr/lib/amd64/llib-lraidcfg.ln          i386
usr/lib/sparcv9/llib-lraidcfg.ln        sparc
#
# This file is used for private communication between mdb, drv/kmdb, and
# misc/kmdb.  The interfaces described herein are not intended for customer
# use, and are thus excluded from packaging.
#
usr/include/sys/kmdb.h
#
# These files are installed in the proto area by the build of libdhcpagent
# and libdhcputil for the benefit of DHCP-related networking commands such
# as dhcpagent, dhcpinfo, ifconfig, and netstat.  These are not interfaces
# for customer use, so the files are excluded from packaging.
#
lib/libdhcpagent.so
lib/libdhcputil.so
lib/amd64/libdhcputil.so                i386
lib/sparcv9/libdhcputil.so              sparc
lib/llib-ldhcpagent
lib/llib-ldhcpagent.ln
lib/llib-ldhcputil
lib/llib-ldhcputil.ln
lib/amd64/llib-ldhcputil.ln             i386
lib/sparcv9/llib-ldhcputil.ln           sparc
usr/include/dhcp_hostconf.h
usr/include/dhcp_impl.h
usr/include/dhcp_inittab.h
usr/include/dhcp_stable.h
usr/include/dhcp_symbol_common.h
usr/include/dhcpagent_ipc.h
usr/include/dhcpagent_util.h
usr/include/dhcpmsg.h
usr/lib/libdhcpagent.so
usr/lib/libdhcputil.so
usr/lib/amd64/libdhcputil.so            i386
usr/lib/sparcv9/libdhcputil.so          sparc
usr/lib/llib-ldhcpagent
usr/lib/llib-ldhcpagent.ln
usr/lib/llib-ldhcputil
usr/lib/llib-ldhcputil.ln
usr/lib/amd64/llib-ldhcputil.ln         i386
usr/lib/sparcv9/llib-ldhcputil.ln       sparc
#
# These files are installed in the proto area by the build of libinstzones
```

```
# and libpkg
#
usr/lib/llib-linstzones
usr/lib/llib-linstzones.ln
usr/lib/amd64/llib-linstzones.ln        i386
usr/lib/sparcv9/llib-linstzones.ln      sparc
usr/lib/llib-lpkg
usr/lib/llib-lpkg.ln
#
# Don’t ship header files private to libipmp and in.mpathd
#
usr/include/ipmp_query_impl.h
#
# These files are installed in the proto area by the build of libinetsvc,
# an inetd-specific library shared by inetd, inetadm and inetconv. Only
# the shared object is shipped.
#
usr/include/inetsvc.h
usr/lib/libinetsvc.so
usr/lib/llib-linetsvc
usr/lib/llib-linetsvc.ln
#
# These files are installed in the proto area by the build of libinetutil,
# a general purpose library for the benefit of internet utilities. Only
# the shared object is shipped.
#
lib/libinetutil.so
lib/amd64/libinetutil.so                i386
lib/sparcv9/libinetutil.so              sparc
lib/llib-linetutil
lib/llib-linetutil.ln
lib/amd64/llib-linetutil.ln             i386
lib/sparcv9/llib-linetutil.ln           sparc
usr/include/libinetutil.h
usr/include/netinet/inetutil.h
usr/include/ofmt.h
usr/lib/libinetutil.so
usr/lib/amd64/libinetutil.so            i386
usr/lib/sparcv9/libinetutil.so          sparc
usr/lib/llib-linetutil
usr/lib/llib-linetutil.ln
usr/lib/amd64/llib-linetutil.ln         i386
usr/lib/sparcv9/llib-linetutil.ln       sparc
#
# Miscellaneous kernel interfaces or kernel<->user interfaces that are
# consolidation private and we do not want to export at this time.
#
usr/include/sys/cryptmod.h
usr/include/sys/dumpadm.h
usr/include/sys/ontrap.h
usr/include/sys/sysmsg_impl.h
usr/include/sys/vlan.h
#
# These files are installed in the proto area so lvm can use
# them during the build process.
#
lib/llib-lmeta
lib/llib-lmeta.ln
usr/include/sdssc.h
usr/lib/llib-lmeta
usr/lib/llib-lmeta.ln
#
# non-public pci header
#
usr/include/sys/pci_impl.h
usr/include/sys/pci_tools.h
```



```
#
# Exception list for RCM project, included by librcm and rcm_daemon
#
usr/include/librcm_event.h
usr/include/librcm_impl.h
#
# MDB deliverables that are not yet public
#
usr/lib/mdb/proc/mdb_test.so
usr/lib/mdb/proc/sparcv9/mdb_test.so    sparc
#
# SNCA project exception list
#
usr/include/inet/kssl/kssl.h
usr/include/inet/kssl/ksslimpl.h
usr/include/inet/kssl/ksslproto.h
usr/include/inet/nca
#
# these are "removed" from the source product build because the only
# packages that currently deliver them are removed.
# they really should’t be in here.
#
etc/sfw
#
# Entries for the libmech_krb5 symlink, which has been included
# for build purposes only, not delivered to customers.
#
usr/lib/gss/libmech_krb5.so
usr/lib/amd64/gss/libmech_krb5.so       i386
usr/lib/sparcv9/gss/libmech_krb5.so     sparc
usr/lib/libmech_krb5.so
usr/lib/amd64/libmech_krb5.so           i386
usr/lib/sparcv9/libmech_krb5.so         sparc
#
# Entries for headers from efcode project which user does not need to see
#
usr/platform/sun4u/include/sys/fc_plat.h                        sparc
usr/platform/sun4u/include/sys/fcode.h                          sparc
#
# Private net80211 headers
#
usr/include/sys/net80211_crypto.h
usr/include/sys/net80211_ht.h
usr/include/sys/net80211_proto.h
usr/include/sys/net80211.h
#
usr/include/net/wpa.h
#
# PPPoE files not delivered to customers.
#
usr/include/net/pppoe.h
usr/include/net/sppptun.h
#
# Simnet
#
usr/include/net/simnet.h
#
# Bridging internal data structures
#
usr/include/net/bridge_impl.h
#
# User<->kernel interface used by cfgadm/USB only
#
usr/include/sys/usb/hubd/hubd_impl.h
#
# User<->kernel interface used by cfgadm/SATA only
```

```
391 #
392 usr/include/sys/sata/sata_cfgadm.h                      i386
393 #
394 # Private ucred kernel header
395 #
396 usr/include/sys/ucred.h
397 #
398 # Private and/or platform-specific smf(5) files
399 #
400 lib/librestart.so
401 lib/llib-lrestart
402 lib/llib-lrestart.ln
403 lib/amd64/llib-lrestart.ln                              i386
404 lib/sparcv9/llib-lrestart.ln                            sparc
405 usr/include/libcontract_priv.h
406 usr/include/librestart_priv.h
407 usr/include/librestart.h
408 usr/lib/librestart.so
409 usr/lib/sparcv9/librestart.so                           sparc
410 lib/svc/manifest/platform/sun4u                         i386
411 lib/svc/manifest/platform/sun4v                         i386
412 var/svc/manifest/platform/sun4u                         i386
413 var/svc/manifest/platform/sun4v                         i386
414 etc/svc/profile/platform_sun4v.xml                      i386
415 etc/svc/profile/platform_SUNW,SPARC-Enterprise.xml      i386
416 etc/svc/profile/platform_SUNW,Sun-Fire-15000.xml        i386
417 etc/svc/profile/platform_SUNW,Sun-Fire-880.xml         i386
418 etc/svc/profile/platform_SUNW,Sun-Fire-V890.xml        i386
419 etc/svc/profile/platform_SUNW,Sun-Fire.xml            i386
420 etc/svc/profile/platform_SUNW,Ultra-Enterprise-10000.xml  i386
421 etc/svc/profile/platform_SUNW,UltraSPARC-IIe-NetraCT-40.xml  i386
422 etc/svc/profile/platform_SUNW,UltraSPARC-IIe-NetraCT-60.xml  i386
423 etc/svc/profile/platform_SUNW,UltraSPARC-IIi-Netract.xml  i386
424 #
425 # Private libuutil files
426 #
427 lib/libuutil.so
428 lib/llib-luutil
429 lib/llib-luutil.ln
430 lib/sparcv9/llib-luutil.ln              sparc
431 usr/include/libuutil_impl.h
432 usr/lib/libuutil.so
433 usr/lib/sparcv9/libuutil.so             sparc
434 #
435 # Private Multidata file.
436 #
437 usr/include/sys/multidata_impl.h
438 #
439 # The following files are used by wanboot.
440 # They contain interfaces which are currently private.
441 #
442 usr/include/sys/wanboot_impl.h
443 usr/include/wanboot
444 usr/include/wanbootutil.h
445 #
446 # Even though all the objects built under usr/src/stand are later glommed
447 # together into a couple of second-stage boot loaders, we dump the static
448 # archives and lint libraries into $(ROOT)/stand for intermediate use
449 # (e.g., for lint, linking the second-stage boot loaders, ...).  Since
450 # these are merely intermediate objects, they do not need to be packaged.
451 #
452 stand                                   sparc
453 #
454 # Private KCF header files
455 #
456 usr/include/sys/crypto/elfsign.h
```



```
457 usr/include/sys/crypto/impl.h
458 usr/include/sys/crypto/ops_impl.h
459 usr/include/sys/crypto/sched_impl.h
460 #
461 # The following files are installed in the proto area
462 # by the build of libavl (AVL Tree Interface Library).
463 # libavl contains interfaces which are all private interfaces.
464 #
465 lib/libavl.so
466 lib/amd64/libavl.so             i386
467 lib/sparcv9/libavl.so           sparc
468 lib/llib-lavl
469 lib/llib-lavl.ln
470 lib/amd64/llib-lavl.ln          i386
471 lib/sparcv9/llib-lavl.ln        sparc
472 usr/lib/libavl.so
473 usr/lib/amd64/libavl.so         i386
474 usr/lib/sparcv9/libavl.so       sparc
475 usr/lib/llib-lavl
476 usr/lib/llib-lavl.ln
477 usr/lib/amd64/llib-lavl.ln      i386
478 usr/lib/sparcv9/llib-lavl.ln    sparc
479 #
480 # The following files are installed in the proto area
481 # by the build of libcmdutils (Command Utilities Library).
482 # libcmdutils contains interfaces which are all private interfaces.
483 #
484 lib/libcmdutils.so
485 lib/amd64/libcmdutils.so                i386
486 lib/sparcv9/libcmdutils.so              sparc
487 lib/llib-lcmdutils
488 lib/llib-lcmdutils.ln
489 lib/amd64/llib-lcmdutils.ln             i386
490 lib/sparcv9/llib-lcmdutils.ln           sparc
491 usr/include/libcmdutils.h
492 usr/lib/libcmdutils.so
493 usr/lib/amd64/libcmdutils.so            i386
494 usr/lib/sparcv9/libcmdutils.so          sparc
495 usr/lib/llib-lcmdutils
496 usr/lib/llib-lcmdutils.ln
497 usr/lib/amd64/llib-lcmdutils.ln         i386
498 usr/lib/sparcv9/llib-lcmdutils.ln       sparc
499 #
500 # Private interfaces in libsec
501 #
502 usr/include/aclutils.h
503 #
504 # USB skeleton driver stays in sync with the rest of USB but doesn’t ship.
505 #
506 kernel/drv/usbskel              i386
507 kernel/drv/amd64/usbskel        i386
508 kernel/drv/sparcv9/usbskel      sparc
509 kernel/drv/usbskel.conf
510 #
511 # Consolidation and Sun private libdevid interfaces
512 # Public libdevid interfaces provided by devid.h
513 #
514 usr/include/sys/libdevid.h
515 #
516 # The following files are installed in the proto area by the build of
517 # libprtdiag.  libprtdiag contains interfaces which are all private.
518 # Only the shared object is shipped.
519 #
520 usr/platform/sun4u/lib/llib-lprtdiag                            sparc
521 usr/platform/sun4u/lib/llib-lprtdiag.ln                         sparc
522 usr/platform/sun4v/lib/llib-lprtdiag.ln                         sparc
```

```
#
# The following files are installed in the proto area by the build of
# mdesc driver in sun4v. These header files are used on in the build
# and do not need to be shipped to customers.
#
usr/include/sys/mdesc.h                                 sparc
usr/include/sys/mdesc_impl.h                            sparc
usr/platform/sun4v/include/sys/mach_descrip.h           sparc
#
# The following files are installed in the proto area by the build of
# libpcp.  libpcp contains interfaces which are all private.
# Only the shared object is shipped.
#
usr/platform/sun4v/lib/llib-lpcp.ln                             sparc
usr/platform/SUNW,Netra-CP3060/lib/llib-lpcp.ln                 sparc
usr/platform/SUNW,Netra-CP3260/lib/llib-lpcp.ln                 sparc
usr/platform/SUNW,Netra-T5220/lib/llib-lpcp.ln                  sparc
usr/platform/SUNW,Netra-T5440/lib/llib-lpcp.ln                  sparc
usr/platform/SUNW,SPARC-Enterprise-T5120/lib/llib-lpcp.ln       sparc
usr/platform/SUNW,Sun-Blade-T6300/lib/llib-lpcp.ln              sparc
usr/platform/SUNW,Sun-Blade-T6320/lib/llib-lpcp.ln              sparc
usr/platform/SUNW,Sun-Fire-T200/lib/llib-lpcp.ln                sparc
usr/platform/SUNW,T5140/lib/llib-lpcp.ln                        sparc
usr/platform/SUNW,USBRDT-5240/lib/llib-lpcp.ln                  sparc
#
# ZFS internal tools and lint libraries
#
usr/lib/llib-lzfs_jni
usr/lib/llib-lzfs_jni.ln
usr/lib/amd64/llib-lzfs_jni.ln          i386
usr/lib/sparcv9/llib-lzfs_jni.ln        sparc
usr/lib/llib-lzpool
usr/lib/llib-lzpool.ln                  i386
usr/lib/amd64/llib-lzpool.ln            i386
usr/lib/sparcv9/llib-lzpool.ln          sparc
#
# ZFS JNI headers
#
usr/include/libzfs_jni_dataset.h
usr/include/libzfs_jni_disk.h
usr/include/libzfs_jni_diskmgt.h
usr/include/libzfs_jni_ipool.h
usr/include/libzfs_jni_main.h
usr/include/libzfs_jni_pool.h
usr/include/libzfs_jni_property.h
usr/include/libzfs_jni_util.h
#
# These files are installed in the proto area for Solaris scsi_vhci driver
# (for MPAPI support) and should not be shipped
#
usr/include/sys/scsi/adapters/mpapi_impl.h
usr/include/sys/scsi/adapters/mpapi_scsi_vhci.h
#
# This library is installed in the proto area by the build of libdisasm, and is
# only used when building the KMDB disasm module.
#
usr/lib/libstanddisasm.so
usr/lib/amd64/libstanddisasm.so         i386
usr/lib/sparcv9/libstanddisasm.so       sparc
#
# TSol: tsol doesn't ship lint source, and tsnet isn't for customers at all.
#
lib/libtsnet.so
usr/lib/llib-ltsnet
usr/lib/llib-ltsol
#
```



```
# nss interfaces shared between libnsl and other ON libraries.
#
usr/include/nss.h
#
# AT&T AST (ksh93) files which are currently needed only to build OS/Net
# (msgcc&co.)
# libast
usr/lib/libast.so
usr/lib/amd64/libast.so                 i386
usr/lib/sparcv9/libast.so               sparc
usr/lib/llib-last
usr/lib/llib-last.ln
usr/lib/amd64/llib-last.ln              i386
usr/lib/sparcv9/llib-last.ln            sparc
# libcmd
usr/lib/llib-lcmd
usr/lib/llib-lcmd.ln
usr/lib/amd64/llib-lcmd.ln              i386
usr/lib/sparcv9/llib-lcmd.ln            sparc
# libdll
usr/lib/libdll.so
usr/lib/amd64/libdll.so                 i386
usr/lib/sparcv9/libdll.so               sparc
usr/lib/llib-ldll
usr/lib/llib-ldll.ln
usr/lib/amd64/llib-ldll.ln              i386
usr/lib/sparcv9/llib-ldll.ln            sparc
# libpp (a helper library needed by AST's msgcc)
usr/lib/libpp.so
usr/lib/llib-lpp
usr/lib/llib-lpp.ln
usr/lib/locale/C/LC_MESSAGES/libpp
# libshell
usr/lib/libshell.so
usr/lib/amd64/libshell.so               i386
usr/lib/sparcv9/libshell.so             sparc
usr/lib/llib-lshell
usr/lib/llib-lshell.ln
usr/lib/amd64/llib-lshell.ln            i386
usr/lib/sparcv9/llib-lshell.ln          sparc
# libsum
usr/lib/libsum.so
usr/lib/amd64/libsum.so                 i386
usr/lib/sparcv9/libsum.so               sparc
usr/lib/llib-lsum
usr/lib/llib-lsum.ln
usr/lib/amd64/llib-lsum.ln              i386
usr/lib/sparcv9/llib-lsum.ln            sparc
#
# This file is used in ON to build DSCP clients.  It is not for customers.
#
usr/include/libdscp.h           sparc
#
# These files are used by the iSCSI Target and the iSCSI Initiator
#
usr/include/sys/iscsi_protocol.h
usr/include/sys/iscsi_authclient.h
usr/include/sys/iscsi_authclientglue.h
#
# These files are used by the COMSTAR iSCSI target port provider
#
usr/include/sys/idm
usr/include/sys/iscsit/chap.h
usr/include/sys/iscsit/iscsi_if.h
usr/include/sys/iscsit/isns_protocol.h
usr/include/sys/iscsit/radius_packet.h
```

```
usr/include/sys/iscsit/radius_protocol.h
#
# libshare is private and the 64-bit sharemgr is not delivered.
#
usr/lib/libshare.so
usr/lib/amd64/libshare.so               i386
usr/lib/sparcv9/libshare.so             sparc
usr/lib/fs/autofs/libshare_autofs.so
usr/lib/fs/autofs/amd64/libshare_autofs.so              i386
usr/lib/fs/autofs/sparcv9/libshare_autofs.so            sparc
usr/lib/fs/nfs/libshare_nfs.so
usr/lib/fs/nfs/amd64/libshare_nfs.so            i386
usr/lib/fs/nfs/sparcv9/libshare_nfs.so          sparc
usr/lib/fs/smb/libshare_smb.so
usr/lib/fs/smb/amd64/libshare_smb.so            i386
usr/lib/fs/smb/sparcv9/libshare_smb.so          sparc
usr/lib/fs/smbfs/libshare_smbfs.so
usr/lib/fs/smbfs/amd64/libshare_smbfs.so        i386
usr/lib/fs/smbfs/sparcv9/libshare_smbfs.so      sparc
usr/include/libshare_impl.h
usr/include/scfutil.h
#
# These files are installed in the proto area by the build of libpri for
# the benefit of the builds of FMA libldom, Zeus, picld plugins, and/or
# other libpri consumers. However, the libpri interfaces are private to
# Sun (Consolidation Private) and not intended for customer use. So these
# files (the symlink and the lint library) are excluded from packaging.
#
usr/lib/libpri.so               sparc
usr/lib/llib-lpri               sparc
usr/lib/llib-lpri.ln            sparc
usr/lib/sparcv9/libpri.so       sparc
usr/lib/sparcv9/llib-lpri.ln    sparc
#
# These files are installed in the proto area by the build of libds for
# the benefit of the builds of sun4v IO FMA and/or other libds
# consumers.  However, the libds interfaces are private to Sun
# (Consolidation Private) and not intended for customer use. So these
# files (the symlink and the lint library) are excluded from packaging.
#
usr/lib/libds.so                        sparc
usr/lib/sparcv9/libds.so                sparc
usr/lib/llib-lds                        sparc
usr/lib/llib-lds.ln                     sparc
usr/lib/sparcv9/llib-lds.ln             sparc
usr/lib/libdscfg.so
usr/lib/llib-ldscfg.ln
usr/platform/sun4v/include/sys/libds.h  sparc
usr/platform/sun4v/include/sys/vlds.h   sparc
#
# Private/Internal u8_textprep header file. Do not ship.
#
usr/include/sys/u8_textprep_data.h
#
# SQLite is private, used by SMF (svc.configd), idmapd and libsmb.
#
usr/include/sqlite
usr/lib/libsqlite-native.o
usr/lib/libsqlite.o
usr/lib/llib-lsqlite.ln
usr/lib/smbsrv/libsqlite.so
#
# Private/Internal kiconv header files. Do not ship.
#
usr/include/sys/kiconv_big5_utf8.h
usr/include/sys/kiconv_cck_common.h
```



```
usr/include/sys/kiconv_cp950hkscs_utf8.h
usr/include/sys/kiconv_emea1.h
usr/include/sys/kiconv_emea2.h
usr/include/sys/kiconv_euckr_utf8.h
usr/include/sys/kiconv_euctw_utf8.h
usr/include/sys/kiconv_gb18030_utf8.h
usr/include/sys/kiconv_gb2312_utf8.h
usr/include/sys/kiconv_hkscs_utf8.h
usr/include/sys/kiconv_ja_jis_to_unicode.h
usr/include/sys/kiconv_ja_unicode_to_jis.h
usr/include/sys/kiconv_ja.h
usr/include/sys/kiconv_ko.h
usr/include/sys/kiconv_latin1.h
usr/include/sys/kiconv_sc.h
usr/include/sys/kiconv_tc.h
usr/include/sys/kiconv_uhc_utf8.h
usr/include/sys/kiconv_utf8_big5.h
usr/include/sys/kiconv_utf8_cp950hkscs.h
usr/include/sys/kiconv_utf8_euckr.h
usr/include/sys/kiconv_utf8_euctw.h
usr/include/sys/kiconv_utf8_gb18030.h
usr/include/sys/kiconv_utf8_gb2312.h
usr/include/sys/kiconv_utf8_hkscs.h
usr/include/sys/kiconv_utf8_uhc.h
#
# At this time, the ttydefs.cleanup file is only useful on sun4u systems
#
etc/flash/postdeployment/ttydefs.cleanup        i386
#
# This header file is shared only between the power commands and
# ppm/srn modules # and should not be in any package
#
usr/include/sys/srn.h
#
# Private/Internal header files of smbsrv. Do not ship.
#
usr/include/smb
usr/include/smbsrv
#
# Private/Internal dtrace scripts of smbsrv. Do not ship.
#
usr/lib/smbsrv/dtrace
#
# Private/Internal (lint) libraries of smbsrv. Do not ship.
#
usr/lib/reparse/llib-lreparse_smb
usr/lib/reparse/llib-lreparse_smb.ln
usr/lib/smbsrv/llib-lmlrpc
usr/lib/smbsrv/llib-lmlrpc.ln
usr/lib/smbsrv/llib-lmlsvc
usr/lib/smbsrv/llib-lmlsvc.ln
usr/lib/smbsrv/llib-lsmb
usr/lib/smbsrv/llib-lsmb.ln
usr/lib/smbsrv/llib-lsmbns
usr/lib/smbsrv/llib-lsmbns.ln
#
#
# Private/Internal 64-bit libraries of smbsrv. Do not ship.
#
usr/lib/smbsrv/amd64                            i386
usr/lib/smbsrv/sparcv9                          sparc

usr/lib/reparse/amd64/libreparse_smb.so         i386
usr/lib/reparse/amd64/libreparse_smb.so.1       i386
usr/lib/reparse/amd64/llib-lreparse_smb.ln      i386
usr/lib/reparse/sparcv9/libreparse_smb.so       sparc
```

```
usr/lib/reparse/sparcv9/libreparse_smb.so.1     sparc
usr/lib/reparse/sparcv9/llib-lreparse_smb.ln    sparc
#
# Private dirent, extended to include flags, for use by SMB server
#
usr/include/sys/extdirent.h
#
# Private header files for vscan service
#
usr/include/libvscan.h
usr/include/sys/vscan.h
#
# libvscan is private
#
usr/lib/vscan/llib-lvscan
usr/lib/vscan/llib-lvscan.ln
#
# i86hvm is not a full platform.  It is just a home for paravirtualized
# drivers.  There is no usr/ component to this sub-platform, but the
# directory is created in the proto area to keep other tools happy.
#
usr/platform/i86hvm                                             i386
#
# Private sdcard framework headers
#
usr/include/sys/sdcard
#
# libsmbfs is private
#
usr/include/netsmb
usr/lib/libsmbfs.so
usr/lib/amd64/libsmbfs.so               i386
usr/lib/sparcv9/libsmbfs.so             sparc
usr/lib/llib-lsmbfs
usr/lib/llib-lsmbfs.ln
usr/lib/amd64/llib-lsmbfs.ln            i386
usr/lib/sparcv9/llib-lsmbfs.ln          sparc
#
# demo & test program for smbfs (private) ACL support
#
usr/lib/fs/smbfs/chacl
usr/lib/fs/smbfs/lsacl
usr/lib/fs/smbfs/testnp
#
# FC related files
kernel/kmdb/fcip                i386
kernel/kmdb/amd64/fcip          i386
kernel/kmdb/sparcv9/fcip        sparc
kernel/kmdb/fcp                 i386
kernel/kmdb/amd64/fcp           i386
kernel/kmdb/sparcv9/fcp         sparc
kernel/kmdb/fctl                i386
kernel/kmdb/amd64/fctl          i386
kernel/kmdb/sparcv9/fctl        sparc
kernel/kmdb/qlc                 i386
kernel/kmdb/amd64/qlc           i386
kernel/kmdb/sparcv9/qlc         sparc
lib/llib-la5k                   sparc
lib/llib-la5k.ln                sparc
lib/sparcv9/llib-la5k.ln        sparc
lib/llib-lg_fc                  sparc
lib/llib-lg_fc.ln               sparc
lib/sparcv9/llib-lg_fc.ln       sparc
usr/include/a_state.h           sparc
usr/include/a5k.h               sparc
usr/include/exec.h              sparc
```



```
usr/include/g_scsi.h            sparc
usr/include/g_state.h           sparc
usr/include/gfc.h               sparc
usr/include/l_common.h          sparc
usr/include/l_error.h           sparc
usr/include/rom.h               sparc
usr/include/stgcom.h            sparc
usr/include/sys/fibre-channel
usr/lib/llib-lHBAAPI
usr/lib/llib-lHBAAPI.ln
usr/lib/amd64/llib-lHBAAPI.ln   i386
usr/lib/sparcv9/llib-lHBAAPI.ln sparc
#
usr/bin/dscfgcli
usr/bin/sd_diag
usr/bin/sd_stats
usr/include/nsctl.h
usr/include/sys/ncall
usr/include/sys/nsc_ddi.h
usr/include/sys/nsc_thread.h
usr/include/sys/nsctl
usr/include/sys/nskernd.h
usr/include/sys/unistat
usr/lib/libnsctl.so
usr/lib/librdc.so
usr/lib/libunistat.so
usr/lib/llib-lnsctl.ln
usr/lib/llib-lrdc.ln
usr/lib/llib-lunistat.ln
#
# These files are used by the iSCSI initiator only.
# No reason to ship them.
#
usr/include/sys/scsi/adapters/iscsi_door.h
usr/include/sys/scsi/adapters/iscsi_if.h
#
# sbd ioctl hdr
#
usr/include/sys/stmf_sbd_ioctl.h
#
# proxy port provider interface
#
usr/include/sys/pppt_ic_if.h
usr/include/sys/pppt_ioctl.h
#
# proxy daemon lint library
#
usr/lib/llib-lstmfproxy
usr/lib/llib-lstmfproxy.ln
usr/lib/amd64/llib-lstmfproxy.ln        i386
usr/lib/sparcv9/llib-lstmfproxy.ln      sparc
#
# portable object file and dictionary used by libfmd_msg test
#
usr/lib/fm/dict/TEST.dict
usr/lib/locale/C/LC_MESSAGES/TEST.mo
usr/lib/locale/C/LC_MESSAGES/TEST.po
#
# Private idmap RPC protocol
#
usr/include/rpcsvc/idmap_prot.h
usr/include/rpcsvc/idmap_prot.x
#
# Private idmap directory API
#
usr/include/directory.h
```

```
#
# librstp is private for bridging
#
usr/include/stp_bpdu.h
usr/include/stp_in.h
usr/include/stp_vectors.h
usr/lib/librstp.so
usr/lib/llib-lrstp
usr/lib/llib-lrstp.ln
#
# Private nvfru API
#
usr/include/nvfru.h
#
# vrrp
#
usr/include/libvrrpadm.h
usr/lib/libvrrpadm.so
usr/lib/amd64/libvrrpadm.so             i386
usr/lib/sparcv9/libvrrpadm.so           sparc
usr/lib/llib-lvrrpadm
usr/lib/llib-lvrrpadm.ln
usr/lib/amd64/llib-lvrrpadm.ln          i386
usr/lib/sparcv9/llib-lvrrpadm.ln        sparc
#
# This is only used during the -t tools build
#
opt/onbld/bin/i386/elfsign      i386
opt/onbld/bin/sparc/elfsign     sparc

#
# Private libdwarf
#
opt/onbld/lib/i386/libdwarf.so  i386
opt/onbld/lib/sparc/libdwarf.so sparc

#
# Private socket filter API
#
usr/include/sys/sockfilter.h
#
# We don't actually validate license action payloads, and the license
# staging area is provided as a separate basedir for package
# publication.  The net result is that everything therein should be
# ignored for packaging validation.
#
licenses
#
# Libbe is private
#
usr/include/libbe_priv.h
#
# ipmi is at present only useful on i386, but for historical reasons is
# delivered on SPARC and used by the build.
#
usr/include/sys/ipmi.h  sparc

#
# libsaveargs is private
#
usr/include/saveargs.h                  i386
usr/lib/amd64/libsaveargs.so            i386
usr/lib/amd64/libstandsaveargs.so       i386
usr/lib/amd64/llib-lsaveargs.ln         i386

#
```



```
# libpcidb is private
#
usr/include/pcidb.h
usr/lib/amd64/libpcidb.so               i386
usr/lib/amd64/llib-lpcidb.ln            i386
usr/lib/sparcv9/libpcidb.so             sparc
usr/lib/sparcv9/llib-lpcidb.ln          sparc
usr/lib/libpcidb.so
usr/lib/llib-lpcidb
usr/lib/llib-lpcidb.ln
```

```
**********************************************************
    8805 Sat May 10 12:08:42 2014
new/usr/src/Makefile.lint
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
#
# CDDL HEADER START
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#

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# include global definitions
include Makefile.master

#
# As pieces are made lint-clean, add them here so the nightly build
# can be used to keep them that way.
#
COMMON_SUBDIRS = \
        cmd/acctadm \
        cmd/asa \
        cmd/amt \
        cmd/audio/audioctl \
        cmd/audio/audiotest \
        cmd/audit \
        cmd/auditconfig \
        cmd/auditd \
        cmd/auditreduce \
        cmd/auditstat \
        cmd/auths \
        cmd/autopush \
        cmd/availdevs \
        cmd/avs \
        cmd/awk \
        cmd/banner \
        cmd/bart \
        cmd/basename \
        cmd/bdiff \
        cmd/bfs \
        cmd/busstat \
        cmd/boot \
        cmd/cal \
        cmd/captoinfo \
        cmd/cat \
        cmd/cdrw \
```



```
        cmd/cfgadm \
        cmd/checkeq \
        cmd/checknr \
        cmd/chgrp \
        cmd/chmod \
        cmd/chown \
        cmd/chroot \
        cmd/clinfo \
        cmd/cmd-crypto \
        cmd/cmd-inet/lib \
        cmd/cmd-inet/lib/netcfgd \
        cmd/cmd-inet/lib/nwamd \
        cmd/cmd-inet/sbin \
        cmd/cmd-inet/usr.bin \
        cmd/cmd-inet/usr.lib/bridged \
        cmd/cmd-inet/usr.lib/dsvclockd \
        cmd/cmd-inet/usr.lib/ilbd \
        cmd/cmd-inet/usr.lib/in.dhcpd \
        cmd/cmd-inet/usr.lib/in.mpathd \
        cmd/cmd-inet/usr.lib/in.ndpd \
        cmd/cmd-inet/usr.lib/inetd \
        cmd/cmd-inet/usr.lib/pppoe \
        cmd/cmd-inet/usr.lib/slpd \
        cmd/cmd-inet/usr.lib/vrrpd \
        cmd/cmd-inet/usr.lib/wpad \
        cmd/cmd-inet/usr.lib/wanboot \
        cmd/cmd-inet/usr.sadm \
        cmd/cmd-inet/usr.sbin \
        cmd/cmd-inet/usr.sbin/ilbadm \
        cmd/cmd-inet/usr.sbin/nwamadm \
        cmd/cmd-inet/usr.sbin/nwamcfg \
        cmd/col \
        cmd/compress \
        cmd/consadm \
        cmd/coreadm \
        cmd/cpc \
        cmd/cpio \
        cmd/crypt \
        cmd/csplit \
        cmd/ctrun \
        cmd/ctstat \
        cmd/ctwatch \
        cmd/date \
        cmd/dd \
        cmd/deroff \
        cmd/devctl \
        cmd/devfsadm \
        cmd/devinfo \
        cmd/devmgmt \
        cmd/devprop \
        cmd/dfs.cmds \
        cmd/diff3 \
        cmd/dis \
        cmd/dirname \
        cmd/diskscan \
        cmd/dispadmin \
        cmd/dladm \
        cmd/dlmgmtd \
        cmd/dtrace \
        cmd/du \
        cmd/dumpadm \
        cmd/dumpcs \
        cmd/echo \
        cmd/eject \
        cmd/emul64ioctl \
        cmd/env \
```

```
128         cmd/expand \
129         cmd/fcinfo \
130         cmd/fdetach \
131         cmd/fdformat \
132         cmd/fdisk \
133         cmd/fgrep \
134         cmd/file \
135         cmd/find \
136         cmd/fmthard \
137         cmd/fmtmsg \
138         cmd/fold \
139         cmd/fm \
140         cmd/format \
141         cmd/fs.d/fd \
142         cmd/fs.d/lofs/mount \
143         cmd/fs.d/mntfs \
144         cmd/fs.d/pcfs/mount \
145         cmd/fs.d/proc \
146         cmd/fs.d/tmpfs \
147         cmd/fs.d/udfs/mount \
148         cmd/fs.d/ufs/mount \
149         cmd/fs.d/ufs/fsirand\
150         cmd/fs.d/zfs/fstyp \
151         cmd/fwflash \
152         cmd/fuser \
153         cmd/gcore \
154         cmd/genmsg \
155         cmd/getconf \
156         cmd/getdevpolicy \
157         cmd/getfacl \
158         cmd/getopt \
159         cmd/gettext \
160         cmd/grep \
161         cmd/grep_xpg4 \
162         cmd/groups \
163         cmd/halt \
164         cmd/head \
165         cmd/hostid \
166         cmd/hostname \
167         cmd/hotplug \
168         cmd/hotplugd \
169         cmd/idmap \
170         cmd/init \
171         cmd/intrstat \
172         cmd/ipcrm \
173         cmd/ipcs \
174         cmd/isaexec \
175         cmd/isalist \
176         cmd/iscsiadm \
177         cmd/iscsid \
178         cmd/iscsitsvc \
179         cmd/isns \
180         cmd/itadm \
181         cmd/kbd \
182         cmd/killall \
183         cmd/ldap \
184         cmd/last \
185         cmd/lastcomm \
186         cmd/ldapcachemgr \
187         cmd/line \
188         cmd/link \
189         cmd/locator \
190         cmd/localedef \
191         cmd/lockstat \
192         cmd/lofiadm \
193         cmd/logadm \
```



```
194         cmd/logger \
195         cmd/login \
196         cmd/logins \
197         cmd/ls \
198         cmd/luxadm \
199         cmd/lvm \
200         cmd/machid \
201         cmd/makekey \
202         cmd/mdb \
203         cmd/mesg \
204         cmd/mkdir \
205         cmd/mkfifo \
206         cmd/mkfile \
207         cmd/mkmsgs \
208         cmd/mknod \
209         cmd/mpathadm \
210         cmd/modload \
211         cmd/msgfmt \
212         cmd/msgid \
213         cmd/mt \
214         cmd/mv \
215         cmd/ndmpadm \
216         cmd/ndmpd \
217         cmd/ndmpstat \
218         cmd/newform \
219         cmd/newgrp \
220         cmd/newtask \
221         cmd/nice \
222         cmd/nl \
223         cmd/nohup \
224         cmd/nscd \
225         cmd/od \
226         cmd/pagesize \
227         cmd/passwd \
228         cmd/pathchk \
229         cmd/pbind \
230         cmd/pcidr \
231         cmd/pcitool \
232         cmd/pfexec \
233         cmd/pgrep \
234         cmd/picl/picld \
235         cmd/picl/prtpicl \
236         cmd/plockstat \
237         cmd/pools \
238         cmd/power \
239         cmd/powertop \
240         cmd/printf \
241         cmd/latencytop \
242         cmd/ppgsz \
243         cmd/praudit \
244         cmd/prctl \
245         cmd/priocntl \
246         cmd/profiles \
247         cmd/prstat \
248         cmd/prtconf \
249         cmd/prtdiag \
250         cmd/prtvtoc \
251         cmd/ps \
252         cmd/psradm \
253         cmd/psrinfo \
254         cmd/psrset \
255         cmd/ptools \
256         cmd/pwck \
257         cmd/pwconv \
258         cmd/ramdiskadm \
259         cmd/raidctl \
```

```
260         cmd/rcap \
261         cmd/rcm_daemon \
262         cmd/rctladm \
263         cmd/renice \
264         cmd/rm \
265         cmd/rmdir \
266         cmd/rmformat \
267         cmd/rmt \
268         cmd/roles \
269         cmd/rpcgen \
270         cmd/rpcsvc/rpc.bootparamd \
271         cmd/runat \
272         cmd/savecore \
273         cmd/sbdadm \
274         cmd/sdpadm \
275         cmd/sed \
276         cmd/setpgrp \
277         cmd/smbios \
278         cmd/sgs \
279         cmd/smbsrv \
280         cmd/smserverd \
281         cmd/sort \
282         cmd/split \
283         cmd/srptadm \
284         cmd/srptsvc \
285         cmd/ssh \
286         cmd/stat \
287         cmd/stmfadm \
288         cmd/stmfsvc \
289         cmd/stmsboot \
290         cmd/streams/strcmd \
291         cmd/strings \
292         cmd/su \
293         cmd/sulogin \
294         cmd/svc \
295         cmd/swap \
296         cmd/sync \
297         cmd/syseventadm \
298         cmd/syseventd \
299         cmd/syslogd \
300         cmd/tabs \
301         cmd/tail \
302         cmd/th_tools \
303         cmd/tip \
304         cmd/touch \
305         cmd/tr \
306         cmd/truss \
307         cmd/tty \
308         cmd/tzreload \
309         cmd/uadmin \
310         cmd/ul \
311         cmd/userattr \
312         cmd/users \
313         cmd/utmp_update \
314         cmd/utmpd \
315         cmd/valtools \
316         cmd/vrrpadm \
317         cmd/vt \
318         cmd/wall \
319         cmd/who \
320         cmd/whodo \
321         cmd/wracct \
322         cmd/wusbadm \
323         cmd/xargs \
324         cmd/xstr \
325         cmd/yes \
```



```
326         cmd/yppasswd \
327         cmd/zdb \
328         cmd/zdump \
329         cmd/zfs \
330         cmd/zhack \
331         cmd/zinject \
332         cmd/zlogin \
333         cmd/zoneadm \
334         cmd/zoneadmd \
335         cmd/zonecfg \
336         cmd/zonename \
337         cmd/zpool \
338         cmd/zlook \
339         cmd/ztest \
340         lib/abi \
341         lib/auditd_plugins \
342         lib/libbe \
343         lib/pylibbe \
344         lib/brand/sn1 \
345         lib/brand/solaris10 \
346         lib/crypt_modules \
347         lib/extendedFILE \
348         lib/libadm \
349         lib/libadutils \
350         lib/libadt_jni \
351         lib/libaio \
352         lib/libavl \
353         lib/libbrand \
354         lib/libbsdmalloc \
355         lib/libbsm \
356         lib/libc \
357         lib/libc_db \
358         lib/libcfgadm \
359         lib/libcmdutils \
360         lib/libcommputil \
361         lib/libcontract \
362         lib/libcryptoutil \
363         lib/libctf \
364         lib/libdevice \
365         lib/libdevid \
366         lib/libdevinfo \
367         lib/libdhcpagent \
368         lib/libdhcpdu \
369         lib/libdhcpsvc \
370         lib/libdhcputil \
371         lib/libdisasm \
372         lib/libdiskmgt \
373         lib/libdladm \
374         lib/libdlpi \
375         lib/libdoor \
376         lib/libdscfg \
377         lib/libdtrace \
378         lib/libefi \
379         lib/libelfsign \
380         lib/libexacct \
381         lib/libfcoe \
382         lib/libgen \
383         lib/libgrubmgmt \
384         lib/libgss \
385         lib/libhotplug \
386         lib/libidmap \
387         lib/libilb \
388         lib/libinetsvc \
389         lib/libinetutil \
390         lib/libinstzones \
391         lib/libipadm \
```

```
392         lib/libipmi \
393         lib/libipmp \
394         lib/libipp \
395         lib/libipsecutil \
396         lib/libiscsit \
397         lib/libkmf \
398         lib/libkstat \
399         lib/liblgrp \
400         lib/liblm \
401         lib/libm \
402         lib/libm1 \
403         lib/libmvec \
404         lib/libmalloc \
405         lib/libmapmalloc \
406         lib/libmapid \
407         lib/libmd \
408         lib/libmp \
409         lib/libmtmalloc \
410         lib/libndmp \
411         lib/libnsctl \
412         lib/libnsl \
413         lib/libnvpair \
414         lib/libnwam \
415         lib/libpam \
416         lib/libpctx \
417         lib/libpicl \
418         lib/libpicltree \
419         lib/libpkg \
420         lib/libpool \
421         lib/libproc \
422         lib/libpthread \
423         lib/libraidcfg \
424         lib/librcm \
425         lib/librdc \
426         lib/libreparse \
427         lib/librestart \
428         lib/librstp \
429         lib/librt \
430         lib/libscf \
431         lib/libsec \
432         lib/libsecdb \
433         lib/libsendfile \
434         lib/libsip \
435         lib/libshare \
436         lib/libsldap \
437         lib/libslp \
438         lib/libsmbfs \
439         lib/libsmbios \
440         lib/libsmedia \
441         lib/libsrpt \
442         lib/libstmf \
443         lib/libsun_ima \
444         lib/libsysevent \
445         lib/libthread \
446         lib/libtsnet \
447         lib/libtsol \
448         lib/libumem \
449         lib/libunistat \
450         lib/libuuid \
451         lib/libutil \
452         lib/libvrrpadm \
453         lib/libwanboot \
454         lib/libwanbootutil \
455         lib/libxnet \
456         lib/libzfs \
457         lib/libzfs_jni \
```



```
458         lib/libzonecfg \
459         lib/libzoneinfo \
460         lib/lvm \
461         lib/madv \
462         lib/mpss \
463         lib/nametoaddr \
464         lib/ncad_addr \
465         lib/nsswitch \
466         lib/pam_modules \
467         lib/passwdutil \
468         lib/pkcs11 \
469         lib/print \
470         lib/raidcfg_plugins \
471         lib/scsi \
472         lib/smbsrv \
473         lib/fm \
474         lib/udapl \
475         lib/watchmalloc \
476         psm \
477         test \
478         ucbcmd/basename \
479         ucbcmd/biff \
480         ucbcmd/echo \
481         ucbcmd/groups \
482         ucbcmd/mkstr \
483         ucbcmd/printenv \
484         ucbcmd/sum \
485         ucbcmd/test \
486         ucbcmd/users \
487         ucbcmd/whoami

489 i386_SUBDIRS= \
490         cmd/acpihpd \
491         cmd/biosdev \
492         cmd/rtc \
493         cmd/ucodeadm \
494         lib/cfgadm_plugins/sata \
495         lib/cfgadm_plugins/sbd \
496         lib/libfdisk

498 sparc_SUBDIRS= \
499         cmd/datadm \
500         cmd/dcs \
501         cmd/drd \
502         cmd/fruadm \
503         cmd/ldmad \
504         cmd/prtdscp \
505         cmd/prtfru \
506         cmd/sckmd \
507         cmd/virtinfo \
508         cmd/vntsd \
509         lib/libds \
510         lib/libdscp \
511         lib/libpri \
512         lib/libpcp \
513         lib/libtsalarm \
514         lib/libv12n \
515         lib/storage \
516         stand

518 LINTSUBDIRS= $(COMMON_SUBDIRS) $($(MACH)_SUBDIRS)

520 .PARALLEL:      $(LINTSUBDIRS)

522 lint:           uts .WAIT subdirs
```

```
 524 subdirs:        $(LINTSUBDIRS)

 526 uts $(LINTSUBDIRS):     FRC
 527         @cd $@; pwd; $(MAKE) lint

 529 FRC:
```

```
**********************************************************
   71419 Sat May 10 12:08:42 2014
new/usr/src/Targetdirs
patch11 - added LIBM man pages
patch01 - 693 import Sun Devpro Math Library
**********************************************************
   1 # CDDL HEADER START
   2 #
   3 # The contents of this file are subject to the terms of the
   4 # Common Development and Distribution License (the "License").
   5 # You may not use this file except in compliance with the License.
   6 #
   7 # You can obtain a copy of the license at usr/src/OPENSOLARIS.LICENSE
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   9 # See the License for the specific language governing permissions
  10 # and limitations under the License.
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  12 # When distributing Covered Code, include this CDDL HEADER in each
  13 # file and include the License file at usr/src/OPENSOLARIS.LICENSE.
  14 # If applicable, add the following below this CDDL HEADER, with the
  15 # fields enclosed by brackets "[]" replaced with your own identifying
  16 # information: Portions Copyright [yyyy] [name of copyright owner]
  17 #
  18 # CDDL HEADER END
  19 #

  21 #
  22 # Copyright (c) 1989, 2010, Oracle and/or its affiliates. All rights reserved.
  23 # Copyright 2011, Richard Lowe
  24 # Copyright (c) 2012 by Delphix. All rights reserved.
  25 # Copyright (c) 2012, Igor Kozhukhov <ikozhukhov@gmail.com>
  26 # Copyright 2012 OmniTI Computer Consulting, Inc.  All rights reserved.
  27 # Copyright (c) 2013 RackTop Systems.
  28 # Copyright 2013 Nexenta Systems, Inc.  All rights reserved.
  29 #

  31 #
  32 # It is easier to think in terms of directory names without the ROOT macro
  33 # prefix.  ROOTDIRS is TARGETDIRS with ROOT prefixes.  It is necessary
  34 # to work with ROOT prefixes when controlling conditional assignments.
  35 #

  37 DIRLINKS=       $(SYM.DIRS)
  38 $(BUILD64)      DIRLINKS += $(SYM.DIRS64)

  40 FILELINKS= $(SYM.USRCCSLIB) $(SYM.USRLIB)
  41 $(BUILD64)      FILELINKS += $(SYM.USRCCSLIB64) $(SYM.USRLIB64)

  43 TARGETDIRS=     $(DIRS)
  44 $(BUILD64)      TARGETDIRS += $(DIRS64)

  46 TARGETDIRS      += $(FILELINKS) $(DIRLINKS)

  48 i386_DIRS=                      \
  49         /boot/acpi              \
  50         /boot/acpi/tables       \
  51         /boot/grub              \
  52         /boot/grub/bin          \
  53         /platform/i86pc         \
  54         /lib/libmvec            \
  55         /usr/lib/xen            \
  56         /usr/lib/xen/bin

  58 sparc_DIRS=                            \
  59         /usr/lib/ldoms
```



```
  61 sparc_64ONLY= $(POUND_SIGN)
  62 64ONLY=  $($(MACH)_64ONLY)

  64 $(64ONLY) MACH32_DIRS=/usr/ucb/$(MACH32)

  66 DIRS= \
  67         /boot \
  68         /boot/solaris \
  69         /boot/solaris/bin \
  70         $($(MACH)_DIRS) \
  71         /dev \
  72         /dev/dsk \
  73         /dev/fd \
  74         /dev/ipnet \
  75         /dev/net \
  76         /dev/rdsk \
  77         /dev/rmt \
  78         /dev/pts \
  79         /dev/sad \
  80         /dev/swap \
  81         /dev/term \
  82         /dev/vt \
  83         /dev/zcons \
  84         /devices \
  85         /devices/pseudo \
  86         /etc \
  87         /etc/brand  \
  88         /etc/brand/solaris10  \
  89         /etc/cron.d \
  90         /etc/crypto \
  91         /etc/crypto/certs \
  92         /etc/crypto/crls \
  93         /etc/dbus-1 \
  94         /etc/dbus-1/system.d \
  95         /etc/default \
  96         /etc/devices  \
  97         /etc/dev  \
  98         /etc/dfs  \
  99         /etc/dladm \
 100         /etc/fs  \
 101         /etc/fs/nfs  \
 102         /etc/fs/zfs \
 103         /etc/ftpd  \
 104         /etc/hal \
 105         /etc/hal/fdi \
 106         /etc/hal/fdi/information \
 107         /etc/hal/fdi/information/10freedesktop \
 108         /etc/hal/fdi/information/20thirdparty \
 109         /etc/hal/fdi/information/30user \
 110         /etc/hal/fdi/policy \
 111         /etc/hal/fdi/policy/10osvendor \
 112         /etc/hal/fdi/policy/20thirdparty \
 113         /etc/hal/fdi/policy/30user \
 114         /etc/hal/fdi/preprobe \
 115         /etc/hal/fdi/preprobe/10osvendor \
 116         /etc/hal/fdi/preprobe/20thirdparty \
 117         /etc/hal/fdi/preprobe/30user \
 118         /etc/ipadm \
 119         /etc/iscsi \
 120         /etc/rpcsec     \
 121         /etc/security   \
 122         /etc/security/auth_attr.d \
 123         /etc/security/exec_attr.d \
 124         /etc/security/prof_attr.d \
 125         /etc/security/tsol      \
 126         /etc/gss        \
```

```
127         /etc/init.d  \
128         /etc/dhcp       \
129         /etc/lib  \
130         /etc/mail  \
131         /etc/mail/cf  \
132         /etc/mail/cf/cf  \
133         /etc/mail/cf/domain  \
134         /etc/mail/cf/feature  \
135         /etc/mail/cf/m4  \
136         /etc/mail/cf/mailer  \
137         /etc/mail/cf/ostype  \
138         /etc/mail/cf/sh  \
139         /etc/net-snmp \
140         /etc/net-snmp/snmp \
141         /etc/opt  \
142         /etc/rc0.d  \
143         /etc/rc1.d  \
144         /etc/rc2.d  \
145         /etc/rc3.d  \
146         /etc/rcS.d  \
147         /etc/saf \
148         /etc/sasl       \
149         /etc/sfw \
150         /etc/skel       \
151         /etc/svc \
152         /etc/svc/profile \
153         /etc/svc/profile/site \
154         /etc/svc/volatile \
155         /etc/tm  \
156         /etc/usb   \
157         /etc/user_attr.d \
158         /etc/zfs  \
159         /etc/zones  \
160         /export  \
161         /home  \
162         /lib \
163         /lib/crypto \
164         /lib/inet \
165         /lib/fm \
166         /lib/secure \
167         /lib/svc \
168         /lib/svc/bin \
169         /lib/svc/capture \
170         /lib/svc/manifest \
171         /lib/svc/manifest/milestone \
172         /lib/svc/manifest/device \
173         /lib/svc/manifest/system \
174         /lib/svc/manifest/system/device \
175         /lib/svc/manifest/system/filesystem \
176         /lib/svc/manifest/system/security \
177         /lib/svc/manifest/system/svc \
178         /lib/svc/manifest/network \
179         /lib/svc/manifest/network/dns \
180         /lib/svc/manifest/network/ipsec \
181         /lib/svc/manifest/network/ldap \
182         /lib/svc/manifest/network/nfs \
183         /lib/svc/manifest/network/nis \
184         /lib/svc/manifest/network/rpc \
185         /lib/svc/manifest/network/security \
186         /lib/svc/manifest/network/shares \
187         /lib/svc/manifest/network/ssl \
188         /lib/svc/manifest/application \
189         /lib/svc/manifest/application/management \
190         /lib/svc/manifest/application/security \
191         /lib/svc/manifest/application/print \
192         /lib/svc/manifest/platform \
```



```
193         /lib/svc/manifest/platform/sun4u \
194         /lib/svc/manifest/platform/sun4v \
195         /lib/svc/manifest/site \
196         /lib/svc/method \
197         /lib/svc/monitor \
198         /lib/svc/seed \
199         /lib/svc/share \
200         /kernel  \
201         /mnt  \
202         /opt  \
203         /platform  \
204         /proc  \
205         /root  \
206         /sbin  \
207         /system \
208         /system/contract \
209         /system/object \
210         /tmp \
211         /usr  \
212         /usr/4lib \
213         /usr/ast \
214         /usr/ast/bin \
215         /usr/bin \
216         /usr/bin/$(MACH32) \
217         /usr/ccs \
218         /usr/ccs/bin \
219         /usr/ccs/lib \
220         /usr/demo \
221         /usr/demo/SOUND \
222         /usr/games \
223         /usr/has \
224         /usr/has/bin \
225         /usr/has/lib \
226         /usr/has/man \
227         /usr/has/man/man1has \
228         /usr/include \
229         /usr/include/ast \
230         /usr/include/fm \
231         /usr/include/gssapi \
232         /usr/include/hal \
233         /usr/include/kerberosv5 \
234         /usr/include/libmilter \
235         /usr/include/libpolkit \
236         /usr/include/sasl \
237         /usr/include/scsi \
238         /usr/include/security \
239         /usr/include/sys/crypto \
240         /usr/include/tsol \
241         /usr/kernel  \
242         /usr/kvm \
243         /usr/lib \
244         /usr/lib/abi \
245         /usr/lib/brand \
246         /usr/lib/brand/ipkg \
247         /usr/lib/brand/labeled \
248         /usr/lib/brand/shared \
249         /usr/lib/brand/sn1 \
250         /usr/lib/brand/solaris10 \
251         /usr/lib/class \
252         /usr/lib/class/FSS \
253         /usr/lib/class/FX \
254         /usr/lib/class/IA \
255         /usr/lib/class/RT \
256         /usr/lib/class/SDC \
257         /usr/lib/class/TS \
258         /usr/lib/crypto \
```

```
259         /usr/lib/drv \
260         /usr/lib/elfedit \
261         /usr/lib/fm \
262         /usr/lib/font \
263         /usr/lib/fs \
264         /usr/lib/fs/nfs \
265         /usr/lib/fs/proc \
266         /usr/lib/fs/smb \
267         /usr/lib/fs/zfs \
268         /usr/lib/gss \
269         /usr/lib/hal \
270         /usr/lib/inet \
271         /usr/lib/inet/dhcp \
272         /usr/lib/inet/dhcp/nsu \
273         /usr/lib/inet/dhcp/svc \
274         /usr/lib/inet/dhcp/svcadm \
275         /usr/lib/inet/ilb \
276         /usr/lib/inet/$(MACH32) \
277         /usr/lib/inet/wanboot \
278         /usr/lib/krb5 \
279         /usr/lib/link_audit \
280         /usr/lib/libp \
281         /usr/lib/lwp \
282         /usr/lib/mdb \
283         /usr/lib/mdb/kvm \
284         /usr/lib/mdb/proc \
285         /usr/lib/nfs \
286         /usr/net \
287         /usr/net/servers \
288         /usr/lib/pool \
289         /usr/lib/python2.6 \
290         /usr/lib/python2.6/vendor-packages \
291         /usr/lib/python2.6/vendor-packages/64 \
292         /usr/lib/python2.6/vendor-packages/solaris \
293         /usr/lib/python2.6/vendor-packages/zfs \
294         /usr/lib/python2.6/vendor-packages/beadm \
295         /usr/lib/rcap \
296         /usr/lib/rcap/$(MACH32) \
297         /usr/lib/sa  \
298         /usr/lib/saf \
299         /usr/lib/sasl \
300         /usr/lib/scsi \
301         /usr/lib/secure \
302         /usr/lib/security \
303         /usr/lib/smbsrv \
304         /usr/lib/vscan \
305         /usr/lib/zfs \
306         /usr/lib/zones \
307         /usr/old \
308         /usr/platform  \
309         /usr/proc \
310         /usr/proc/bin \
311         /usr/sadm \
312         /usr/sadm/install \
313         /usr/sadm/install/bin \
314         /usr/sadm/install/scripts \
315         /usr/sbin \
316         /usr/sbin/$(MACH32) \
317         /usr/share  \
318         /usr/share/applications \
319         /usr/share/audio \
320         /usr/share/audio/samples \
321         /usr/share/audio/samples/au \
322         /usr/share/gnome \
323         /usr/share/gnome/autostart \
324         /usr/share/hwdata \
```



```
325         /usr/share/lib \
326         /usr/share/lib/ccs \
327         /usr/share/lib/tmac  \
328         /usr/share/lib/ldif  \
329         /usr/share/lib/xml \
330         /usr/share/lib/xml/dtd \
331         /usr/share/man \
332         /usr/share/man/man1 \
333         /usr/share/man/man1b \
334         /usr/share/man/man1c \
335         /usr/share/man/man1m \
336         /usr/share/man/man2 \
337         /usr/share/man/man3 \
338         /usr/share/man/man3bsm \
339         /usr/share/man/man3c \
340         /usr/share/man/man3c_db \
341         /usr/share/man/man3cfgadm \
342         /usr/share/man/man3commputil \
343         /usr/share/man/man3contract \
344         /usr/share/man/man3cpc \
345         /usr/share/man/man3curses \
346         /usr/share/man/man3dat \
347         /usr/share/man/man3devid \
348         /usr/share/man/man3devinfo \
349         /usr/share/man/man3dlpi \
350         /usr/share/man/man3dns_sd \
351         /usr/share/man/man3elf \
352         /usr/share/man/man3exacct \
353         /usr/share/man/man3ext \
354         /usr/share/man/man3fcoe \
355         /usr/share/man/man3fstyp \
356         /usr/share/man/man3gen \
357         /usr/share/man/man3gss \
358         /usr/share/man/man3head \
359         /usr/share/man/man3iscsit \
360         /usr/share/man/man3kstat \
361         /usr/share/man/man3kvm \
362         /usr/share/man/man3ldap \
363         /usr/share/man/man3lgrp \
364         /usr/share/man/man3lib \
365         /usr/share/man/man3m \
366         /usr/share/man/man3mail \
367         /usr/share/man/man3malloc \
368         /usr/share/man/man3mp \
369         /usr/share/man/man3mpapi \
370         /usr/share/man/man3mvec \
371         /usr/share/man/man3nsl \
372         /usr/share/man/man3nvpair \
373         /usr/share/man/man3pam \
374         /usr/share/man/man3papi \
375         /usr/share/man/man3perl \
376         /usr/share/man/man3picl \
377         /usr/share/man/man3picltree \
378         /usr/share/man/man3pool \
379         /usr/share/man/man3proc \
380         /usr/share/man/man3project \
381         /usr/share/man/man3resolv \
382         /usr/share/man/man3rpc \
383         /usr/share/man/man3rsm \
384         /usr/share/man/man3sasl \
385         /usr/share/man/man3scf \
386         /usr/share/man/man3sec \
387         /usr/share/man/man3secdb \
388         /usr/share/man/man3sip \
389         /usr/share/man/man3slp \
390         /usr/share/man/man3socket \
```

```
391         /usr/share/man/man3stmf \
392         /usr/share/man/man3sysevent \
393         /usr/share/man/man3tecla \
394         /usr/share/man/man3tnf \
395         /usr/share/man/man3tsol \
396         /usr/share/man/man3uuid \
397         /usr/share/man/man3volmgt \
398         /usr/share/man/man3xcurses \
399         /usr/share/man/man3xnet \
400         /usr/share/man/man4 \
401         /usr/share/man/man5 \
402         /usr/share/man/man7 \
403         /usr/share/man/man7d \
404         /usr/share/man/man7fs \
405         /usr/share/man/man7i \
406         /usr/share/man/man7ipp \
407         /usr/share/man/man7m \
408         /usr/share/man/man7p \
409         /usr/share/man/man9 \
410         /usr/share/man/man9e \
411         /usr/share/man/man9f \
412         /usr/share/man/man9p \
413         /usr/share/man/man9s \
414         /usr/share/src \
415         /usr/snadm \
416         /usr/snadm/lib \
417         /usr/ucb \
418         $(MACH32_DIRS) \
419         /usr/ucblib \
420         /usr/xpg4 \
421         /usr/xpg4/bin \
422         /usr/xpg4/include \
423         /usr/xpg4/lib \
424         /usr/xpg6 \
425         /usr/xpg6/bin \
426         /var  \
427         /var/adm  \
428         /var/adm/exacct \
429         /var/adm/log \
430         /var/adm/pool \
431         /var/adm/sa \
432         /var/adm/sm.bin \
433         /var/adm/streams \
434         /var/cores \
435         /var/cron \
436         /var/db \
437         /var/db/ipf \
438         /var/games \
439         /var/idmap \
440         /var/krb5 \
441         /var/krb5/rcache  \
442         /var/krb5/rcache/root  \
443         /var/ld \
444         /var/log \
445         /var/log/pool \
446         /var/logadm \
447         /var/mail \
448         /var/news \
449         /var/opt \
450         /var/preserve \
451         /var/run \
452         /var/saf \
453         /var/sadm \
454         /var/sadm/install \
455         /var/sadm/install/admin \
456         /var/sadm/install/logs \
```



```
457         /var/sadm/pkg \
458         /var/sadm/security \
459         /var/smb \
460         /var/smb/cvol \
461         /var/smb/cvol/windows \
462         /var/smb/cvol/windows/system32 \
463         /var/smb/cvol/windows/system32/vss \
464         /var/spool \
465         /var/spool/cron \
466         /var/spool/cron/atjobs \
467         /var/spool/cron/crontabs \
468         /var/spool/lp \
469         /var/spool/pkg \
470         /var/spool/uucp \
471         /var/spool/uucppublic \
472         /var/svc \
473         /var/svc/log \
474         /var/svc/manifest \
475         /var/svc/manifest/milestone \
476         /var/svc/manifest/device \
477         /var/svc/manifest/system \
478         /var/svc/manifest/system/device \
479         /var/svc/manifest/system/filesystem \
480         /var/svc/manifest/system/security \
481         /var/svc/manifest/system/svc \
482         /var/svc/manifest/network \
483         /var/svc/manifest/network/dns \
484         /var/svc/manifest/network/ipsec \
485         /var/svc/manifest/network/ldap \
486         /var/svc/manifest/network/nfs \
487         /var/svc/manifest/network/nis \
488         /var/svc/manifest/network/rpc \
489         /var/svc/manifest/network/routing \
490         /var/svc/manifest/network/security \
491         /var/svc/manifest/network/shares \
492         /var/svc/manifest/network/ssl \
493         /var/svc/manifest/application \
494         /var/svc/manifest/application/management \
495         /var/svc/manifest/application/print \
496         /var/svc/manifest/application/security \
497         /var/svc/manifest/platform \
498         /var/svc/manifest/platform/sun4u \
499         /var/svc/manifest/platform/sun4v \
500         /var/svc/manifest/site \
501         /var/svc/profile \
502         /var/uucp \
503         /var/tmp \
504         /var/tsol \
505         /var/tsol/doors

507 sparcv9_DIRS64= \
508         /platform/sun4u \
509         /platform/sun4u/lib \
510         /platform/sun4u/lib/$(MACH64) \
511         /usr/platform/sun4u \
512         /usr/platform/sun4u/sbin \
513         /usr/platform/sun4u/lib \
514         /platform/sun4v/lib \
515         /platform/sun4v/lib/$(MACH64) \
516         /usr/platform/sun4v/sbin \
517         /usr/platform/sun4v/lib \
518         /usr/platform/sun4u-us3/lib \
519         /usr/platform/sun4u-opl/lib

521 amd64_DIRS64= \
522         /platform/i86pc/amd64
```

```
524 DIRS64= \
525         $($(MACH64)_DIRS64) \
526         /lib/$(MACH64) \
527         /lib/crypto/$(MACH64) \
528         /lib/fm/$(MACH64) \
529         /lib/secure/$(MACH64) \
530         /usr/bin/$(MACH64) \
531         /usr/ccs/bin/$(MACH64)  \
532         /usr/ccs/lib/$(MACH64) \
533         /usr/lib/$(MACH64) \
534         /usr/lib/$(MACH64)/gss \
535         /usr/lib/brand/sn1/$(MACH64) \
536         /usr/lib/brand/solaris10/$(MACH64) \
537         /usr/lib/elfedit/$(MACH64) \
538         /usr/lib/fm/$(MACH64) \
539         /usr/lib/fs/nfs/$(MACH64) \
540         /usr/lib/fs/smb/$(MACH64) \
541         /usr/lib/inet/$(MACH64) \
542         /usr/lib/krb5/$(MACH64) \
543         /usr/lib/libp/$(MACH64) \
544         /usr/lib/link_audit/$(MACH64) \
545         /usr/lib/lwp/$(MACH64) \
546         /usr/lib/mdb/kvm/$(MACH64) \
547         /usr/lib/mdb/proc/$(MACH64) \
548         /usr/lib/rcap/$(MACH64) \
549         /usr/lib/sasl/$(MACH64) \
550         /usr/lib/scsi/$(MACH64) \
551         /usr/lib/secure/$(MACH64) \
552         /usr/lib/security/$(MACH64) \
553         /usr/lib/smbsrv/$(MACH64) \
554         /usr/lib/abi/$(MACH64) \
555         /usr/sbin/$(MACH64) \
556         /usr/ucb/$(MACH64) \
557         /usr/ucblib/$(MACH64) \
558         /usr/xpg4/lib/$(MACH64) \
559         /var/ld/$(MACH64)

561 # /var/mail/:saved is built directly by the rootdirs target in
562 # /usr/src/Makefile because of the colon in its name.

564 # macros for symbolic links
565 SYM.DIRS= \
566         /bin \
567         /dev/stdin \
568         /dev/stdout \
569         /dev/stderr \
570         /etc/lib/ld.so.1 \
571         /etc/lib/libdl.so.1 \
572         /etc/lib/nss_files.so.1 \
573         /etc/log \
574         /lib/32 \
575         /lib/crypto/32 \
576         /lib/secure/32 \
577         /usr/adm \
578         /usr/spool \
579         /usr/lib/tmac \
580         /usr/ccs/lib/link_audit \
581         /usr/news \
582         /usr/preserve \
583         /usr/lib/32 \
584         /usr/lib/cron \
585         /usr/lib/elfedit/32 \
586         /usr/lib/libp/32 \
587         /usr/lib/lwp/32 \
588         /usr/lib/link_audit/32 \
```



```
589         /usr/lib/secure/32 \
590         /usr/mail \
591         /usr/man \
592         /usr/pub \
593         /usr/src \
594         /usr/tmp \
595         /usr/ucblib/32 \
596         /var/ld/32

598 sparc_SYM.DIRS64=

600 SYM.DIRS64= \
601         $($(MACH)_SYM.DIRS64) \
602         /lib/64 \
603         /lib/crypto/64 \
604         /lib/secure/64 \
605         /usr/lib/64 \
606         /usr/lib/brand/sn1/64 \
607         /usr/lib/brand/solaris10/64 \
608         /usr/lib/elfedit/64 \
609         /usr/lib/libp/64 \
610         /usr/lib/link_audit/64 \
611         /usr/lib/lwp/64 \
612         /usr/lib/secure/64 \
613         /usr/lib/security/64 \
614         /usr/xpg4/lib/64 \
615         /var/ld/64 \
616         /usr/ucblib/64

618 # prepend the ROOT prefix

620 ROOTDIRS=       $(TARGETDIRS:%=$(ROOT)%)

622 # conditional assignments
623 #
624 # Target directories with non-default values for owner and group must
625 # be referenced here, using their fully-prefixed names, and the non-
626 # default values assigned.  If a directory is mentioned above and not
627 # mentioned below, it has default values for attributes.
628 #
629 # The default value for DIRMODE is specified in usr/src/Makefile.master.
630 #

632 $(ROOT)/var/adm \
633 $(ROOT)/var/adm/sa :=           DIRMODE= 775

635 $(ROOT)/var/spool/lp:=          DIRMODE= 775

637 # file mode
638 #
639 $(ROOT)/tmp \
640 $(ROOT)/var/krb5/rcache \
641 $(ROOT)/var/preserve \
642 $(ROOT)/var/spool/pkg \
643 $(ROOT)/var/spool/uucppublic \
644 $(ROOT)/var/tmp:=       DIRMODE= 1777

646 $(ROOT)/root:=          DIRMODE= 700

648 $(ROOT)/var/krb5/rcache/root:=  DIRMODE= 700


651 #
652 # These permissions must match those set
653 # in the package manifests.
654 #
```

```
655 $(ROOT)/var/sadm/pkg \
656 $(ROOT)/var/sadm/security \
657 $(ROOT)/var/sadm/install/logs :=        DIRMODE= 555


660 #
661 # These permissions must match the ones set
662 # internally by fdfs and autofs.
663 #
664 $(ROOT)/dev/fd \
665 $(ROOT)/home:=          DIRMODE= 555

667 $(ROOT)/var/mail:=      DIRMODE=1777

669 $(ROOT)/proc:=          DIRMODE= 555

671 $(ROOT)/system/contract:=       DIRMODE= 555
672 $(ROOT)/system/object:=         DIRMODE= 555

674 # symlink assignments, LINKDEST is the value of the symlink
675 #
676 $(ROOT)/usr/lib/cron:=                  LINKDEST=../../etc/cron.d
677 $(ROOT)/bin:=                           LINKDEST=usr/bin
678 $(ROOT)/lib/32:=                        LINKDEST=.
679 $(ROOT)/lib/crypto/32:=                 LINKDEST=.
680 $(ROOT)/lib/secure/32:=                 LINKDEST=.
681 $(ROOT)/dev/stdin:=                     LINKDEST=fd/0
682 $(ROOT)/dev/stdout:=                    LINKDEST=fd/1
683 $(ROOT)/dev/stderr:=                    LINKDEST=fd/2
684 $(ROOT)/usr/pub:=                       LINKDEST=share/lib/pub
685 $(ROOT)/usr/man:=                       LINKDEST=share/man
686 $(ROOT)/usr/src:=                       LINKDEST=share/src
687 $(ROOT)/usr/adm:=                       LINKDEST=../var/adm
688 $(ROOT)/etc/lib/ld.so.1:=               LINKDEST=../../lib/ld.so.1
689 $(ROOT)/etc/lib/libdl.so.1:=            LINKDEST=../../lib/libdl.so.1
690 $(ROOT)/etc/lib/nss_files.so.1:=        LINKDEST=../../lib/nss_files.so.1
691 $(ROOT)/etc/log:=                       LINKDEST=../var/adm/log
692 $(ROOT)/usr/mail:=                      LINKDEST=../var/mail
693 $(ROOT)/usr/news:=                      LINKDEST=../var/news
694 $(ROOT)/usr/preserve:=                  LINKDEST=../var/preserve
695 $(ROOT)/usr/spool:=                     LINKDEST=../var/spool
696 $(ROOT)/usr/tmp:=                       LINKDEST=../var/tmp
697 $(ROOT)/usr/lib/tmac:=                  LINKDEST=../share/lib/tmac
698 $(ROOT)/usr/lib/32:=                    LINKDEST=.
699 $(ROOT)/usr/lib/elfedit/32:=            LINKDEST=.
700 $(ROOT)/usr/lib/libp/32:=               LINKDEST=.
701 $(ROOT)/usr/lib/lwp/32:=                LINKDEST=.
702 $(ROOT)/usr/lib/link_audit/32:=         LINKDEST=.
703 $(ROOT)/usr/lib/secure/32:=             LINKDEST=.
704 $(ROOT)/usr/ccs/lib/link_audit:=        LINKDEST=../../lib/link_audit
705 $(ROOT)/var/ld/32:=                     LINKDEST=.
706 $(ROOT)/usr/ucblib/32:=                 LINKDEST=.


709 $(BUILD64) $(ROOT)/lib/64:=            LINKDEST=$(MACH64)
710 $(BUILD64) $(ROOT)/lib/crypto/64:=      LINKDEST=$(MACH64)
711 $(BUILD64) $(ROOT)/lib/secure/64:=      LINKDEST=$(MACH64)
712 $(BUILD64) $(ROOT)/usr/lib/64:=         LINKDEST=$(MACH64)
713 $(BUILD64) $(ROOT)/usr/lib/elfedit/64:= LINKDEST=$(MACH64)
714 $(BUILD64) $(ROOT)/usr/lib/brand/sn1/64:=       LINKDEST=$(MACH64)
715 $(BUILD64) $(ROOT)/usr/lib/brand/solaris10/64:= LINKDEST=$(MACH64)
716 $(BUILD64) $(ROOT)/usr/lib/libp/64:=    LINKDEST=$(MACH64)
717 $(BUILD64) $(ROOT)/usr/lib/lwp/64:=     LINKDEST=$(MACH64)
718 $(BUILD64) $(ROOT)/usr/lib/link_audit/64:=      LINKDEST=$(MACH64)
719 $(BUILD64) $(ROOT)/usr/lib/secure/64:=  LINKDEST=$(MACH64)
720 $(BUILD64) $(ROOT)/usr/lib/security/64:=        LINKDEST=$(MACH64)
```



```
721 $(BUILD64) $(ROOT)/usr/xpg4/lib/64:=    LINKDEST=$(MACH64)
722 $(BUILD64) $(ROOT)/var/ld/64:=          LINKDEST=$(MACH64)
723 $(BUILD64) $(ROOT)/usr/ucblib/64:=      LINKDEST=$(MACH64)

725 #
726 # Installing a directory symlink calls for overriding INS.dir to install
727 # a symlink.
728 #
729 $(DIRLINKS:%=$(ROOT)%):= \
730    INS.dir= -$(RM) -r $@; $(SYMLINK) $(LINKDEST) $@

732 # Special symlinks to populate usr/ccs/lib, whose objects
733 # have actually been moved to usr/lib
734 # Rather than adding another set of rules, we add usr/lib/lwp files here
735 $(ROOT)/usr/ccs/lib/libcurses.so:=      REALPATH=../../../lib/libcurses.so.1
736 $(ROOT)/usr/ccs/lib/llib-lcurses:=      REALPATH=../../../lib/llib-lcurses
737 $(ROOT)/usr/ccs/lib/llib-lcurses.ln:=   REALPATH=../../../lib/llib-lcurses.ln
738 $(ROOT)/usr/ccs/lib/libform.so:=        REALPATH=../../lib/libform.so.1
739 $(ROOT)/usr/ccs/lib/llib-lform:=        REALPATH=../../lib/llib-lform
740 $(ROOT)/usr/ccs/lib/llib-lform.ln:=     REALPATH=../../lib/llib-lform.ln
741 $(ROOT)/usr/ccs/lib/libgen.so:=         REALPATH=../../../lib/libgen.so.1
742 $(ROOT)/usr/ccs/lib/llib-lgen:=         REALPATH=../../../lib/llib-lgen
743 $(ROOT)/usr/ccs/lib/llib-lgen.ln:=      REALPATH=../../../lib/llib-lgen.ln
744 $(ROOT)/usr/ccs/lib/libmalloc.so:=      REALPATH=../../lib/libmalloc.so.1
745 $(ROOT)/usr/ccs/lib/libmenu.so:=        REALPATH=../../lib/libmenu.so.1
746 $(ROOT)/usr/ccs/lib/llib-lmenu:=        REALPATH=../../lib/llib-lmenu
747 $(ROOT)/usr/ccs/lib/llib-lmenu.ln:=     REALPATH=../../lib/llib-lmenu.ln
748 $(ROOT)/usr/ccs/lib/libpanel.so:=       REALPATH=../../lib/libpanel.so.1
749 $(ROOT)/usr/ccs/lib/llib-lpanel:=       REALPATH=../../lib/llib-lpanel
750 $(ROOT)/usr/ccs/lib/llib-lpanel.ln:=    REALPATH=../../lib/llib-lpanel.ln
751 $(ROOT)/usr/ccs/lib/libtermlib.so:=     REALPATH=../../../lib/libcurses.so.1
752 $(ROOT)/usr/ccs/lib/llib-ltermlib:=     REALPATH=../../../lib/llib-lcurses
753 $(ROOT)/usr/ccs/lib/llib-ltermlib.ln:=  REALPATH=../../../lib/llib-lcurses.ln
754 $(ROOT)/usr/ccs/lib/libtermcap.so:=     REALPATH=../../../lib/libtermcap.so.1
755 $(ROOT)/usr/ccs/lib/llib-ltermcap:=     REALPATH=../../../lib/llib-ltermcap
756 $(ROOT)/usr/ccs/lib/llib-ltermcap.ln:=  REALPATH=../../../lib/llib-ltermcap.ln
757 $(ROOT)/usr/ccs/lib/values-Xa.o:=       REALPATH=../../lib/values-Xa.o
758 $(ROOT)/usr/ccs/lib/values-Xc.o:=       REALPATH=../../lib/values-Xc.o
759 $(ROOT)/usr/ccs/lib/values-Xs.o:=       REALPATH=../../lib/values-Xs.o
760 $(ROOT)/usr/ccs/lib/values-Xt.o:=       REALPATH=../../lib/values-Xt.o
761 $(ROOT)/usr/ccs/lib/values-xpg4.o:=     REALPATH=../../lib/values-xpg4.o
762 $(ROOT)/usr/ccs/lib/values-xpg6.o:=     REALPATH=../../lib/values-xpg6.o
763 $(ROOT)/usr/ccs/lib/libl.so:=           REALPATH=../../lib/libl.so.1
764 $(ROOT)/usr/ccs/lib/llib-ll.ln:=        REALPATH=../../lib/llib-ll.ln
765 $(ROOT)/usr/ccs/lib/liby.so:=           REALPATH=../../lib/liby.so.1
766 $(ROOT)/usr/ccs/lib/llib-ly.ln:=        REALPATH=../../lib/llib-ly.ln
767 $(ROOT)/usr/lib/libp/libc.so.1:=        REALPATH=../../../lib/libc.so.1
768 $(ROOT)/usr/lib/lwp/libthread.so.1:=    REALPATH=../libthread.so.1
769 $(ROOT)/usr/lib/lwp/libthread_db.so.1:= REALPATH=../libthread_db.so.1

771 # symlinks to populate usr/ccs/lib/$(MACH64)
772 $(ROOT)/usr/ccs/lib/$(MACH64)/libcurses.so:= \
773         REALPATH=../../../../lib/$(MACH64)/libcurses.so.1
774 $(ROOT)/usr/ccs/lib/$(MACH64)/llib-lcurses.ln:= \
775         REALPATH=../../../../lib/$(MACH64)/llib-lcurses.ln
776 $(ROOT)/usr/ccs/lib/$(MACH64)/libform.so:= \
777         REALPATH=../../../lib/$(MACH64)/libform.so.1
778 $(ROOT)/usr/ccs/lib/$(MACH64)/llib-lform.ln:= \
779         REALPATH=../../../lib/$(MACH64)/llib-lform.ln
780 $(ROOT)/usr/ccs/lib/$(MACH64)/libgen.so:= \
781         REALPATH=../../../../lib/$(MACH64)/libgen.so.1
782 $(ROOT)/usr/ccs/lib/$(MACH64)/llib-lgen.ln:= \
783         REALPATH=../../../../lib/$(MACH64)/llib-lgen.ln
784 $(ROOT)/usr/ccs/lib/$(MACH64)/libmalloc.so:= \
785         REALPATH=../../../lib/$(MACH64)/libmalloc.so.1
786 $(ROOT)/usr/ccs/lib/$(MACH64)/libmenu.so:= \
```

```
787         REALPATH=../../../lib/$(MACH64)/libmenu.so.1
788 $(ROOT)/usr/ccs/lib/$(MACH64)/llib-lmenu.ln:= \
789         REALPATH=../../../lib/$(MACH64)/llib-lmenu.ln
790 $(ROOT)/usr/ccs/lib/$(MACH64)/libpanel.so:= \
791         REALPATH=../../../lib/$(MACH64)/libpanel.so.1
792 $(ROOT)/usr/ccs/lib/$(MACH64)/llib-lpanel.ln:= \
793         REALPATH=../../../lib/$(MACH64)/llib-lpanel.ln
794 $(ROOT)/usr/ccs/lib/$(MACH64)/libtermlib.so:= \
795         REALPATH=../../../../lib/$(MACH64)/libcurses.so.1
796 $(ROOT)/usr/ccs/lib/$(MACH64)/llib-ltermlib.ln:= \
797         REALPATH=../../../../lib/$(MACH64)/llib-lcurses.ln
798 $(ROOT)/usr/ccs/lib/$(MACH64)/libtermcap.so:= \
799         REALPATH=../../../../lib/$(MACH64)/libtermcap.so.1
800 $(ROOT)/usr/ccs/lib/$(MACH64)/llib-ltermcap.ln:= \
801         REALPATH=../../../../lib/$(MACH64)/llib-ltermcap.ln
802 $(ROOT)/usr/ccs/lib/$(MACH64)/values-Xa.o:= \
803         REALPATH=../../../lib/$(MACH64)/values-Xa.o
804 $(ROOT)/usr/ccs/lib/$(MACH64)/values-Xc.o:= \
805         REALPATH=../../../lib/$(MACH64)/values-Xc.o
806 $(ROOT)/usr/ccs/lib/$(MACH64)/values-Xs.o:= \
807         REALPATH=../../../lib/$(MACH64)/values-Xs.o
808 $(ROOT)/usr/ccs/lib/$(MACH64)/values-Xt.o:= \
809         REALPATH=../../../lib/$(MACH64)/values-Xt.o
810 $(ROOT)/usr/ccs/lib/$(MACH64)/values-xpg4.o:= \
811         REALPATH=../../../lib/$(MACH64)/values-xpg4.o
812 $(ROOT)/usr/ccs/lib/$(MACH64)/values-xpg6.o:= \
813         REALPATH=../../../lib/$(MACH64)/values-xpg6.o
814 $(ROOT)/usr/ccs/lib/$(MACH64)/libl.so:= \
815         REALPATH=../../../lib/$(MACH64)/libl.so.1
816 $(ROOT)/usr/ccs/lib/$(MACH64)/llib-ll.ln:= \
817         REALPATH=../../../lib/$(MACH64)/llib-ll.ln
818 $(ROOT)/usr/ccs/lib/$(MACH64)/liby.so:= \
819         REALPATH=../../../lib/$(MACH64)/liby.so.1
820 $(ROOT)/usr/ccs/lib/$(MACH64)/llib-ly.ln:= \
821         REALPATH=../../../lib/$(MACH64)/llib-ly.ln
822 $(ROOT)/usr/lib/libp/$(MACH64)/libc.so.1:= \
823         REALPATH=../../../../lib/$(MACH64)/libc.so.1
824 $(ROOT)/usr/lib/lwp/$(MACH64)/libthread.so.1:= \
825         REALPATH=../../$(MACH64)/libthread.so.1
826 $(ROOT)/usr/lib/lwp/$(MACH64)/libthread_db.so.1:= \
827         REALPATH=../../$(MACH64)/libthread_db.so.1

829 SYM.USRCCSLIB= \
830         /usr/ccs/lib/libcurses.so \
831         /usr/ccs/lib/llib-lcurses \
832         /usr/ccs/lib/llib-lcurses.ln \
833         /usr/ccs/lib/libform.so \
834         /usr/ccs/lib/llib-lform \
835         /usr/ccs/lib/llib-lform.ln \
836         /usr/ccs/lib/libgen.so \
837         /usr/ccs/lib/llib-lgen \
838         /usr/ccs/lib/llib-lgen.ln \
839         /usr/ccs/lib/libmalloc.so \
840         /usr/ccs/lib/libmenu.so \
841         /usr/ccs/lib/llib-lmenu \
842         /usr/ccs/lib/llib-lmenu.ln \
843         /usr/ccs/lib/libpanel.so \
844         /usr/ccs/lib/llib-lpanel \
845         /usr/ccs/lib/llib-lpanel.ln \
846         /usr/ccs/lib/libtermlib.so \
847         /usr/ccs/lib/llib-ltermlib \
848         /usr/ccs/lib/llib-ltermlib.ln \
849         /usr/ccs/lib/libtermcap.so \
850         /usr/ccs/lib/llib-ltermcap \
851         /usr/ccs/lib/llib-ltermcap.ln \
852         /usr/ccs/lib/values-Xa.o \
```



```
853         /usr/ccs/lib/values-Xc.o \
854         /usr/ccs/lib/values-Xs.o \
855         /usr/ccs/lib/values-Xt.o \
856         /usr/ccs/lib/values-xpg4.o \
857         /usr/ccs/lib/values-xpg6.o \
858         /usr/ccs/lib/libl.so \
859         /usr/ccs/lib/llib-ll.ln \
860         /usr/ccs/lib/liby.so \
861         /usr/ccs/lib/llib-ly.ln \
862         /usr/lib/libp/libc.so.1 \
863         /usr/lib/lwp/libthread.so.1 \
864         /usr/lib/lwp/libthread_db.so.1

866 SYM.USRCCSLIB64= \
867         /usr/ccs/lib/$(MACH64)/libcurses.so \
868         /usr/ccs/lib/$(MACH64)/llib-lcurses.ln \
869         /usr/ccs/lib/$(MACH64)/libform.so \
870         /usr/ccs/lib/$(MACH64)/llib-lform.ln \
871         /usr/ccs/lib/$(MACH64)/libgen.so \
872         /usr/ccs/lib/$(MACH64)/llib-lgen.ln \
873         /usr/ccs/lib/$(MACH64)/libmalloc.so \
874         /usr/ccs/lib/$(MACH64)/libmenu.so \
875         /usr/ccs/lib/$(MACH64)/llib-lmenu.ln \
876         /usr/ccs/lib/$(MACH64)/libpanel.so \
877         /usr/ccs/lib/$(MACH64)/llib-lpanel.ln \
878         /usr/ccs/lib/$(MACH64)/libtermlib.so \
879         /usr/ccs/lib/$(MACH64)/llib-ltermlib.ln \
880         /usr/ccs/lib/$(MACH64)/libtermcap.so \
881         /usr/ccs/lib/$(MACH64)/llib-ltermcap.ln \
882         /usr/ccs/lib/$(MACH64)/values-Xa.o \
883         /usr/ccs/lib/$(MACH64)/values-Xc.o \
884         /usr/ccs/lib/$(MACH64)/values-Xs.o \
885         /usr/ccs/lib/$(MACH64)/values-Xt.o \
886         /usr/ccs/lib/$(MACH64)/values-xpg4.o \
887         /usr/ccs/lib/$(MACH64)/values-xpg6.o \
888         /usr/ccs/lib/$(MACH64)/libl.so \
889         /usr/ccs/lib/$(MACH64)/llib-ll.ln \
890         /usr/ccs/lib/$(MACH64)/liby.so \
891         /usr/ccs/lib/$(MACH64)/llib-ly.ln \
892         /usr/lib/libp/$(MACH64)/libc.so.1 \
893         /usr/lib/lwp/$(MACH64)/libthread.so.1 \
894         /usr/lib/lwp/$(MACH64)/libthread_db.so.1

896 # Special symlinks to direct libraries that have been moved
897 # from /usr/lib to /lib in order to live in the root filesystem.
898 $(ROOT)/lib/libposix4.so.1:=            REALPATH=librt.so.1
899 $(ROOT)/lib/libposix4.so:=              REALPATH=libposix4.so.1
900 $(ROOT)/lib/llib-lposix4:=              REALPATH=llib-lrt
901 $(ROOT)/lib/llib-lposix4.ln:=           REALPATH=llib-lrt.ln
902 $(ROOT)/lib/libthread_db.so.1:=         REALPATH=libc_db.so.1
903 $(ROOT)/lib/libthread_db.so:=           REALPATH=libc_db.so.1
904 $(ROOT)/usr/lib/ld.so.1:=               REALPATH=../../lib/ld.so.1
905 $(ROOT)/usr/lib/libadm.so.1:=           REALPATH=../../lib/libadm.so.1
906 $(ROOT)/usr/lib/libadm.so:=             REALPATH=../../lib/libadm.so.1
907 $(ROOT)/usr/lib/libaio.so.1:=           REALPATH=../../lib/libaio.so.1
908 $(ROOT)/usr/lib/libaio.so:=             REALPATH=../../lib/libaio.so.1
909 $(ROOT)/usr/lib/libavl.so.1:=           REALPATH=../../lib/libavl.so.1
910 $(ROOT)/usr/lib/libavl.so:=             REALPATH=../../lib/libavl.so.1
911 $(ROOT)/usr/lib/libbsm.so.1:=           REALPATH=../../lib/libbsm.so.1
912 $(ROOT)/usr/lib/libbsm.so:=             REALPATH=../../lib/libbsm.so.1
913 $(ROOT)/usr/lib/libc.so.1:=             REALPATH=../../lib/libc.so.1
914 $(ROOT)/usr/lib/libc.so:=               REALPATH=../../lib/libc.so.1
915 $(ROOT)/usr/lib/libc_db.so.1:=          REALPATH=../../lib/libc_db.so.1
916 $(ROOT)/usr/lib/libc_db.so:=            REALPATH=../../lib/libc_db.so.1
917 $(ROOT)/usr/lib/libcmdutils.so.1:=      REALPATH=../../lib/libcmdutils.so.1
918 $(ROOT)/usr/lib/libcmdutils.so:=        REALPATH=../../lib/libcmdutils.so.1
```

```
 919 $(ROOT)/usr/lib/libcontract.so.1:=      REALPATH=../../lib/libcontract.so.1
 920 $(ROOT)/usr/lib/libcontract.so:=        REALPATH=../../lib/libcontract.so.1
 921 $(ROOT)/usr/lib/libcryptoutil.so.1:=    REALPATH=../../lib/libcryptoutil.so.1
 922 $(ROOT)/usr/lib/libcryptoutil.so:=      REALPATH=../../lib/libcryptoutil.so.1
 923 $(ROOT)/usr/lib/libctf.so.1:=           REALPATH=../../lib/libctf.so.1
 924 $(ROOT)/usr/lib/libctf.so:=             REALPATH=../../lib/libctf.so.1
 925 $(ROOT)/usr/lib/libcurses.so.1:=        REALPATH=../../lib/libcurses.so.1
 926 $(ROOT)/usr/lib/libcurses.so:=          REALPATH=../../lib/libcurses.so.1
 927 $(ROOT)/usr/lib/libdevice.so.1:=        REALPATH=../../lib/libdevice.so.1
 928 $(ROOT)/usr/lib/libdevice.so:=          REALPATH=../../lib/libdevice.so.1
 929 $(ROOT)/usr/lib/libdevid.so.1:=         REALPATH=../../lib/libdevid.so.1
 930 $(ROOT)/usr/lib/libdevid.so:=           REALPATH=../../lib/libdevid.so.1
 931 $(ROOT)/usr/lib/libdevinfo.so.1:=       REALPATH=../../lib/libdevinfo.so.1
 932 $(ROOT)/usr/lib/libdevinfo.so:=         REALPATH=../../lib/libdevinfo.so.1
 933 $(ROOT)/usr/lib/libdhcpagent.so.1:=     REALPATH=../../lib/libdhcpagent.so.1
 934 $(ROOT)/usr/lib/libdhcpagent.so:=       REALPATH=../../lib/libdhcpagent.so.1
 935 $(ROOT)/usr/lib/libdhcputil.so.1:=      REALPATH=../../lib/libdhcputil.so.1
 936 $(ROOT)/usr/lib/libdhcputil.so:=        REALPATH=../../lib/libdhcputil.so.1
 937 $(ROOT)/usr/lib/libdl.so.1:=            REALPATH=../../lib/libdl.so.1
 938 $(ROOT)/usr/lib/libdl.so:=              REALPATH=../../lib/libdl.so.1
 939 $(ROOT)/usr/lib/libdlpi.so.1:=          REALPATH=../../lib/libdlpi.so.1
 940 $(ROOT)/usr/lib/libdlpi.so:=            REALPATH=../../lib/libdlpi.so.1
 941 $(ROOT)/usr/lib/libdoor.so.1:=          REALPATH=../../lib/libdoor.so.1
 942 $(ROOT)/usr/lib/libdoor.so:=            REALPATH=../../lib/libdoor.so.1
 943 $(ROOT)/usr/lib/libefi.so.1:=           REALPATH=../../lib/libefi.so.1
 944 $(ROOT)/usr/lib/libefi.so:=             REALPATH=../../lib/libefi.so.1
 945 $(ROOT)/usr/lib/libelf.so.1:=           REALPATH=../../lib/libelf.so.1
 946 $(ROOT)/usr/lib/libelf.so:=             REALPATH=../../lib/libelf.so.1
 947 $(ROOT)/usr/lib/libfdisk.so.1:=         REALPATH=../../lib/libfdisk.so.1
 948 $(ROOT)/usr/lib/libfdisk.so:=           REALPATH=../../lib/libfdisk.so.1
 949 $(ROOT)/usr/lib/libgen.so.1:=           REALPATH=../../lib/libgen.so.1
 950 $(ROOT)/usr/lib/libgen.so:=             REALPATH=../../lib/libgen.so.1
 951 $(ROOT)/usr/lib/libinetutil.so.1:=      REALPATH=../../lib/libinetutil.so.1
 952 $(ROOT)/usr/lib/libinetutil.so:=        REALPATH=../../lib/libinetutil.so.1
 953 $(ROOT)/usr/lib/libintl.so.1:=          REALPATH=../../lib/libintl.so.1
 954 $(ROOT)/usr/lib/libintl.so:=            REALPATH=../../lib/libintl.so.1
 955 $(ROOT)/usr/lib/libkmf.so.1:=           REALPATH=../../lib/libkmf.so.1
 956 $(ROOT)/usr/lib/libkmf.so:=             REALPATH=../../lib/libkmf.so.1
 957 $(ROOT)/usr/lib/libkmfberder.so.1:=     REALPATH=../../lib/libkmfberder.so.1
 958 $(ROOT)/usr/lib/libkmfberder.so:=       REALPATH=../../lib/libkmfberder.so.1
 959 $(ROOT)/usr/lib/libkstat.so.1:=         REALPATH=../../lib/libkstat.so.1
 960 $(ROOT)/usr/lib/libkstat.so:=           REALPATH=../../lib/libkstat.so.1
 961 $(ROOT)/usr/lib/liblddbg.so.4:=         REALPATH=../../lib/liblddbg.so.4
 962 $(ROOT)/usr/lib/libm.so.1:=             REALPATH=../../lib/libm.so.1
 963 $(ROOT)/usr/lib/libm.so.2:=             REALPATH=../../lib/libm.so.2
 964 $(ROOT)/usr/lib/libm.so:=               REALPATH=../../lib/libm.so.2
 965 $(ROOT)/usr/lib/libmd.so.1:=            REALPATH=../../lib/libmd.so.1
 966 $(ROOT)/usr/lib/libmd.so:=              REALPATH=../../lib/libmd.so.1
 967 $(ROOT)/usr/lib/libmd5.so.1:=           REALPATH=../../lib/libmd5.so.1
 968 $(ROOT)/usr/lib/libmd5.so:=             REALPATH=../../lib/libmd5.so.1
 969 $(ROOT)/usr/lib/libmeta.so.1:=          REALPATH=../../lib/libmeta.so.1
 970 $(ROOT)/usr/lib/libmeta.so:=            REALPATH=../../lib/libmeta.so.1
 971 $(ROOT)/usr/lib/libmp.so.1:=            REALPATH=../../lib/libmp.so.1
 972 $(ROOT)/usr/lib/libmp.so.2:=            REALPATH=../../lib/libmp.so.2
 973 $(ROOT)/usr/lib/libmp.so:=              REALPATH=../../lib/libmp.so.2
 974 $(ROOT)/usr/lib/libmvec.so.1:=          REALPATH=../../lib/libmvec.so.1
 975 $(ROOT)/usr/lib/libmvec.so:=            REALPATH=../../lib/libmvec.so.1
 976 $(ROOT)/usr/lib/libnsl.so.1:=           REALPATH=../../lib/libnsl.so.1
 977 $(ROOT)/usr/lib/libnsl.so:=             REALPATH=../../lib/libnsl.so.1
 978 $(ROOT)/usr/lib/libnvpair.so.1:=        REALPATH=../../lib/libnvpair.so.1
 979 $(ROOT)/usr/lib/libnvpair.so:=          REALPATH=../../lib/libnvpair.so.1
 980 $(ROOT)/usr/lib/libpam.so.1:=           REALPATH=../../lib/libpam.so.1
 981 $(ROOT)/usr/lib/libpam.so:=             REALPATH=../../lib/libpam.so.1
 982 $(ROOT)/usr/lib/libposix4.so.1:=        REALPATH=../../lib/librt.so.1
 983 $(ROOT)/usr/lib/libposix4.so:=          REALPATH=../../lib/librt.so.1
 984 $(ROOT)/usr/lib/libproc.so.1:=          REALPATH=../../lib/libproc.so.1
```



```
 985 $(ROOT)/usr/lib/libproc.so:=           REALPATH=../../lib/libproc.so.1
 986 $(ROOT)/usr/lib/libpthread.so.1:=      REALPATH=../../lib/libpthread.so.1
 987 $(ROOT)/usr/lib/libpthread.so:=        REALPATH=../../lib/libpthread.so.1
 988 $(ROOT)/usr/lib/librcm.so.1:=          REALPATH=../../lib/librcm.so.1
 989 $(ROOT)/usr/lib/librcm.so:=            REALPATH=../../lib/librcm.so.1
 990 $(ROOT)/usr/lib/libresolv.so.1:=       REALPATH=../../lib/libresolv.so.1
 991 $(ROOT)/usr/lib/libresolv.so.2:=       REALPATH=../../lib/libresolv.so.2
 992 $(ROOT)/usr/lib/libresolv.so:=         REALPATH=../../lib/libresolv.so.2
 993 $(ROOT)/usr/lib/librestart.so.1:=      REALPATH=../../lib/librestart.so.1
 994 $(ROOT)/usr/lib/librestart.so:=        REALPATH=../../lib/librestart.so.1
 995 $(ROOT)/usr/lib/librpcsvc.so.1:=       REALPATH=../../lib/librpcsvc.so.1
 996 $(ROOT)/usr/lib/librpcsvc.so:=         REALPATH=../../lib/librpcsvc.so.1
 997 $(ROOT)/usr/lib/librt.so.1:=           REALPATH=../../lib/librt.so.1
 998 $(ROOT)/usr/lib/librt.so:=             REALPATH=../../lib/librt.so.1
 999 $(ROOT)/usr/lib/librtld.so.1:=         REALPATH=../../lib/librtld.so.1
1000 $(ROOT)/usr/lib/librtld_db.so.1:=      REALPATH=../../lib/librtld_db.so.1
1001 $(ROOT)/usr/lib/librtld_db.so:=        REALPATH=../../lib/librtld_db.so.1
1002 $(ROOT)/usr/lib/libscf.so.1:=          REALPATH=../../lib/libscf.so.1
1003 $(ROOT)/usr/lib/libscf.so:=            REALPATH=../../lib/libscf.so.1
1004 $(ROOT)/usr/lib/libsec.so.1:=          REALPATH=../../lib/libsec.so.1
1005 $(ROOT)/usr/lib/libsec.so:=            REALPATH=../../lib/libsec.so.1
1006 $(ROOT)/usr/lib/libsecdb.so.1:=        REALPATH=../../lib/libsecdb.so.1
1007 $(ROOT)/usr/lib/libsecdb.so:=          REALPATH=../../lib/libsecdb.so.1
1008 $(ROOT)/usr/lib/libsendfile.so.1:=     REALPATH=../../lib/libsendfile.so.1
1009 $(ROOT)/usr/lib/libsendfile.so:=       REALPATH=../../lib/libsendfile.so.1
1010 $(ROOT)/usr/lib/libsocket.so.1:=       REALPATH=../../lib/libsocket.so.1
1011 $(ROOT)/usr/lib/libsocket.so:=         REALPATH=../../lib/libsocket.so.1
1012 $(ROOT)/usr/lib/libsysevent.so.1:=     REALPATH=../../lib/libsysevent.so.1
1013 $(ROOT)/usr/lib/libsysevent.so:=       REALPATH=../../lib/libsysevent.so.1
1014 $(ROOT)/usr/lib/libtermcap.so.1:=      REALPATH=../../lib/libtermcap.so.1
1015 $(ROOT)/usr/lib/libtermcap.so:=        REALPATH=../../lib/libtermcap.so.1
1016 $(ROOT)/usr/lib/libtermlib.so.1:=      REALPATH=../../lib/libcurses.so.1
1017 $(ROOT)/usr/lib/libtermlib.so:=        REALPATH=../../lib/libcurses.so.1
1018 $(ROOT)/usr/lib/libthread.so.1:=       REALPATH=../../lib/libthread.so.1
1019 $(ROOT)/usr/lib/libthread.so:=         REALPATH=../../lib/libthread.so.1
1020 $(ROOT)/usr/lib/libthread_db.so.1:=    REALPATH=../../lib/libc_db.so.1
1021 $(ROOT)/usr/lib/libthread_db.so:=      REALPATH=../../lib/libc_db.so.1
1022 $(ROOT)/usr/lib/libtsnet.so.1:=        REALPATH=../../lib/libtsnet.so.1
1023 $(ROOT)/usr/lib/libtsnet.so:=          REALPATH=../../lib/libtsnet.so.1
1024 $(ROOT)/usr/lib/libtsol.so.2:=         REALPATH=../../lib/libtsol.so.2
1025 $(ROOT)/usr/lib/libtsol.so:=           REALPATH=../../lib/libtsol.so.2
1026 $(ROOT)/usr/lib/libumem.so.1:=         REALPATH=../../lib/libumem.so.1
1027 $(ROOT)/usr/lib/libumem.so:=           REALPATH=../../lib/libumem.so.1
1028 $(ROOT)/usr/lib/libuuid.so.1:=         REALPATH=../../lib/libuuid.so.1
1029 $(ROOT)/usr/lib/libuuid.so:=           REALPATH=../../lib/libuuid.so.1
1030 $(ROOT)/usr/lib/libuutil.so.1:=        REALPATH=../../lib/libuutil.so.1
1031 $(ROOT)/usr/lib/libuutil.so:=          REALPATH=../../lib/libuutil.so.1
1032 $(ROOT)/usr/lib/libw.so.1:=            REALPATH=../../lib/libw.so.1
1033 $(ROOT)/usr/lib/libw.so:=              REALPATH=../../lib/libw.so.1
1034 $(ROOT)/usr/lib/libxnet.so.1:=         REALPATH=../../lib/libxnet.so.1
1035 $(ROOT)/usr/lib/libxnet.so:=           REALPATH=../../lib/libxnet.so.1
1036 $(ROOT)/usr/lib/libzfs.so.1:=          REALPATH=../../lib/libzfs.so.1
1037 $(ROOT)/usr/lib/libzfs.so:=            REALPATH=../../lib/libzfs.so.1
1038 $(ROOT)/usr/lib/libzfs_core.so.1:=     REALPATH=../../lib/libzfs_core.so.1
1039 $(ROOT)/usr/lib/libzfs_core.so:=       REALPATH=../../lib/libzfs_core.so.1
1040 $(ROOT)/usr/lib/llib-ladm.ln:=         REALPATH=../../lib/llib-ladm.ln
1041 $(ROOT)/usr/lib/llib-ladm:=            REALPATH=../../lib/llib-ladm
1042 $(ROOT)/usr/lib/llib-laio.ln:=         REALPATH=../../lib/llib-laio.ln
1043 $(ROOT)/usr/lib/llib-laio:=            REALPATH=../../lib/llib-laio
1044 $(ROOT)/usr/lib/llib-lavl.ln:=         REALPATH=../../lib/llib-lavl.ln
1045 $(ROOT)/usr/lib/llib-lavl:=            REALPATH=../../lib/llib-lavl
1046 $(ROOT)/usr/lib/llib-lbsm.ln:=         REALPATH=../../lib/llib-lbsm.ln
1047 $(ROOT)/usr/lib/llib-lbsm:=            REALPATH=../../lib/llib-lbsm
1048 $(ROOT)/usr/lib/llib-lc.ln:=           REALPATH=../../lib/llib-lc.ln
1049 $(ROOT)/usr/lib/llib-lc:=              REALPATH=../../lib/llib-lc
1050 $(ROOT)/usr/lib/llib-lcmdutils.ln:=    REALPATH=../../lib/llib-lcmdutils.ln
```

```
1051 $(ROOT)/usr/lib/llib-lcmdutils:=        REALPATH=../../lib/llib-lcmdutils
1052 $(ROOT)/usr/lib/llib-lcontract.ln:=     REALPATH=../../lib/llib-lcontract.ln
1053 $(ROOT)/usr/lib/llib-lcontract:=        REALPATH=../../lib/llib-lcontract
1054 $(ROOT)/usr/lib/llib-lctf.ln:=          REALPATH=../../lib/llib-lctf.ln
1055 $(ROOT)/usr/lib/llib-lctf:=             REALPATH=../../lib/llib-lctf
1056 $(ROOT)/usr/lib/llib-lcurses.ln:=       REALPATH=../../lib/llib-lcurses.ln
1057 $(ROOT)/usr/lib/llib-lcurses:=          REALPATH=../../lib/llib-lcurses
1058 $(ROOT)/usr/lib/llib-ldevice.ln:=       REALPATH=../../lib/llib-ldevice.ln
1059 $(ROOT)/usr/lib/llib-ldevice:=          REALPATH=../../lib/llib-ldevice
1060 $(ROOT)/usr/lib/llib-ldevid.ln:=        REALPATH=../../lib/llib-ldevid.ln
1061 $(ROOT)/usr/lib/llib-ldevid:=           REALPATH=../../lib/llib-ldevid
1062 $(ROOT)/usr/lib/llib-ldevinfo.ln:=      REALPATH=../../lib/llib-ldevinfo.ln
1063 $(ROOT)/usr/lib/llib-ldevinfo:=         REALPATH=../../lib/llib-ldevinfo
1064 $(ROOT)/usr/lib/llib-ldhcpagent.ln:=    REALPATH=../../lib/llib-ldhcpagent.ln
1065 $(ROOT)/usr/lib/llib-ldhcpagent:=       REALPATH=../../lib/llib-ldhcpagent
1066 $(ROOT)/usr/lib/llib-ldhcputil.ln:=     REALPATH=../../lib/llib-ldhcputil.ln
1067 $(ROOT)/usr/lib/llib-ldhcputil:=        REALPATH=../../lib/llib-ldhcputil
1068 $(ROOT)/usr/lib/llib-ldl.ln:=           REALPATH=../../lib/llib-ldl.ln
1069 $(ROOT)/usr/lib/llib-ldl:=              REALPATH=../../lib/llib-ldl
1070 $(ROOT)/usr/lib/llib-ldoor.ln:=         REALPATH=../../lib/llib-ldoor.ln
1071 $(ROOT)/usr/lib/llib-ldoor:=            REALPATH=../../lib/llib-ldoor
1072 $(ROOT)/usr/lib/llib-lefi.ln:=          REALPATH=../../lib/llib-lefi.ln
1073 $(ROOT)/usr/lib/llib-lefi:=             REALPATH=../../lib/llib-lefi
1074 $(ROOT)/usr/lib/llib-lelf.ln:=          REALPATH=../../lib/llib-lelf.ln
1075 $(ROOT)/usr/lib/llib-lelf:=             REALPATH=../../lib/llib-lelf
1076 $(ROOT)/usr/lib/llib-lfdisk.ln:=        REALPATH=../../lib/llib-lfdisk.ln
1077 $(ROOT)/usr/lib/llib-lfdisk:=           REALPATH=../../lib/llib-lfdisk
1078 $(ROOT)/usr/lib/llib-lgen.ln:=          REALPATH=../../lib/llib-lgen.ln
1079 $(ROOT)/usr/lib/llib-lgen:=             REALPATH=../../lib/llib-lgen
1080 $(ROOT)/usr/lib/llib-linetutil.ln:=     REALPATH=../../lib/llib-linetutil.ln
1081 $(ROOT)/usr/lib/llib-linetutil:=        REALPATH=../../lib/llib-linetutil
1082 $(ROOT)/usr/lib/llib-lintl.ln:=         REALPATH=../../lib/llib-lintl.ln
1083 $(ROOT)/usr/lib/llib-lintl:=            REALPATH=../../lib/llib-lintl
1084 $(ROOT)/usr/lib/llib-lkstat.ln:=        REALPATH=../../lib/llib-lkstat.ln
1085 $(ROOT)/usr/lib/llib-lkstat:=           REALPATH=../../lib/llib-lkstat
1086 $(ROOT)/usr/lib/llib-lm:=               REALPATH=../../lib/llib-lm
1087 $(ROOT)/usr/lib/llib-lm.ln:=            REALPATH=../../lib/llib-lm.ln
1088 $(ROOT)/usr/lib/llib-lmd5.ln:=          REALPATH=../../lib/llib-lmd5.ln
1089 $(ROOT)/usr/lib/llib-lmd5:=             REALPATH=../../lib/llib-lmd5
1090 $(ROOT)/usr/lib/llib-lmeta.ln:=         REALPATH=../../lib/llib-lmeta.ln
1091 $(ROOT)/usr/lib/llib-lmeta:=            REALPATH=../../lib/llib-lmeta
1092 $(ROOT)/usr/lib/llib-lnsl.ln:=          REALPATH=../../lib/llib-lnsl.ln
1093 $(ROOT)/usr/lib/llib-lnsl:=             REALPATH=../../lib/llib-lnsl
1094 $(ROOT)/usr/lib/llib-lnvpair.ln:=       REALPATH=../../lib/llib-lnvpair.ln
1095 $(ROOT)/usr/lib/llib-lnvpair:=          REALPATH=../../lib/llib-lnvpair
1096 $(ROOT)/usr/lib/llib-lpam.ln:=          REALPATH=../../lib/llib-lpam.ln
1097 $(ROOT)/usr/lib/llib-lpam:=             REALPATH=../../lib/llib-lpam
1098 $(ROOT)/usr/lib/llib-lposix4.ln:=       REALPATH=../../lib/llib-lrt.ln
1099 $(ROOT)/usr/lib/llib-lposix4:=          REALPATH=../../lib/llib-lrt
1100 $(ROOT)/usr/lib/llib-lpthread.ln:=      REALPATH=../../lib/llib-lpthread.ln
1101 $(ROOT)/usr/lib/llib-lpthread:=         REALPATH=../../lib/llib-lpthread
1102 $(ROOT)/usr/lib/llib-lresolv.ln:=       REALPATH=../../lib/llib-lresolv.ln
1103 $(ROOT)/usr/lib/llib-lresolv:=          REALPATH=../../lib/llib-lresolv
1104 $(ROOT)/usr/lib/llib-lrpcsvc.ln:=       REALPATH=../../lib/llib-lrpcsvc.ln
1105 $(ROOT)/usr/lib/llib-lrpcsvc:=          REALPATH=../../lib/llib-lrpcsvc
1106 $(ROOT)/usr/lib/llib-lrt.ln:=           REALPATH=../../lib/llib-lrt.ln
1107 $(ROOT)/usr/lib/llib-lrt:=              REALPATH=../../lib/llib-lrt
1108 $(ROOT)/usr/lib/llib-lrtld_db.ln:=      REALPATH=../../lib/llib-lrtld_db.ln
1109 $(ROOT)/usr/lib/llib-lrtld_db:=         REALPATH=../../lib/llib-lrtld_db
1110 $(ROOT)/usr/lib/llib-lscf.ln:=          REALPATH=../../lib/llib-lscf.ln
1111 $(ROOT)/usr/lib/llib-lscf:=             REALPATH=../../lib/llib-lscf
1112 $(ROOT)/usr/lib/llib-lsec.ln:=          REALPATH=../../lib/llib-lsec.ln
1113 $(ROOT)/usr/lib/llib-lsec:=             REALPATH=../../lib/llib-lsec
1114 $(ROOT)/usr/lib/llib-lsecdb.ln:=        REALPATH=../../lib/llib-lsecdb.ln
1115 $(ROOT)/usr/lib/llib-lsecdb:=           REALPATH=../../lib/llib-lsecdb
1116 $(ROOT)/usr/lib/llib-lsendfile.ln:=     REALPATH=../../lib/llib-lsendfile.ln
```



```
1117 $(ROOT)/usr/lib/llib-lsendfile:=       REALPATH=../../lib/llib-lsendfile
1118 $(ROOT)/usr/lib/llib-lsocket.ln:=      REALPATH=../../lib/llib-lsocket.ln
1119 $(ROOT)/usr/lib/llib-lsocket:=         REALPATH=../../lib/llib-lsocket
1120 $(ROOT)/usr/lib/llib-lsysevent.ln:=    REALPATH=../../lib/llib-lsysevent.ln
1121 $(ROOT)/usr/lib/llib-lsysevent:=       REALPATH=../../lib/llib-lsysevent
1122 $(ROOT)/usr/lib/llib-ltermcap.ln:=     REALPATH=../../lib/llib-ltermcap.ln
1123 $(ROOT)/usr/lib/llib-ltermcap:=        REALPATH=../../lib/llib-ltermcap
1124 $(ROOT)/usr/lib/llib-ltermlib.ln:=     REALPATH=../../lib/llib-lcurses.ln
1125 $(ROOT)/usr/lib/llib-ltermlib:=        REALPATH=../../lib/llib-lcurses
1126 $(ROOT)/usr/lib/llib-lthread.ln:=      REALPATH=../../lib/llib-lthread.ln
1127 $(ROOT)/usr/lib/llib-lthread:=         REALPATH=../../lib/llib-lthread
1128 $(ROOT)/usr/lib/llib-lthread_db.ln:=   REALPATH=../../lib/llib-lc_db.ln
1129 $(ROOT)/usr/lib/llib-lthread_db:=      REALPATH=../../lib/llib-lc_db
1130 $(ROOT)/usr/lib/llib-ltsnet.ln:=       REALPATH=../../lib/llib-ltsnet.ln
1131 $(ROOT)/usr/lib/llib-ltsnet:=          REALPATH=../../lib/llib-ltsnet
1132 $(ROOT)/usr/lib/llib-ltsol.ln:=        REALPATH=../../lib/llib-ltsol.ln
1133 $(ROOT)/usr/lib/llib-ltsol:=           REALPATH=../../lib/llib-ltsol
1134 $(ROOT)/usr/lib/llib-lumem.ln:=        REALPATH=../../lib/llib-lumem.ln
1135 $(ROOT)/usr/lib/llib-lumem:=           REALPATH=../../lib/llib-lumem
1136 $(ROOT)/usr/lib/llib-luuid.ln:=        REALPATH=../../lib/llib-luuid.ln
1137 $(ROOT)/usr/lib/llib-luuid:=           REALPATH=../../lib/llib-luuid
1138 $(ROOT)/usr/lib/llib-lxnet.ln:=        REALPATH=../../lib/llib-lxnet.ln
1139 $(ROOT)/usr/lib/llib-lxnet:=           REALPATH=../../lib/llib-lxnet
1140 $(ROOT)/usr/lib/llib-lzfs.ln:=         REALPATH=../../lib/llib-lzfs.ln
1141 $(ROOT)/usr/lib/llib-lzfs:=            REALPATH=../../lib/llib-lzfs
1142 $(ROOT)/usr/lib/llib-lzfs_core.ln:=    REALPATH=../../lib/llib-lzfs_core.ln
1143 $(ROOT)/usr/lib/llib-lzfs_core:=       REALPATH=../../lib/llib-lzfs_core
1144 $(ROOT)/usr/lib/nss_compat.so.1:=      REALPATH=../../lib/nss_compat.so.1
1145 $(ROOT)/usr/lib/nss_dns.so.1:=         REALPATH=../../lib/nss_dns.so.1
1146 $(ROOT)/usr/lib/nss_files.so.1:=       REALPATH=../../lib/nss_files.so.1
1147 $(ROOT)/usr/lib/nss_nis.so.1:=         REALPATH=../../lib/nss_nis.so.1
1148 $(ROOT)/usr/lib/nss_user.so.1:=        REALPATH=../../lib/nss_user.so.1
1149 $(ROOT)/usr/lib/fm/libfmevent.so.1:=   REALPATH=../../../lib/fm/libfmevent.so.1
1150 $(ROOT)/usr/lib/fm/libfmevent.so:=     REALPATH=../../../lib/fm/libfmevent.so.1
1151 $(ROOT)/usr/lib/fm/llib-lfmevent.ln:=  REALPATH=../../../lib/fm/llib-lfmevent.l
1152 $(ROOT)/usr/lib/fm/llib-lfmevent:=     REALPATH=../../../lib/fm/llib-lfmevent

1154 $(ROOT)/lib/$(MACH64)/libposix4.so.1:= \
1155         REALPATH=librt.so.1
1156 $(ROOT)/lib/$(MACH64)/libposix4.so:= \
1157         REALPATH=libposix4.so.1
1158 $(ROOT)/lib/$(MACH64)/llib-lposix4.ln:= \
1159         REALPATH=llib-lrt.ln
1160 $(ROOT)/lib/$(MACH64)/libthread_db.so.1:= \
1161         REALPATH=libc_db.so.1
1162 $(ROOT)/lib/$(MACH64)/libthread_db.so:= \
1163         REALPATH=libc_db.so.1
1164 $(ROOT)/usr/lib/$(MACH64)/ld.so.1:= \
1165         REALPATH=../../../lib/$(MACH64)/ld.so.1
1166 $(ROOT)/usr/lib/$(MACH64)/libadm.so.1:= \
1167         REALPATH=../../../lib/$(MACH64)/libadm.so.1
1168 $(ROOT)/usr/lib/$(MACH64)/libadm.so:= \
1169         REALPATH=../../../lib/$(MACH64)/libadm.so.1
1170 $(ROOT)/usr/lib/$(MACH64)/libaio.so.1:= \
1171         REALPATH=../../../lib/$(MACH64)/libaio.so.1
1172 $(ROOT)/usr/lib/$(MACH64)/libaio.so:= \
1173         REALPATH=../../../lib/$(MACH64)/libaio.so.1
1174 $(ROOT)/usr/lib/$(MACH64)/libavl.so.1:= \
1175         REALPATH=../../../lib/$(MACH64)/libavl.so.1
1176 $(ROOT)/usr/lib/$(MACH64)/libavl.so:= \
1177         REALPATH=../../../lib/$(MACH64)/libavl.so.1
1178 $(ROOT)/usr/lib/$(MACH64)/libbsm.so.1:= \
1179         REALPATH=../../../lib/$(MACH64)/libbsm.so.1
1180 $(ROOT)/usr/lib/$(MACH64)/libbsm.so:= \
1181         REALPATH=../../../lib/$(MACH64)/libbsm.so.1
1182 $(ROOT)/usr/lib/$(MACH64)/libc.so.1:= \
```

```
1183         REALPATH=../../../lib/$(MACH64)/libc.so.1
1184 $(ROOT)/usr/lib/$(MACH64)/libc.so:= \
1185         REALPATH=../../../lib/$(MACH64)/libc.so.1
1186 $(ROOT)/usr/lib/$(MACH64)/libc_db.so.1:= \
1187         REALPATH=../../../lib/$(MACH64)/libc_db.so.1
1188 $(ROOT)/usr/lib/$(MACH64)/libc_db.so:= \
1189         REALPATH=../../../lib/$(MACH64)/libc_db.so.1
1190 $(ROOT)/usr/lib/$(MACH64)/libcmdutils.so.1:= \
1191         REALPATH=../../../lib/$(MACH64)/libcmdutils.so.1
1192 $(ROOT)/usr/lib/$(MACH64)/libcmdutils.so:= \
1193         REALPATH=../../../lib/$(MACH64)/libcmdutils.so.1
1194 $(ROOT)/usr/lib/$(MACH64)/libcontract.so.1:= \
1195         REALPATH=../../../lib/$(MACH64)/libcontract.so.1
1196 $(ROOT)/usr/lib/$(MACH64)/libcontract.so:= \
1197         REALPATH=../../../lib/$(MACH64)/libcontract.so.1
1198 $(ROOT)/usr/lib/$(MACH64)/libctf.so.1:= \
1199         REALPATH=../../../lib/$(MACH64)/libctf.so.1
1200 $(ROOT)/usr/lib/$(MACH64)/libctf.so:= \
1201         REALPATH=../../../lib/$(MACH64)/libctf.so.1
1202 $(ROOT)/usr/lib/$(MACH64)/libcurses.so.1:= \
1203         REALPATH=../../../lib/$(MACH64)/libcurses.so.1
1204 $(ROOT)/usr/lib/$(MACH64)/libcurses.so:= \
1205         REALPATH=../../../lib/$(MACH64)/libcurses.so.1
1206 $(ROOT)/usr/lib/$(MACH64)/libdevice.so.1:= \
1207         REALPATH=../../../lib/$(MACH64)/libdevice.so.1
1208 $(ROOT)/usr/lib/$(MACH64)/libdevice.so:= \
1209         REALPATH=../../../lib/$(MACH64)/libdevice.so.1
1210 $(ROOT)/usr/lib/$(MACH64)/libdevid.so.1:= \
1211         REALPATH=../../../lib/$(MACH64)/libdevid.so.1
1212 $(ROOT)/usr/lib/$(MACH64)/libdevid.so:= \
1213         REALPATH=../../../lib/$(MACH64)/libdevid.so.1
1214 $(ROOT)/usr/lib/$(MACH64)/libdevinfo.so.1:= \
1215         REALPATH=../../../lib/$(MACH64)/libdevinfo.so.1
1216 $(ROOT)/usr/lib/$(MACH64)/libdevinfo.so:= \
1217         REALPATH=../../../lib/$(MACH64)/libdevinfo.so.1
1218 $(ROOT)/usr/lib/$(MACH64)/libdhcputil.so.1:= \
1219         REALPATH=../../../lib/$(MACH64)/libdhcputil.so.1
1220 $(ROOT)/usr/lib/$(MACH64)/libdhcputil.so:= \
1221         REALPATH=../../../lib/$(MACH64)/libdhcputil.so.1
1222 $(ROOT)/usr/lib/$(MACH64)/libdl.so.1:= \
1223         REALPATH=../../../lib/$(MACH64)/libdl.so.1
1224 $(ROOT)/usr/lib/$(MACH64)/libdl.so:= \
1225         REALPATH=../../../lib/$(MACH64)/libdl.so.1
1226 $(ROOT)/usr/lib/$(MACH64)/libdlpi.so.1:= \
1227         REALPATH=../../../lib/$(MACH64)/libdlpi.so.1
1228 $(ROOT)/usr/lib/$(MACH64)/libdlpi.so:= \
1229         REALPATH=../../../lib/$(MACH64)/libdlpi.so.1
1230 $(ROOT)/usr/lib/$(MACH64)/libdoor.so.1:= \
1231         REALPATH=../../../lib/$(MACH64)/libdoor.so.1
1232 $(ROOT)/usr/lib/$(MACH64)/libdoor.so:= \
1233         REALPATH=../../../lib/$(MACH64)/libdoor.so.1
1234 $(ROOT)/usr/lib/$(MACH64)/libefi.so.1:= \
1235         REALPATH=../../../lib/$(MACH64)/libefi.so.1
1236 $(ROOT)/usr/lib/$(MACH64)/libefi.so:= \
1237         REALPATH=../../../lib/$(MACH64)/libefi.so.1
1238 $(ROOT)/usr/lib/$(MACH64)/libelf.so.1:= \
1239         REALPATH=../../../lib/$(MACH64)/libelf.so.1
1240 $(ROOT)/usr/lib/$(MACH64)/libelf.so:= \
1241         REALPATH=../../../lib/$(MACH64)/libelf.so.1
1242 $(ROOT)/usr/lib/$(MACH64)/libgen.so.1:= \
1243         REALPATH=../../../lib/$(MACH64)/libgen.so.1
1244 $(ROOT)/usr/lib/$(MACH64)/libgen.so:= \
1245         REALPATH=../../../lib/$(MACH64)/libgen.so.1
1246 $(ROOT)/usr/lib/$(MACH64)/libinetutil.so.1:= \
1247         REALPATH=../../../lib/$(MACH64)/libinetutil.so.1
1248 $(ROOT)/usr/lib/$(MACH64)/libinetutil.so:= \
```



```
1249         REALPATH=../../../lib/$(MACH64)/libinetutil.so.1
1250 $(ROOT)/usr/lib/$(MACH64)/libintl.so.1:= \
1251         REALPATH=../../../lib/$(MACH64)/libintl.so.1
1252 $(ROOT)/usr/lib/$(MACH64)/libintl.so:= \
1253         REALPATH=../../../lib/$(MACH64)/libintl.so.1
1254 $(ROOT)/usr/lib/$(MACH64)/libkstat.so.1:= \
1255         REALPATH=../../../lib/$(MACH64)/libkstat.so.1
1256 $(ROOT)/usr/lib/$(MACH64)/libkstat.so:= \
1257         REALPATH=../../../lib/$(MACH64)/libkstat.so.1
1258 $(ROOT)/usr/lib/$(MACH64)/liblddbg.so.4:= \
1259         REALPATH=../../../lib/$(MACH64)/liblddbg.so.4
1260 $(ROOT)/usr/lib/$(MACH64)/libm.so.1:= \
1261         REALPATH=../../../lib/$(MACH64)/libm.so.1
1262 $(ROOT)/usr/lib/$(MACH64)/libm.so.2:= \
1263         REALPATH=../../../lib/$(MACH64)/libm.so.2
1264 $(ROOT)/usr/lib/$(MACH64)/libm.so:= \
1265         REALPATH=../../../lib/$(MACH64)/libm.so.2
1266 $(ROOT)/usr/lib/$(MACH64)/libmd.so.1:= \
1267         REALPATH=../../../lib/$(MACH64)/libmd.so.1
1268 $(ROOT)/usr/lib/$(MACH64)/libmd.so:= \
1269         REALPATH=../../../lib/$(MACH64)/libmd.so.1
1270 $(ROOT)/usr/lib/$(MACH64)/libmd5.so.1:= \
1271         REALPATH=../../../lib/$(MACH64)/libmd5.so.1
1272 $(ROOT)/usr/lib/$(MACH64)/libmd5.so:= \
1273         REALPATH=../../../lib/$(MACH64)/libmd5.so.1
1274 $(ROOT)/usr/lib/$(MACH64)/libmp.so.2:= \
1275         REALPATH=../../../lib/$(MACH64)/libmp.so.2
1276 $(ROOT)/usr/lib/$(MACH64)/libmp.so:= \
1277         REALPATH=../../../lib/$(MACH64)/libmp.so.2
1278 $(ROOT)/usr/lib/$(MACH64)/libmvec.so.1:= \
1279         REALPATH=../../../lib/$(MACH64)/libmvec.so.1
1280 $(ROOT)/usr/lib/$(MACH64)/libmvec.so:= \
1281         REALPATH=../../../lib/$(MACH64)/libmvec.so.1
1282 $(ROOT)/usr/lib/$(MACH64)/libnsl.so.1:= \
1283         REALPATH=../../../lib/$(MACH64)/libnsl.so.1
1284 $(ROOT)/usr/lib/$(MACH64)/libnsl.so:= \
1285         REALPATH=../../../lib/$(MACH64)/libnsl.so.1
1286 $(ROOT)/usr/lib/$(MACH64)/libnvpair.so.1:= \
1287         REALPATH=../../../lib/$(MACH64)/libnvpair.so.1
1288 $(ROOT)/usr/lib/$(MACH64)/libnvpair.so:= \
1289         REALPATH=../../../lib/$(MACH64)/libnvpair.so.1
1290 $(ROOT)/usr/lib/$(MACH64)/libpam.so.1:= \
1291         REALPATH=../../../lib/$(MACH64)/libpam.so.1
1292 $(ROOT)/usr/lib/$(MACH64)/libpam.so:= \
1293         REALPATH=../../../lib/$(MACH64)/libpam.so.1
1294 $(ROOT)/usr/lib/$(MACH64)/libposix4.so.1:= \
1295         REALPATH=../../../lib/$(MACH64)/librt.so.1
1296 $(ROOT)/usr/lib/$(MACH64)/libposix4.so:= \
1297         REALPATH=../../../lib/$(MACH64)/librt.so.1
1298 $(ROOT)/usr/lib/$(MACH64)/libproc.so.1:= \
1299         REALPATH=../../../lib/$(MACH64)/libproc.so.1
1300 $(ROOT)/usr/lib/$(MACH64)/libproc.so:= \
1301         REALPATH=../../../lib/$(MACH64)/libproc.so.1
1302 $(ROOT)/usr/lib/$(MACH64)/libpthread.so.1:= \
1303         REALPATH=../../../lib/$(MACH64)/libpthread.so.1
1304 $(ROOT)/usr/lib/$(MACH64)/libpthread.so:= \
1305         REALPATH=../../../lib/$(MACH64)/libpthread.so.1
1306 $(ROOT)/usr/lib/$(MACH64)/librcm.so.1:= \
1307         REALPATH=../../../lib/$(MACH64)/librcm.so.1
1308 $(ROOT)/usr/lib/$(MACH64)/librcm.so:= \
1309         REALPATH=../../../lib/$(MACH64)/librcm.so.1
1310 $(ROOT)/usr/lib/$(MACH64)/libresolv.so.2:= \
1311         REALPATH=../../../lib/$(MACH64)/libresolv.so.2
1312 $(ROOT)/usr/lib/$(MACH64)/libresolv.so:= \
1313         REALPATH=../../../lib/$(MACH64)/libresolv.so.2
1314 $(ROOT)/usr/lib/$(MACH64)/librestart.so.1:= \
```

```
1315         REALPATH=../../../lib/$(MACH64)/librestart.so.1
1316 $(ROOT)/usr/lib/$(MACH64)/librestart.so:= \
1317         REALPATH=../../../lib/$(MACH64)/librestart.so.1
1318 $(ROOT)/usr/lib/$(MACH64)/librpcsvc.so.1:= \
1319         REALPATH=../../../lib/$(MACH64)/librpcsvc.so.1
1320 $(ROOT)/usr/lib/$(MACH64)/librpcsvc.so:= \
1321         REALPATH=../../../lib/$(MACH64)/librpcsvc.so.1
1322 $(ROOT)/usr/lib/$(MACH64)/librt.so.1:= \
1323         REALPATH=../../../lib/$(MACH64)/librt.so.1
1324 $(ROOT)/usr/lib/$(MACH64)/librt.so:= \
1325         REALPATH=../../../lib/$(MACH64)/librt.so.1
1326 $(ROOT)/usr/lib/$(MACH64)/librtld.so.1:= \
1327         REALPATH=../../../lib/$(MACH64)/librtld.so.1
1328 $(ROOT)/usr/lib/$(MACH64)/librtld_db.so.1:= \
1329         REALPATH=../../../lib/$(MACH64)/librtld_db.so.1
1330 $(ROOT)/usr/lib/$(MACH64)/librtld_db.so:= \
1331         REALPATH=../../../lib/$(MACH64)/librtld_db.so.1
1332 $(ROOT)/usr/lib/$(MACH64)/libscf.so.1:= \
1333         REALPATH=../../../lib/$(MACH64)/libscf.so.1
1334 $(ROOT)/usr/lib/$(MACH64)/libscf.so:= \
1335         REALPATH=../../../lib/$(MACH64)/libscf.so.1
1336 $(ROOT)/usr/lib/$(MACH64)/libsec.so.1:= \
1337         REALPATH=../../../lib/$(MACH64)/libsec.so.1
1338 $(ROOT)/usr/lib/$(MACH64)/libsec.so:= \
1339         REALPATH=../../../lib/$(MACH64)/libsec.so.1
1340 $(ROOT)/usr/lib/$(MACH64)/libsecdb.so.1:= \
1341         REALPATH=../../../lib/$(MACH64)/libsecdb.so.1
1342 $(ROOT)/usr/lib/$(MACH64)/libsecdb.so:= \
1343         REALPATH=../../../lib/$(MACH64)/libsecdb.so.1
1344 $(ROOT)/usr/lib/$(MACH64)/libsendfile.so.1:= \
1345         REALPATH=../../../lib/$(MACH64)/libsendfile.so.1
1346 $(ROOT)/usr/lib/$(MACH64)/libsendfile.so:= \
1347         REALPATH=../../../lib/$(MACH64)/libsendfile.so.1
1348 $(ROOT)/usr/lib/$(MACH64)/libsocket.so.1:= \
1349         REALPATH=../../../lib/$(MACH64)/libsocket.so.1
1350 $(ROOT)/usr/lib/$(MACH64)/libsocket.so:= \
1351         REALPATH=../../../lib/$(MACH64)/libsocket.so.1
1352 $(ROOT)/usr/lib/$(MACH64)/libsysevent.so.1:= \
1353         REALPATH=../../../lib/$(MACH64)/libsysevent.so.1
1354 $(ROOT)/usr/lib/$(MACH64)/libsysevent.so:= \
1355         REALPATH=../../../lib/$(MACH64)/libsysevent.so.1
1356 $(ROOT)/usr/lib/$(MACH64)/libtermcap.so.1:= \
1357         REALPATH=../../../lib/$(MACH64)/libtermcap.so.1
1358 $(ROOT)/usr/lib/$(MACH64)/libtermcap.so:= \
1359         REALPATH=../../../lib/$(MACH64)/libtermcap.so.1
1360 $(ROOT)/usr/lib/$(MACH64)/libtermlib.so.1:= \
1361         REALPATH=../../../lib/$(MACH64)/libcurses.so.1
1362 $(ROOT)/usr/lib/$(MACH64)/libtermlib.so:= \
1363         REALPATH=../../../lib/$(MACH64)/libcurses.so.1
1364 $(ROOT)/usr/lib/$(MACH64)/libthread.so.1:= \
1365         REALPATH=../../../lib/$(MACH64)/libthread.so.1
1366 $(ROOT)/usr/lib/$(MACH64)/libthread.so:= \
1367         REALPATH=../../../lib/$(MACH64)/libthread.so.1
1368 $(ROOT)/usr/lib/$(MACH64)/libthread_db.so.1:= \
1369         REALPATH=../../../lib/$(MACH64)/libc_db.so.1
1370 $(ROOT)/usr/lib/$(MACH64)/libthread_db.so:= \
1371         REALPATH=../../../lib/$(MACH64)/libc_db.so.1
1372 $(ROOT)/usr/lib/$(MACH64)/libtsnet.so.1:= \
1373         REALPATH=../../../lib/$(MACH64)/libtsnet.so.1
1374 $(ROOT)/usr/lib/$(MACH64)/libtsnet.so:= \
1375         REALPATH=../../../lib/$(MACH64)/libtsnet.so.1
1376 $(ROOT)/usr/lib/$(MACH64)/libtsol.so.2:= \
1377         REALPATH=../../../lib/$(MACH64)/libtsol.so.2
1378 $(ROOT)/usr/lib/$(MACH64)/libtsol.so:= \
1379         REALPATH=../../../lib/$(MACH64)/libtsol.so.2
1380 $(ROOT)/usr/lib/$(MACH64)/libumem.so.1:= \
```



```
1381         REALPATH=../../../lib/$(MACH64)/libumem.so.1
1382 $(ROOT)/usr/lib/$(MACH64)/libumem.so:= \
1383         REALPATH=../../../lib/$(MACH64)/libumem.so.1
1384 $(ROOT)/usr/lib/$(MACH64)/libuuid.so.1:= \
1385         REALPATH=../../../lib/$(MACH64)/libuuid.so.1
1386 $(ROOT)/usr/lib/$(MACH64)/libuuid.so:= \
1387         REALPATH=../../../lib/$(MACH64)/libuuid.so.1
1388 $(ROOT)/usr/lib/$(MACH64)/libuutil.so.1:= \
1389         REALPATH=../../../lib/$(MACH64)/libuutil.so.1
1390 $(ROOT)/usr/lib/$(MACH64)/libuutil.so:= \
1391         REALPATH=../../../lib/$(MACH64)/libuutil.so.1
1392 $(ROOT)/usr/lib/$(MACH64)/libw.so.1:= \
1393         REALPATH=../../../lib/$(MACH64)/libw.so.1
1394 $(ROOT)/usr/lib/$(MACH64)/libw.so:= \
1395         REALPATH=../../../lib/$(MACH64)/libw.so.1
1396 $(ROOT)/usr/lib/$(MACH64)/libxnet.so.1:= \
1397         REALPATH=../../../lib/$(MACH64)/libxnet.so.1
1398 $(ROOT)/usr/lib/$(MACH64)/libxnet.so:= \
1399         REALPATH=../../../lib/$(MACH64)/libxnet.so.1
1400 $(ROOT)/usr/lib/$(MACH64)/libzfs.so:= \
1401         REALPATH=../../../lib/$(MACH64)/libzfs.so.1
1402 $(ROOT)/usr/lib/$(MACH64)/libzfs.so.1:= \
1403         REALPATH=../../../lib/$(MACH64)/libzfs.so.1
1404 $(ROOT)/usr/lib/$(MACH64)/libzfs_core.so:= \
1405         REALPATH=../../../lib/$(MACH64)/libzfs_core.so.1
1406 $(ROOT)/usr/lib/$(MACH64)/libzfs_core.so.1:= \
1407         REALPATH=../../../lib/$(MACH64)/libzfs_core.so.1
1408 $(ROOT)/usr/lib/$(MACH64)/libfdisk.so.1:= \
1409         REALPATH=../../../lib/$(MACH64)/libfdisk.so.1
1410 $(ROOT)/usr/lib/$(MACH64)/libfdisk.so:= \
1411         REALPATH=../../../lib/$(MACH64)/libfdisk.so.1
1412 $(ROOT)/usr/lib/$(MACH64)/llib-ladm.ln:= \
1413         REALPATH=../../../lib/$(MACH64)/llib-ladm.ln
1414 $(ROOT)/usr/lib/$(MACH64)/llib-laio.ln:= \
1415         REALPATH=../../../lib/$(MACH64)/llib-laio.ln
1416 $(ROOT)/usr/lib/$(MACH64)/llib-lavl.ln:= \
1417         REALPATH=../../../lib/$(MACH64)/llib-lavl.ln
1418 $(ROOT)/usr/lib/$(MACH64)/llib-lbsm.ln:= \
1419         REALPATH=../../../lib/$(MACH64)/llib-lbsm.ln
1420 $(ROOT)/usr/lib/$(MACH64)/llib-lc.ln:= \
1421         REALPATH=../../../lib/$(MACH64)/llib-lc.ln
1422 $(ROOT)/usr/lib/$(MACH64)/llib-lcmdutils.ln:= \
1423         REALPATH=../../../lib/$(MACH64)/llib-lcmdutils.ln
1424 $(ROOT)/usr/lib/$(MACH64)/llib-lcontract.ln:= \
1425         REALPATH=../../../lib/$(MACH64)/llib-lcontract.ln
1426 $(ROOT)/usr/lib/$(MACH64)/llib-lctf.ln:= \
1427         REALPATH=../../../lib/$(MACH64)/llib-lctf.ln
1428 $(ROOT)/usr/lib/$(MACH64)/llib-lcurses.ln:= \
1429         REALPATH=../../../lib/$(MACH64)/llib-lcurses.ln
1430 $(ROOT)/usr/lib/$(MACH64)/llib-ldevice.ln:= \
1431         REALPATH=../../../lib/$(MACH64)/llib-ldevice.ln
1432 $(ROOT)/usr/lib/$(MACH64)/llib-ldevid.ln:= \
1433         REALPATH=../../../lib/$(MACH64)/llib-ldevid.ln
1434 $(ROOT)/usr/lib/$(MACH64)/llib-ldevinfo.ln:= \
1435         REALPATH=../../../lib/$(MACH64)/llib-ldevinfo.ln
1436 $(ROOT)/usr/lib/$(MACH64)/llib-ldhcputil.ln:= \
1437         REALPATH=../../../lib/$(MACH64)/llib-ldhcputil.ln
1438 $(ROOT)/usr/lib/$(MACH64)/llib-ldl.ln:= \
1439         REALPATH=../../../lib/$(MACH64)/llib-ldl.ln
1440 $(ROOT)/usr/lib/$(MACH64)/llib-ldoor.ln:= \
1441         REALPATH=../../../lib/$(MACH64)/llib-ldoor.ln
1442 $(ROOT)/usr/lib/$(MACH64)/llib-lefi.ln:= \
1443         REALPATH=../../../lib/$(MACH64)/llib-lefi.ln
1444 $(ROOT)/usr/lib/$(MACH64)/llib-lelf.ln:= \
1445         REALPATH=../../../lib/$(MACH64)/llib-lelf.ln
1446 $(ROOT)/usr/lib/$(MACH64)/llib-lgen.ln:= \
```

```
1447         REALPATH=../../../lib/$(MACH64)/llib-lgen.ln
1448 $(ROOT)/usr/lib/$(MACH64)/llib-linetutil.ln:= \
1449         REALPATH=../../../lib/$(MACH64)/llib-linetutil.ln
1450 $(ROOT)/usr/lib/$(MACH64)/llib-lintl.ln:= \
1451         REALPATH=../../../lib/$(MACH64)/llib-lintl.ln
1452 $(ROOT)/usr/lib/$(MACH64)/llib-lkstat.ln:= \
1453         REALPATH=../../../lib/$(MACH64)/llib-lkstat.ln
1454 $(ROOT)/usr/lib/$(MACH64)/llib-lm.ln:= \
1455         REALPATH=../../../lib/$(MACH64)/llib-lm.ln
1456 $(ROOT)/usr/lib/$(MACH64)/llib-lmd5.ln:= \
1457         REALPATH=../../../lib/$(MACH64)/llib-lmd5.ln
1458 $(ROOT)/usr/lib/$(MACH64)/llib-lnsl.ln:= \
1459         REALPATH=../../../lib/$(MACH64)/llib-lnsl.ln
1460 $(ROOT)/usr/lib/$(MACH64)/llib-lnvpair.ln:= \
1461         REALPATH=../../../lib/$(MACH64)/llib-lnvpair.ln
1462 $(ROOT)/usr/lib/$(MACH64)/llib-lpam.ln:= \
1463         REALPATH=../../../lib/$(MACH64)/llib-lpam.ln
1464 $(ROOT)/usr/lib/$(MACH64)/llib-lposix4.ln:= \
1465         REALPATH=../../../lib/$(MACH64)/llib-lrt.ln
1466 $(ROOT)/usr/lib/$(MACH64)/llib-lpthread.ln:= \
1467         REALPATH=../../../lib/$(MACH64)/llib-lpthread.ln
1468 $(ROOT)/usr/lib/$(MACH64)/llib-lresolv.ln:= \
1469         REALPATH=../../../lib/$(MACH64)/llib-lresolv.ln
1470 $(ROOT)/usr/lib/$(MACH64)/llib-lrpcsvc.ln:= \
1471         REALPATH=../../../lib/$(MACH64)/llib-lrpcsvc.ln
1472 $(ROOT)/usr/lib/$(MACH64)/llib-lrt.ln:= \
1473         REALPATH=../../../lib/$(MACH64)/llib-lrt.ln
1474 $(ROOT)/usr/lib/$(MACH64)/llib-lrtld_db.ln:= \
1475         REALPATH=../../../lib/$(MACH64)/llib-lrtld_db.ln
1476 $(ROOT)/usr/lib/$(MACH64)/llib-lscf.ln:= \
1477         REALPATH=../../../lib/$(MACH64)/llib-lscf.ln
1478 $(ROOT)/usr/lib/$(MACH64)/llib-lsec.ln:= \
1479         REALPATH=../../../lib/$(MACH64)/llib-lsec.ln
1480 $(ROOT)/usr/lib/$(MACH64)/llib-lsecdb.ln:= \
1481         REALPATH=../../../lib/$(MACH64)/llib-lsecdb.ln
1482 $(ROOT)/usr/lib/$(MACH64)/llib-lsendfile.ln:= \
1483         REALPATH=../../../lib/$(MACH64)/llib-lsendfile.ln
1484 $(ROOT)/usr/lib/$(MACH64)/llib-lsocket.ln:= \
1485         REALPATH=../../../lib/$(MACH64)/llib-lsocket.ln
1486 $(ROOT)/usr/lib/$(MACH64)/llib-lsysevent.ln:= \
1487         REALPATH=../../../lib/$(MACH64)/llib-lsysevent.ln
1488 $(ROOT)/usr/lib/$(MACH64)/llib-ltermcap.ln:= \
1489         REALPATH=../../../lib/$(MACH64)/llib-ltermcap.ln
1490 $(ROOT)/usr/lib/$(MACH64)/llib-ltermlib.ln:= \
1491         REALPATH=../../../lib/$(MACH64)/llib-lcurses.ln
1492 $(ROOT)/usr/lib/$(MACH64)/llib-lthread.ln:= \
1493         REALPATH=../../../lib/$(MACH64)/llib-lthread.ln
1494 $(ROOT)/usr/lib/$(MACH64)/llib-lthread_db.ln:= \
1495         REALPATH=../../../lib/$(MACH64)/llib-lc_db.ln
1496 $(ROOT)/usr/lib/$(MACH64)/llib-ltsnet.ln:= \
1497         REALPATH=../../../lib/$(MACH64)/llib-ltsnet.ln
1498 $(ROOT)/usr/lib/$(MACH64)/llib-ltsol.ln:= \
1499         REALPATH=../../../lib/$(MACH64)/llib-ltsol.ln
1500 $(ROOT)/usr/lib/$(MACH64)/llib-lumem.ln:= \
1501         REALPATH=../../../lib/$(MACH64)/llib-lumem.ln
1502 $(ROOT)/usr/lib/$(MACH64)/llib-luuid.ln:= \
1503         REALPATH=../../../lib/$(MACH64)/llib-luuid.ln
1504 $(ROOT)/usr/lib/$(MACH64)/llib-lxnet.ln:= \
1505         REALPATH=../../../lib/$(MACH64)/llib-lxnet.ln
1506 $(ROOT)/usr/lib/$(MACH64)/llib-lzfs.ln:= \
1507         REALPATH=../../../lib/$(MACH64)/llib-lzfs.ln
1508 $(ROOT)/usr/lib/$(MACH64)/llib-lzfs_core.ln:= \
1509         REALPATH=../../../lib/$(MACH64)/llib-lzfs_core.ln
1510 $(ROOT)/usr/lib/$(MACH64)/llib-lfdisk.ln:= \
1511         REALPATH=../../../lib/$(MACH64)/llib-lfdisk.ln
1512 $(ROOT)/usr/lib/$(MACH64)/nss_compat.so.1:= \
```



```
1513         REALPATH=../../../lib/$(MACH64)/nss_compat.so.1
1514 $(ROOT)/usr/lib/$(MACH64)/nss_dns.so.1:= \
1515         REALPATH=../../../lib/$(MACH64)/nss_dns.so.1
1516 $(ROOT)/usr/lib/$(MACH64)/nss_files.so.1:= \
1517         REALPATH=../../../lib/$(MACH64)/nss_files.so.1
1518 $(ROOT)/usr/lib/$(MACH64)/nss_nis.so.1:= \
1519         REALPATH=../../../lib/$(MACH64)/nss_nis.so.1
1520 $(ROOT)/usr/lib/$(MACH64)/nss_user.so.1:= \
1521         REALPATH=../../../lib/$(MACH64)/nss_user.so.1
1522 $(ROOT)/usr/lib/fm/$(MACH64)/libfmevent.so.1:= \
1523         REALPATH=../../../../lib/fm/$(MACH64)/libfmevent.so.1
1524 $(ROOT)/usr/lib/fm/$(MACH64)/libfmevent.so:= \
1525         REALPATH=../../../../lib/fm/$(MACH64)/libfmevent.so.1
1526 $(ROOT)/usr/lib/fm/$(MACH64)/llib-lfmevent.ln:= \
1527         REALPATH=../../../../lib/fm/$(MACH64)/llib-lfmevent.ln

1529 i386_SYM.USRLIB= \
1530         /usr/lib/libfdisk.so \
1531         /usr/lib/libfdisk.so.1 \
1532         /usr/lib/llib-lfdisk \
1533         /usr/lib/llib-lfdisk.ln

1535 SYM.USRLIB= \
1536         $($(MACH)_SYM.USRLIB)   \
1537         /lib/libposix4.so \
1538         /lib/libposix4.so.1 \
1539         /lib/llib-lposix4 \
1540         /lib/llib-lposix4.ln \
1541         /lib/libthread_db.so \
1542         /lib/libthread_db.so.1 \
1543         /usr/lib/ld.so.1 \
1544         /usr/lib/libadm.so \
1545         /usr/lib/libadm.so.1 \
1546         /usr/lib/libaio.so \
1547         /usr/lib/libaio.so.1 \
1548         /usr/lib/libavl.so \
1549         /usr/lib/libavl.so.1 \
1550         /usr/lib/libbsm.so \
1551         /usr/lib/libbsm.so.1 \
1552         /usr/lib/libc.so \
1553         /usr/lib/libc.so.1 \
1554         /usr/lib/libc_db.so \
1555         /usr/lib/libc_db.so.1 \
1556         /usr/lib/libcmdutils.so \
1557         /usr/lib/libcmdutils.so.1 \
1558         /usr/lib/libcontract.so \
1559         /usr/lib/libcontract.so.1 \
1560         /usr/lib/libctf.so \
1561         /usr/lib/libctf.so.1 \
1562         /usr/lib/libcurses.so \
1563         /usr/lib/libcurses.so.1 \
1564         /usr/lib/libdevice.so \
1565         /usr/lib/libdevice.so.1 \
1566         /usr/lib/libdevid.so \
1567         /usr/lib/libdevid.so.1 \
1568         /usr/lib/libdevinfo.so \
1569         /usr/lib/libdevinfo.so.1 \
1570         /usr/lib/libdhcpagent.so \
1571         /usr/lib/libdhcpagent.so.1 \
1572         /usr/lib/libdhcputil.so \
1573         /usr/lib/libdhcputil.so.1 \
1574         /usr/lib/libdl.so \
1575         /usr/lib/libdl.so.1 \
1576         /usr/lib/libdlpi.so \
1577         /usr/lib/libdlpi.so.1 \
1578         /usr/lib/libdoor.so \
```

```
1579         /usr/lib/libdoor.so.1 \
1580         /usr/lib/libefi.so \
1581         /usr/lib/libefi.so.1 \
1582         /usr/lib/libelf.so \
1583         /usr/lib/libelf.so.1 \
1584         /usr/lib/libgen.so \
1585         /usr/lib/libgen.so.1 \
1586         /usr/lib/libinetutil.so \
1587         /usr/lib/libinetutil.so.1 \
1588         /usr/lib/libintl.so \
1589         /usr/lib/libintl.so.1 \
1590         /usr/lib/libkstat.so \
1591         /usr/lib/libkstat.so.1 \
1592         /usr/lib/liblddbg.so.4 \
1593         /usr/lib/libm.so.1 \
1594         /usr/lib/libm.so.2 \
1595         /usr/lib/libm.so \
1596         /usr/lib/libmd.so \
1597         /usr/lib/libmd.so.1 \
1598         /usr/lib/libmd5.so \
1599         /usr/lib/libmd5.so.1 \
1600         /usr/lib/libmeta.so \
1601         /usr/lib/libmeta.so.1 \
1602         /usr/lib/libmp.so \
1603         /usr/lib/libmp.so.1 \
1604         /usr/lib/libmp.so.2 \
1605         /usr/lib/libmvec.so.1 \
1606         /usr/lib/libmvec.so \
1607         /usr/lib/libnsl.so \
1608         /usr/lib/libnsl.so.1 \
1609         /usr/lib/libnvpair.so \
1610         /usr/lib/libnvpair.so.1 \
1611         /usr/lib/libpam.so \
1612         /usr/lib/libpam.so.1 \
1613         /usr/lib/libposix4.so \
1614         /usr/lib/libposix4.so.1 \
1615         /usr/lib/libproc.so \
1616         /usr/lib/libproc.so.1 \
1617         /usr/lib/libpthread.so \
1618         /usr/lib/libpthread.so.1 \
1619         /usr/lib/librcm.so \
1620         /usr/lib/librcm.so.1 \
1621         /usr/lib/libresolv.so \
1622         /usr/lib/libresolv.so.1 \
1623         /usr/lib/libresolv.so.2 \
1624         /usr/lib/librestart.so \
1625         /usr/lib/librestart.so.1 \
1626         /usr/lib/librpcsvc.so \
1627         /usr/lib/librpcsvc.so.1 \
1628         /usr/lib/librt.so \
1629         /usr/lib/librt.so.1 \
1630         /usr/lib/librtld.so.1 \
1631         /usr/lib/librtld_db.so \
1632         /usr/lib/librtld_db.so.1 \
1633         /usr/lib/libscf.so \
1634         /usr/lib/libscf.so.1 \
1635         /usr/lib/libsec.so \
1636         /usr/lib/libsec.so.1 \
1637         /usr/lib/libsecdb.so \
1638         /usr/lib/libsecdb.so.1 \
1639         /usr/lib/libsendfile.so \
1640         /usr/lib/libsendfile.so.1 \
1641         /usr/lib/libsocket.so \
1642         /usr/lib/libsocket.so.1 \
1643         /usr/lib/libsysevent.so \
1644         /usr/lib/libsysevent.so.1 \
```



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1645         /usr/lib/libtermcap.so \
1646         /usr/lib/libtermcap.so.1 \
1647         /usr/lib/libtermlib.so \
1648         /usr/lib/libtermlib.so.1 \
1649         /usr/lib/libthread.so \
1650         /usr/lib/libthread.so.1 \
1651         /usr/lib/libthread_db.so \
1652         /usr/lib/libthread_db.so.1 \
1653         /usr/lib/libtsnet.so \
1654         /usr/lib/libtsnet.so.1 \
1655         /usr/lib/libtsol.so \
1656         /usr/lib/libtsol.so.2 \
1657         /usr/lib/libumem.so \
1658         /usr/lib/libumem.so.1 \
1659         /usr/lib/libuuid.so \
1660         /usr/lib/libuuid.so.1 \
1661         /usr/lib/libuutil.so \
1662         /usr/lib/libuutil.so.1 \
1663         /usr/lib/libw.so \
1664         /usr/lib/libw.so.1 \
1665         /usr/lib/libxnet.so \
1666         /usr/lib/libxnet.so.1 \
1667         /usr/lib/libzfs.so \
1668         /usr/lib/libzfs.so.1 \
1669         /usr/lib/libzfs_core.so \
1670         /usr/lib/libzfs_core.so.1 \
1671         /usr/lib/llib-ladm \
1672         /usr/lib/llib-ladm.ln \
1673         /usr/lib/llib-laio \
1674         /usr/lib/llib-laio.ln \
1675         /usr/lib/llib-lavl \
1676         /usr/lib/llib-lavl.ln \
1677         /usr/lib/llib-lbsm \
1678         /usr/lib/llib-lbsm.ln \
1679         /usr/lib/llib-lc \
1680         /usr/lib/llib-lc.ln \
1681         /usr/lib/llib-lcmdutils \
1682         /usr/lib/llib-lcmdutils.ln \
1683         /usr/lib/llib-lcontract \
1684         /usr/lib/llib-lcontract.ln \
1685         /usr/lib/llib-lctf \
1686         /usr/lib/llib-lctf.ln \
1687         /usr/lib/llib-lcurses \
1688         /usr/lib/llib-lcurses.ln \
1689         /usr/lib/llib-ldevice \
1690         /usr/lib/llib-ldevice.ln \
1691         /usr/lib/llib-ldevid \
1692         /usr/lib/llib-ldevid.ln \
1693         /usr/lib/llib-ldevinfo \
1694         /usr/lib/llib-ldevinfo.ln \
1695         /usr/lib/llib-ldhcpagent \
1696         /usr/lib/llib-ldhcpagent.ln \
1697         /usr/lib/llib-ldhcputil \
1698         /usr/lib/llib-ldhcputil.ln \
1699         /usr/lib/llib-ldl \
1700         /usr/lib/llib-ldl.ln \
1701         /usr/lib/llib-ldoor \
1702         /usr/lib/llib-ldoor.ln \
1703         /usr/lib/llib-lefi \
1704         /usr/lib/llib-lefi.ln \
1705         /usr/lib/llib-lelf \
1706         /usr/lib/llib-lelf.ln \
1707         /usr/lib/llib-lgen \
1708         /usr/lib/llib-lgen.ln \
1709         /usr/lib/llib-linetutil \
1710         /usr/lib/llib-linetutil.ln \
```

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1711         /usr/lib/llib-lintl \
1712         /usr/lib/llib-lintl.ln \
1713         /usr/lib/llib-lkstat \
1714         /usr/lib/llib-lkstat.ln \
1715         /usr/lib/llib-lm \
1716         /usr/lib/llib-lm.ln \
1717         /usr/lib/llib-lmd5 \
1718         /usr/lib/llib-lmd5.ln \
1719         /usr/lib/llib-lmeta \
1720         /usr/lib/llib-lmeta.ln \
1721         /usr/lib/llib-lnsl \
1722         /usr/lib/llib-lnsl.ln \
1723         /usr/lib/llib-lnvpair \
1724         /usr/lib/llib-lnvpair.ln \
1725         /usr/lib/llib-lpam \
1726         /usr/lib/llib-lpam.ln \
1727         /usr/lib/llib-lposix4 \
1728         /usr/lib/llib-lposix4.ln \
1729         /usr/lib/llib-lpthread \
1730         /usr/lib/llib-lpthread.ln \
1731         /usr/lib/llib-lresolv \
1732         /usr/lib/llib-lresolv.ln \
1733         /usr/lib/llib-lrpcsvc \
1734         /usr/lib/llib-lrpcsvc.ln \
1735         /usr/lib/llib-lrt \
1736         /usr/lib/llib-lrt.ln \
1737         /usr/lib/llib-lrtld_db \
1738         /usr/lib/llib-lrtld_db.ln \
1739         /usr/lib/llib-lscf \
1740         /usr/lib/llib-lscf.ln \
1741         /usr/lib/llib-lsec \
1742         /usr/lib/llib-lsec.ln \
1743         /usr/lib/llib-lsecdb \
1744         /usr/lib/llib-lsecdb.ln \
1745         /usr/lib/llib-lsendfile \
1746         /usr/lib/llib-lsendfile.ln \
1747         /usr/lib/llib-lsocket \
1748         /usr/lib/llib-lsocket.ln \
1749         /usr/lib/llib-lsysevent \
1750         /usr/lib/llib-lsysevent.ln \
1751         /usr/lib/llib-ltermcap \
1752         /usr/lib/llib-ltermcap.ln \
1753         /usr/lib/llib-ltermlib \
1754         /usr/lib/llib-ltermlib.ln \
1755         /usr/lib/llib-lthread \
1756         /usr/lib/llib-lthread.ln \
1757         /usr/lib/llib-lthread_db \
1758         /usr/lib/llib-lthread_db.ln \
1759         /usr/lib/llib-ltsnet \
1760         /usr/lib/llib-ltsnet.ln \
1761         /usr/lib/llib-ltsol \
1762         /usr/lib/llib-ltsol.ln \
1763         /usr/lib/llib-lumem \
1764         /usr/lib/llib-lumem.ln \
1765         /usr/lib/llib-luuid \
1766         /usr/lib/llib-luuid.ln \
1767         /usr/lib/llib-lxnet \
1768         /usr/lib/llib-lxnet.ln \
1769         /usr/lib/llib-lzfs \
1770         /usr/lib/llib-lzfs.ln \
1771         /usr/lib/llib-lzfs_core \
1772         /usr/lib/llib-lzfs_core.ln \
1773         /usr/lib/nss_compat.so.1 \
1774         /usr/lib/nss_dns.so.1 \
1775         /usr/lib/nss_files.so.1 \
1776         /usr/lib/nss_nis.so.1 \
```



```
1777         /usr/lib/nss_user.so.1 \
1778         /usr/lib/fm/libfmevent.so \
1779         /usr/lib/fm/libfmevent.so.1 \
1780         /usr/lib/fm/llib-lfmevent \
1781         /usr/lib/fm/llib-lfmevent.ln

1783 sparcv9_SYM.USRLIB64=

1785 amd64_SYM.USRLIB64=     \
1786         /usr/lib/amd64/libfdisk.so      \
1787         /usr/lib/amd64/libfdisk.so.1    \
1788         /usr/lib/amd64/llib-lfdisk.ln


1791 SYM.USRLIB64= \
1792         $($(MACH64)_SYM.USRLIB64)               \
1793         /lib/$(MACH64)/libposix4.so \
1794         /lib/$(MACH64)/libposix4.so.1 \
1795         /lib/$(MACH64)/llib-lposix4.ln \
1796         /lib/$(MACH64)/libthread_db.so \
1797         /lib/$(MACH64)/libthread_db.so.1 \
1798         /usr/lib/$(MACH64)/ld.so.1 \
1799         /usr/lib/$(MACH64)/libadm.so \
1800         /usr/lib/$(MACH64)/libadm.so.1 \
1801         /usr/lib/$(MACH64)/libaio.so \
1802         /usr/lib/$(MACH64)/libaio.so.1 \
1803         /usr/lib/$(MACH64)/libavl.so \
1804         /usr/lib/$(MACH64)/libavl.so.1 \
1805         /usr/lib/$(MACH64)/libbsm.so \
1806         /usr/lib/$(MACH64)/libbsm.so.1 \
1807         /usr/lib/$(MACH64)/libc.so \
1808         /usr/lib/$(MACH64)/libc.so.1 \
1809         /usr/lib/$(MACH64)/libc_db.so \
1810         /usr/lib/$(MACH64)/libc_db.so.1 \
1811         /usr/lib/$(MACH64)/libcmdutils.so \
1812         /usr/lib/$(MACH64)/libcmdutils.so.1 \
1813         /usr/lib/$(MACH64)/libcontract.so \
1814         /usr/lib/$(MACH64)/libcontract.so.1 \
1815         /usr/lib/$(MACH64)/libctf.so \
1816         /usr/lib/$(MACH64)/libctf.so.1 \
1817         /usr/lib/$(MACH64)/libcurses.so \
1818         /usr/lib/$(MACH64)/libcurses.so.1 \
1819         /usr/lib/$(MACH64)/libdevice.so \
1820         /usr/lib/$(MACH64)/libdevice.so.1 \
1821         /usr/lib/$(MACH64)/libdevid.so \
1822         /usr/lib/$(MACH64)/libdevid.so.1 \
1823         /usr/lib/$(MACH64)/libdevinfo.so \
1824         /usr/lib/$(MACH64)/libdevinfo.so.1 \
1825         /usr/lib/$(MACH64)/libdhcputil.so \
1826         /usr/lib/$(MACH64)/libdhcputil.so.1 \
1827         /usr/lib/$(MACH64)/libdl.so \
1828         /usr/lib/$(MACH64)/libdl.so.1 \
1829         /usr/lib/$(MACH64)/libdlpi.so \
1830         /usr/lib/$(MACH64)/libdlpi.so.1 \
1831         /usr/lib/$(MACH64)/libdoor.so \
1832         /usr/lib/$(MACH64)/libdoor.so.1 \
1833         /usr/lib/$(MACH64)/libefi.so \
1834         /usr/lib/$(MACH64)/libefi.so.1 \
1835         /usr/lib/$(MACH64)/libelf.so \
1836         /usr/lib/$(MACH64)/libelf.so.1 \
1837         /usr/lib/$(MACH64)/libgen.so \
1838         /usr/lib/$(MACH64)/libgen.so.1 \
1839         /usr/lib/$(MACH64)/libinetutil.so \
1840         /usr/lib/$(MACH64)/libinetutil.so.1 \
1841         /usr/lib/$(MACH64)/libintl.so \
1842         /usr/lib/$(MACH64)/libintl.so.1 \
```

```
1843         /usr/lib/$(MACH64)/libkstat.so \
1844         /usr/lib/$(MACH64)/libkstat.so.1 \
1845         /usr/lib/$(MACH64)/liblddbg.so.4 \
1846         /usr/lib/$(MACH64)/libm.so.1 \
1847         /usr/lib/$(MACH64)/libm.so.2 \
1848         /usr/lib/$(MACH64)/libm.so \
1849         /usr/lib/$(MACH64)/libmd.so \
1850         /usr/lib/$(MACH64)/libmd.so.1 \
1851         /usr/lib/$(MACH64)/libmd5.so \
1852         /usr/lib/$(MACH64)/libmd5.so.1 \
1853         /usr/lib/$(MACH64)/libmp.so \
1854         /usr/lib/$(MACH64)/libmp.so.2 \
1855         /usr/lib/$(MACH64)/libmvec.so.1 \
1856         /usr/lib/$(MACH64)/libmvec.so \
1857         /usr/lib/$(MACH64)/libnsl.so \
1858         /usr/lib/$(MACH64)/libnsl.so.1 \
1859         /usr/lib/$(MACH64)/libnvpair.so \
1860         /usr/lib/$(MACH64)/libnvpair.so.1 \
1861         /usr/lib/$(MACH64)/libpam.so \
1862         /usr/lib/$(MACH64)/libpam.so.1 \
1863         /usr/lib/$(MACH64)/libposix4.so \
1864         /usr/lib/$(MACH64)/libposix4.so.1 \
1865         /usr/lib/$(MACH64)/libproc.so \
1866         /usr/lib/$(MACH64)/libproc.so.1 \
1867         /usr/lib/$(MACH64)/libpthread.so \
1868         /usr/lib/$(MACH64)/libpthread.so.1 \
1869         /usr/lib/$(MACH64)/librcm.so \
1870         /usr/lib/$(MACH64)/librcm.so.1 \
1871         /usr/lib/$(MACH64)/libresolv.so \
1872         /usr/lib/$(MACH64)/libresolv.so.2 \
1873         /usr/lib/$(MACH64)/librestart.so \
1874         /usr/lib/$(MACH64)/librestart.so.1 \
1875         /usr/lib/$(MACH64)/librpcsvc.so \
1876         /usr/lib/$(MACH64)/librpcsvc.so.1 \
1877         /usr/lib/$(MACH64)/librt.so \
1878         /usr/lib/$(MACH64)/librt.so.1 \
1879         /usr/lib/$(MACH64)/librtld.so.1 \
1880         /usr/lib/$(MACH64)/librtld_db.so \
1881         /usr/lib/$(MACH64)/librtld_db.so.1 \
1882         /usr/lib/$(MACH64)/libscf.so \
1883         /usr/lib/$(MACH64)/libscf.so.1 \
1884         /usr/lib/$(MACH64)/libsec.so \
1885         /usr/lib/$(MACH64)/libsec.so.1 \
1886         /usr/lib/$(MACH64)/libsecdb.so \
1887         /usr/lib/$(MACH64)/libsecdb.so.1 \
1888         /usr/lib/$(MACH64)/libsendfile.so \
1889         /usr/lib/$(MACH64)/libsendfile.so.1 \
1890         /usr/lib/$(MACH64)/libsocket.so \
1891         /usr/lib/$(MACH64)/libsocket.so.1 \
1892         /usr/lib/$(MACH64)/libsysevent.so \
1893         /usr/lib/$(MACH64)/libsysevent.so.1 \
1894         /usr/lib/$(MACH64)/libtermcap.so \
1895         /usr/lib/$(MACH64)/libtermcap.so.1 \
1896         /usr/lib/$(MACH64)/libtermlib.so \
1897         /usr/lib/$(MACH64)/libtermlib.so.1 \
1898         /usr/lib/$(MACH64)/libthread.so \
1899         /usr/lib/$(MACH64)/libthread.so.1 \
1900         /usr/lib/$(MACH64)/libthread_db.so \
1901         /usr/lib/$(MACH64)/libthread_db.so.1 \
1902         /usr/lib/$(MACH64)/libtsnet.so \
1903         /usr/lib/$(MACH64)/libtsnet.so.1 \
1904         /usr/lib/$(MACH64)/libtsol.so \
1905         /usr/lib/$(MACH64)/libtsol.so.2 \
1906         /usr/lib/$(MACH64)/libumem.so \
1907         /usr/lib/$(MACH64)/libumem.so.1 \
1908         /usr/lib/$(MACH64)/libuuid.so \
```



```
1909         /usr/lib/$(MACH64)/libuuid.so.1 \
1910         /usr/lib/$(MACH64)/libuutil.so \
1911         /usr/lib/$(MACH64)/libuutil.so.1 \
1912         /usr/lib/$(MACH64)/libw.so \
1913         /usr/lib/$(MACH64)/libw.so.1 \
1914         /usr/lib/$(MACH64)/libxnet.so \
1915         /usr/lib/$(MACH64)/libxnet.so.1 \
1916         /usr/lib/$(MACH64)/libzfs.so \
1917         /usr/lib/$(MACH64)/libzfs.so.1 \
1918         /usr/lib/$(MACH64)/libzfs_core.so \
1919         /usr/lib/$(MACH64)/libzfs_core.so.1 \
1920         /usr/lib/$(MACH64)/llib-ladm.ln \
1921         /usr/lib/$(MACH64)/llib-laio.ln \
1922         /usr/lib/$(MACH64)/llib-lavl.ln \
1923         /usr/lib/$(MACH64)/llib-lbsm.ln \
1924         /usr/lib/$(MACH64)/llib-lc.ln \
1925         /usr/lib/$(MACH64)/llib-lcmdutils.ln \
1926         /usr/lib/$(MACH64)/llib-lcontract.ln \
1927         /usr/lib/$(MACH64)/llib-lctf.ln \
1928         /usr/lib/$(MACH64)/llib-lcurses.ln \
1929         /usr/lib/$(MACH64)/llib-ldevice.ln \
1930         /usr/lib/$(MACH64)/llib-ldevid.ln \
1931         /usr/lib/$(MACH64)/llib-ldevinfo.ln \
1932         /usr/lib/$(MACH64)/llib-ldhcputil.ln \
1933         /usr/lib/$(MACH64)/llib-ldl.ln \
1934         /usr/lib/$(MACH64)/llib-ldoor.ln \
1935         /usr/lib/$(MACH64)/llib-lefi.ln \
1936         /usr/lib/$(MACH64)/llib-lelf.ln \
1937         /usr/lib/$(MACH64)/llib-lgen.ln \
1938         /usr/lib/$(MACH64)/llib-linetutil.ln \
1939         /usr/lib/$(MACH64)/llib-lintl.ln \
1940         /usr/lib/$(MACH64)/llib-lkstat.ln \
1941         /usr/lib/$(MACH64)/llib-lm.ln \
1942         /usr/lib/$(MACH64)/llib-lmd5.ln \
1943         /usr/lib/$(MACH64)/llib-lnsl.ln \
1944         /usr/lib/$(MACH64)/llib-lnvpair.ln \
1945         /usr/lib/$(MACH64)/llib-lpam.ln \
1946         /usr/lib/$(MACH64)/llib-lposix4.ln \
1947         /usr/lib/$(MACH64)/llib-lpthread.ln \
1948         /usr/lib/$(MACH64)/llib-lresolv.ln \
1949         /usr/lib/$(MACH64)/llib-lrpcsvc.ln \
1950         /usr/lib/$(MACH64)/llib-lrt.ln \
1951         /usr/lib/$(MACH64)/llib-lrtld_db.ln \
1952         /usr/lib/$(MACH64)/llib-lscf.ln \
1953         /usr/lib/$(MACH64)/llib-lsec.ln \
1954         /usr/lib/$(MACH64)/llib-lsecdb.ln \
1955         /usr/lib/$(MACH64)/llib-lsendfile.ln \
1956         /usr/lib/$(MACH64)/llib-lsocket.ln \
1957         /usr/lib/$(MACH64)/llib-lsysevent.ln \
1958         /usr/lib/$(MACH64)/llib-ltermcap.ln \
1959         /usr/lib/$(MACH64)/llib-ltermlib.ln \
1960         /usr/lib/$(MACH64)/llib-lthread.ln \
1961         /usr/lib/$(MACH64)/llib-lthread_db.ln \
1962         /usr/lib/$(MACH64)/llib-ltsnet.ln \
1963         /usr/lib/$(MACH64)/llib-ltsol.ln \
1964         /usr/lib/$(MACH64)/llib-lumem.ln \
1965         /usr/lib/$(MACH64)/llib-luuid.ln \
1966         /usr/lib/$(MACH64)/llib-lxnet.ln \
1967         /usr/lib/$(MACH64)/llib-lzfs.ln \
1968         /usr/lib/$(MACH64)/llib-lzfs_core.ln \
1969         /usr/lib/$(MACH64)/nss_compat.so.1 \
1970         /usr/lib/$(MACH64)/nss_dns.so.1 \
1971         /usr/lib/$(MACH64)/nss_files.so.1 \
1972         /usr/lib/$(MACH64)/nss_nis.so.1 \
1973         /usr/lib/$(MACH64)/nss_user.so.1 \
1974         /usr/lib/fm/$(MACH64)/libfmevent.so \
```

```
1975         /usr/lib/fm/$(MACH64)/libfmevent.so.1 \
1976         /usr/lib/fm/$(MACH64)/llib-lfmevent.ln

1978 #
1979 # usr/src/Makefile uses INS.dir for any member of ROOTDIRS, the fact
1980 # these are symlinks to files has no bearing on this.
1981 #
1982 $(FILELINKS:%=$(ROOT)%):= \
1983     INS.dir= -$(RM) $@; $(SYMLINK) $(REALPATH) $@
```

```
**********************************************************
   11135 Sat May 10 12:08:42 2014
new/usr/src/head/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
#
# CDDL HEADER START
#
# The contents of this file are subject to the terms of the
# Common Development and Distribution License (the "License").
# You may not use this file except in compliance with the License.
#
# You can obtain a copy of the license at usr/src/OPENSOLARIS.LICENSE
# or http://www.opensolaris.org/os/licensing.
# See the License for the specific language governing permissions
# and limitations under the License.
#
# When distributing Covered Code, include this CDDL HEADER in each
# file and include the License file at usr/src/OPENSOLARIS.LICENSE.
# If applicable, add the following below this CDDL HEADER, with the
# fields enclosed by brackets "[]" replaced with your own identifying
# information: Portions Copyright [yyyy] [name of copyright owner]
#
# CDDL HEADER END
#
#
# Copyright 2011 Nexenta Systems, Inc.  All rights reserved.
#
# Copyright 2010 Sun Microsystems, Inc.  All rights reserved.
# Use is subject to license terms.
#
# head/Makefile
#
# include global definitions
include ../Makefile.master

sparc_HDRS=
i386_HDRS=      stack_unwind.h

# Headers are listed one per line so that TeamWare can auto-merge most changes

KRB5HDRS= mit_copyright.h mit-sipb-copyright.h

ATTRDB_HDRS=    secdb.h auth_attr.h exec_attr.h prof_attr.h user_attr.h \
        auth_list.h

HDRS=   $($(MACH)_HDRS)  $(ATTRDB_HDRS) \
        aio.h           \
        alloca.h        \
        apptrace.h      \
        apptrace_impl.h \
        ar.h            \
        archives.h      \
        assert.h        \
        atomic.h        \
        attr.h          \
        complex.h       \
        config_admin.h  \
        cpio.h          \
        crypt.h         \
        ctype.h         \
        deflt.h         \
        devid.h         \
        devmgmt.h       \
        devpoll.h       \
        dial.h          \
```



```
        dirent.h        \
        dlfcn.h         \
        door.h          \
        elf.h           \
        err.h           \
        errno.h         \
        euc.h           \
        exacct.h        \
        exacct_impl.h   \
        execinfo.h      \
        fatal.h         \
        fcntl.h         \
        fenv.h          \
        float.h         \
        floatingpoint.h \
        fmtmsg.h        \
        fnmatch.h       \
        ftw.h           \
        gelf.h          \
        getopt.h        \
        getwidth.h      \
        glob.h          \
        grp.h           \
        iconv.h         \
        ieeefp.h        \
        ifaddrs.h       \
        inttypes.h      \
        iso646.h        \
        klpd.h          \
        langinfo.h      \
        lastlog.h       \
        lber.h          \
        ldap.h          \
        libelf.h        \
        libgen.h        \
        libintl.h       \
        libw.h          \
        libzonecfg.h    \
        limits.h        \
        linenum.h       \
        link.h          \
        listen.h        \
        locale.h        \
        macros.h        \
        malloc.h        \
        math.h          \
        mdmn_changelog.h        \
        memory.h        \
        meta.h          \
        meta_runtime.h  \
        metadyn.h       \
        mon.h           \
        monetary.h      \
        mp.h            \
        mqueue.h        \
        nan.h           \
        ndbm.h          \
        ndpd.h          \
        netconfig.h     \
        netdb.h         \
        netdir.h        \
        nl_types.h      \
        nlist.h         \
        note.h          \
        nsctl.h         \
        nsswitch.h      \
```

```
128         nss_common.h    \
129         nss_dbdefs.h    \
130         nss_netdir.h    \
131         paths.h         \
132         pcsample.h      \
133         pfmt.h          \
134         pkgdev.h        \
135         pkginfo.h       \
136         pkglocs.h       \
137         pkgstrct.h      \
138         pkgtrans.h      \
139         poll.h          \
140         port.h          \
141         priv.h          \
142         priv_utils.h    \
143         proc_service.h  \
144         procfs.h        \
145         prof.h          \
146         project.h       \
147         pthread.h       \
148         pw.h            \
149         pwd.h           \
150         rctl.h          \
151         re_comp.h       \
152         regex.h         \
153         regexp.h        \
154         resolv.h        \
155         rje.h           \
156         rtld_db.h       \
157         sac.h           \
158         sched.h         \
159         schedctl.h      \
160         sdssc.h         \
161         search.h        \
162         semaphore.h     \
163         setjmp.h        \
164         sgtty.h         \
165         shadow.h        \
166         siginfo.h       \
167         signal.h        \
168         spawn.h         \
169         stdarg.h        \
170         stdbool.h       \
171         stddef.h        \
172         stdint.h        \
173         stdio.h         \
174         stdio_ext.h     \
175         stdio_tag.h     \
176         stdio_impl.h    \
177         stdlib.h        \
178         storclass.h     \
179         string.h        \
180         strings.h       \
181         stropts.h       \
182         synch.h         \
183         sysexits.h      \
184         syslog.h        \
185         syms.h          \
186         tar.h           \
187         termio.h        \
188         termios.h       \
189         tgmath.h        \
190         thread.h        \
191         thread_db.h     \
192         time.h          \
193         tiuser.h        \
```



```
194         tzfile.h        \
195         ucontext.h      \
196         ucred.h         \
197         ulimit.h        \
198         unistd.h        \
199         userdefs.h      \
200         ustat.h         \
201         utime.h         \
202         utmp.h          \
203         utmpx.h         \
204         valtools.h      \
205         values.h        \
206         varargs.h       \
207         wait.h          \
208         wchar.h         \
209         wchar_impl.h    \
210         wctype.h        \
211         widec.h         \
212         wordexp.h       \
213         xti.h           \
214         xti_inet.h      \
215         zone.h

217 ISOHDRS = \
218         ctype_c99.h     \
219         ctype_iso.h     \
220         limits_iso.h    \
221         locale_iso.h    \
222         math_c99.h      \
223         math_iso.h      \
224         setjmp_iso.h    \
225         signal_iso.h    \
226         stdarg_c99.h    \
227         stdarg_iso.h    \
228         stddef_iso.h    \
229         stdio_c99.h     \
230         stdio_iso.h     \
231         stdlib_c99.h    \
232         stdlib_iso.h    \
233         string_iso.h    \
234         time_iso.h      \
235         wchar_c99.h     \
236         wchar_iso.h     \
237         wctype_c99.h    \
238         wctype_iso.h

240 ARPAHDRS =             \
241         ftp.h           \
242         inet.h          \
243         nameser.h       \
244         telnet.h        \
245         tftp.h          \
246         nameser_compat.h

248 AUDIOHDRS =            \
249         au.h

251 UUIDHDRS =             \
252         uuid.h

254 # rpcsvc headers which are just headers (not derived from a .x file)
255 RPCSVC_SRC_HDRS =      \
256         bootparam.h     \
257         daemon_utils.h  \
258         dbm.h           \
259         nis_db.h        \
```

```
260         nislib.h        \
261         svc_dg_priv.h   \
262         yp_prot.h       \
263         ypclnt.h        \
264         yppasswd.h      \
265         ypupd.h         \
266         rpc_sztypes.h

268 # rpcsvc headers which are generated from .x files
269 RPCSVC_GEN_HDRS = \
270         bootparam_prot.h \
271         mount.h         \
272         nfs_prot.h      \
273         nfs4_prot.h     \
274         nis.h           \
275         rex.h           \
276         rquota.h        \
277         rstat.h         \
278         rusers.h        \
279         rwall.h         \
280         spray.h         \
281         ufs_prot.h      \
282         nfs_acl.h

284 LVMRPCHDRS = \
285 mhdx.h mdiox.h meta_basic.h metad.h metamed.h metamhd.h metacl.h

287 SYMHDRASSERT = $(ROOT)/usr/include/iso/assert_iso.h
288 SYMHDRERRNO = $(ROOT)/usr/include/iso/errno_iso.h
289 SYMHDRFLOAT = $(ROOT)/usr/include/iso/float_iso.h
290 SYMHDRISO646 = $(ROOT)/usr/include/iso/iso646_iso.h

292 RPCGENFLAGS = -C -h
293 rpcsvc/rwall.h :=       RPCGENFLAGS += -M
294 meta_basic.h := RPCGENFLAGS += -M
295 metad.h := RPCGENFLAGS += -M
296 metamed.h := RPCGENFLAGS += -M
297 mhdx.h := RPCGENFLAGS += -M
298 mdiox.h := RPCGENFLAGS += -M
299 metamhd.h := RPCGENFLAGS += -M
300 metacl.h := RPCGENFLAGS += -M

302 # rpcsvc rpcgen source (.x files)
303 #
304 # yp.x is an attempt at codifying what was hand coded in RPCL.
305 # Unfortunately it doesn't quite work. (The handcoded stuff isn't
306 # expressable in RPCL) this is due to the fact that YP was written
307 # before rpcgen existed.  Hence, yp_prot.h cannot be derived from yp.x
308 #
309 # There is no '.h' for nis_object.x because it is included by nis.x and
310 # the resulting .h is nis.h.

312 RPCSVCPROTS = \
313 $(RPCSVC_GEN_HDRS:%.h=%.x)        nis_object.x       yp.x

315 LVMSVCPROTS = \
316 $(LVMRPCHDRS:%.h=%.x)

318 RPCSVCHDRS= $(RPCSVC_SRC_HDRS) $(RPCSVC_GEN_HDRS)

320 PROTOHDRS=   dumprestore.h routed.h ripngd.h rwhod.h timed.h

322 ROOTHDRS= $(HDRS:%=$(ROOT)/usr/include/%)  \
323         $(KRB5HDRS:%=$(ROOT)/usr/include/kerberosv5/%)  \
324         $(ISOHDRS:%=$(ROOT)/usr/include/iso/%)  \
325         $(ARPAHDRS:%=$(ROOT)/usr/include/arpa/%)  \
```



```
326         $(AUDIOHDRS:%=$(ROOT)/usr/include/audio/%)  \
327         $(UUIDHDRS:%=$(ROOT)/usr/include/uuid/%)  \
328         $(RPCSVCHDRS:%=$(ROOT)/usr/include/rpcsvc/%)  \
329         $(RPCSVCPROTS:%=$(ROOT)/usr/include/rpcsvc/%)  \
330         $(LVMRPCHDRS:%=$(ROOT)/usr/include/%) \
331         $(PROTOHDRS:%=$(ROOT)/usr/include/protocols/%)

333 DIRS= iso arpa audio rpcsvc protocols security uuid kerberosv5
334 ROOTDIRS= $(DIRS:%=$(ROOT)/usr/include/%)

336 SED=    sed

338 # check files really don't exist
339 #
340 # should do something with the rpcsvc headers

342 iso/%.check:            iso/%.h
343         $(DOT_H_CHECK)

345 arpa/%.check:           arpa/%.h
346         $(DOT_H_CHECK)

348 audio/%.check:          audio/%.h
349         $(DOT_H_CHECK)

351 rpcsvc/%.check:         rpcsvc/%.h
352         $(DOT_H_CHECK)

354 rpcsvc/%.check:         rpcsvc/%.x
355         $(DOT_X_CHECK)

357 protocols/%.check:      protocols/%.h
358         $(DOT_H_CHECK)

360 kerberosv5/%.check:             kerberosv5/%.h
361         $(DOT_H_CHECK)

363 uuid/%.check:           uuid/%.h
364         $(DOT_H_CHECK)

366 # Note that the derived headers (rpcgen) are not checked at this time.  These
367 # need work at the source level and rpcgen itself has a bug which causes a
368 # cstyle violation.  Furthermore, there seems to be good reasons for the
369 # generated headers to not pass all of the hdrchk rules.
370 #
371 # Add the following to the CHECKHDRS list to activate the .x checks:
372 #       $(RPCSVCPROTS:%.x=rpcsvc/%.check) \
373 #
374 CHECKHDRS= $(HDRS:%.h=%.check)  \
375         $(KRB5HDRS:%.h=kerberosv5/%.check)  \
376         $(ISOHDRS:%.h=iso/%.check)  \
377         $(ARPAHDRS:%.h=arpa/%.check)  \
378         $(AUDIOHDRS:%.h=audio/%.check)  \
379         $(UUIDHDRS:%.h=uuid/%.check)  \
380         $(RPCSVC_SRC_HDRS:%.h=rpcsvc/%.check) \
381         $(PROTOHDRS:%.h=protocols/%.check)

383 # headers which won't quite meet the standards...
384 #
385 # assert.h is required by ansi-c to *not* be idempotent (section 4.1.2).
386 # Hence the trailing guard is not the last thing in the file nor can it
387 # be without playing silly games.

389 assert.check    := HDRCHK_TAIL = | grep -v "end guard wrong" | true

391 # install rules
```

```
393 $(ROOT)/usr/include/security/%: security/%
394         $(INS.file)

396 $(ROOT)/usr/include/protocols/%: protocols/%
397         $(INS.file)

399 $(ROOT)/usr/include/rpcsvc/%: rpcsvc/%
400         $(INS.file)

402 $(ROOT)/usr/include/kerberosv5/%: kerberosv5/%
403         $(INS.file)

405 $(ROOT)/usr/include/arpa/%: arpa/%
406         $(INS.file)

408 $(ROOT)/usr/include/audio/%: audio/%
409         $(INS.file)

411 $(ROOT)/usr/include/iso/%: iso/%
412         $(INS.file)

414 $(ROOT)/usr/include/uuid/%: uuid/%
415         $(INS.file)

417 $(ROOT)/usr/include/%: %
418         $(INS.file)

420 .KEEP_STATE:

422 .PARALLEL:      $(ROOTHDRS) $(CHECKHDRS)

424 install_h:      $(ROOTDIRS) .WAIT $(ROOTHDRS) $(SYMHDRASSERT) $(SYMHDRERRNO) \
425                 $(SYMHDRFLOAT) $(SYMHDRISO646)

427 check:  $(CHECKHDRS)

429 clean clobber:
430         $(RM) $(LVMRPCHDRS);
431         cd rpcsvc ; $(RM) $(RPCSVC_GEN_HDRS)

433 $(ROOTDIRS):
434         $(INS.dir)

436 $(SYMHDRASSERT):
437         -$(RM) $@; $(SYMLINK) ../assert.h $@

439 $(SYMHDRERRNO):
440         -$(RM) $@; $(SYMLINK) ../errno.h $@

442 $(SYMHDRFLOAT):
443         -$(RM) $@; $(SYMLINK) ../float.h $@

445 $(SYMHDRISO646):
446         -$(RM) $@; $(SYMLINK) ../iso646.h $@

448 rpcsvc/%.h:     rpcsvc/%.x
449         $(RPCGEN) $(RPCGENFLAGS) $< -o $@

451 rpcsvc/nis.h:   rpcsvc/nis.x
452         $(RPCGEN) $(RPCGENFLAGS) rpcsvc/nis.x |\
453         $(SED) -e '/EDIT_START/,$$ d' > $@

455 meta_basic.h:   ../uts/common/sys/lvm/meta_basic.x
456         $(RPCGEN) $(RPCGENFLAGS)  ../uts/common/sys/lvm/meta_basic.x | \
457         awk '/<synch.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t
```



```
458         /<thread.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t/* _
459         { print $0 } \
460         ' > $@

462 metad.h:        metad.x
463         $(RPCGEN) $(RPCGENFLAGS)  metad.x | \
464         awk '/<synch.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t
465         /<thread.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t/* _
466         { print $0 } \
467         ' > $@

469 mhdx.h: ../uts/common/sys/lvm/mhdx.x
470         $(RPCGEN) $(RPCGENFLAGS) ../uts/common/sys/lvm/mhdx.x | \
471         awk '/<synch.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t
472         /<thread.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t/* _
473         { print $0 } \
474         ' > $@

476 mdiox.h:        ../uts/common/sys/lvm/mdiox.x
477         $(RPCGEN) $(RPCGENFLAGS) ../uts/common/sys/lvm/mdiox.x | \
478         nawk '{sub(/sys\/lvm\/md_mhdx/, "mhdx"); print $$0}' | \
479         nawk '{sub(/sys\/lvm\/md_basic/, "meta_basic"); print $$0}' | \
480         awk '/<synch.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t
481         /<thread.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t/* _
482         { print $0 } \
483         ' > $@

485 metamed.h:      ../uts/common/sys/lvm/metamed.x
486         $(RPCGEN) $(RPCGENFLAGS) ../uts/common/sys/lvm/metamed.x | \
487         nawk '{sub(/sys\/lvm\/md_basic/, "meta_basic"); print $$0}' | \
488         awk '/<synch.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t
489         /<thread.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t/* _
490         { print $0 } \
491         ' > $@

493 metamhd.h:      metamhd.x
494         $(RPCGEN) $(RPCGENFLAGS) metamhd.x | \
495         awk '/<synch.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t
496         /<thread.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t/* _
497         { print $0 } \
498         ' > $@

500 metacl.h:       metacl.x
501         $(RPCGEN) $(RPCGENFLAGS) metacl.x | \
502         awk '/<synch.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t
503         /<thread.h>/ { print "#ifdef _REENTRANT"; print $$0; print "#endif\t/* _
504         { print $0 } \
505         ' > $@
```

```
**********************************************************
    4750 Sat May 10 12:08:43 2014
new/usr/src/head/complex.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
 *
 * The contents of this file are subject to the terms of the
 * Common Development and Distribution License (the "License").
 * You may not use this file except in compliance with the License.
 *
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 * or http://www.opensolaris.org/os/licensing.
 * See the License for the specific language governing permissions
 * and limitations under the License.
 *
 * When distributing Covered Code, include this CDDL HEADER in each
 * file and include the License file at usr/src/OPENSOLARIS.LICENSE.
 * If applicable, add the following below this CDDL HEADER, with the
 * fields enclosed by brackets "[]" replaced with your own identifying
 * information: Portions Copyright [yyyy] [name of copyright owner]
 *
 * CDDL HEADER END
 */
/*
 * Copyright 2011 Nexenta Systems, Inc.  All rights reserved.
 */
/*
 * Copyright 2004 Sun Microsystems, Inc.  All rights reserved.
 * Use is subject to license terms.
 */

#ifndef _COMPLEX_H
#define _COMPLEX_H

#ifdef  __cplusplus
extern "C" {
#endif

/* #if !defined(__cplusplus) */

/*
 * Compilation environments for Solaris must provide the _Imaginary datatype
 * and the compiler intrinsics _Complex_I and _Imaginary_I
 */
#define _Complex_I      _Complex_I
#define complex         _Complex
#define _Imaginary_I    _Imaginary_I
#define imaginary       _Imaginary
#undef  I
#define I               _Imaginary_I

extern float cabsf(float complex);
extern float cargf(float complex);
extern float cimagf(float complex);
extern float crealf(float complex);
extern float complex cacosf(float complex);
extern float complex cacoshf(float complex);
extern float complex casinf(float complex);
extern float complex casinhf(float complex);
extern float complex catanf(float complex);
extern float complex catanhf(float complex);
extern float complex ccosf(float complex);
extern float complex ccoshf(float complex);
extern float complex cexpf(float complex);
```



```
extern float complex clogf(float complex);
extern float complex conjf(float complex);
extern float complex cpowf(float complex, float complex);
extern float complex cprojf(float complex);
extern float complex csinf(float complex);
extern float complex csinhf(float complex);
extern float complex csqrtf(float complex);
extern float complex ctanf(float complex);
extern float complex ctanhf(float complex);

extern double cabs(double complex);
extern double carg(double complex);
extern double cimag(double complex);
extern double creal(double complex);
extern double complex cacos(double complex);
extern double complex cacosh(double complex);
extern double complex casin(double complex);
extern double complex casinh(double complex);
extern double complex catan(double complex);
extern double complex catanh(double complex);
extern double complex ccos(double complex);
extern double complex ccosh(double complex);
extern double complex cexp(double complex);
#if defined(__PRAGMA_REDEFINE_EXTNAME)
#pragma redefine_extname clog __clog
#else
#undef  clog
#define clog    __clog
#endif
extern double complex clog(double complex);
extern double complex conj(double complex);
extern double complex cpow(double complex, double complex);
extern double complex cproj(double complex);
extern double complex csin(double complex);
extern double complex csinh(double complex);
extern double complex csqrt(double complex);
extern double complex ctan(double complex);
extern double complex ctanh(double complex);

extern long double cabsl(long double complex);
extern long double cargl(long double complex);
extern long double cimagl(long double complex);
extern long double creall(long double complex);
extern long double complex cacoshl(long double complex);
extern long double complex cacosl(long double complex);
extern long double complex casinhl(long double complex);
extern long double complex casinl(long double complex);
extern long double complex catanhl(long double complex);
extern long double complex catanl(long double complex);
extern long double complex ccoshl(long double complex);
extern long double complex ccosl(long double complex);
extern long double complex cexpl(long double complex);
extern long double complex clogl(long double complex);
extern long double complex conjl(long double complex);
extern long double complex cpowl(long double complex, long double complex);
extern long double complex cprojl(long double complex);
extern long double complex csinhl(long double complex);
extern long double complex csinl(long double complex);
extern long double complex csqrtl(long double complex);
extern long double complex ctanhl(long double complex);
extern long double complex ctanl(long double complex);

/* #endif */    /* !defined(__cplusplus) */
#ifdef  __cplusplus
}
#endif
```

```
129 #endif  /* _COMPLEX_H */
```

```
**********************************************************
    5435 Sat May 10 12:08:43 2014
new/usr/src/head/fenv.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */
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 */

#ifndef _FENV_H
#define _FENV_H

#include <sys/feature_tests.h>

#ifdef __cplusplus
extern "C" {
#endif

#ifndef __P
#ifdef __STDC__
#define __P(p)  p
#else
#define __P(p)  ()
#endif
#endif  /* !defined(__P) */

/*
 * Rounding modes
 */
#if defined(__sparc)

#define FE_TONEAREST    0
#define FE_TOWARDZERO   1
#define FE_UPWARD       2
#define FE_DOWNWARD     3

#elif defined(__i386) || defined(__amd64)

#define FE_TONEAREST    0
#define FE_DOWNWARD     1
#define FE_UPWARD       2
#define FE_TOWARDZERO   3
```



```
#endif

extern int fegetround __P((void));
extern int fesetround __P((int));

#if (defined(__i386) || defined(__amd64)) && \
        (!defined(_STRICT_STDC) || defined(__EXTENSIONS__))

#define FE_FLTPREC      0
#define FE_DBLPREC      2
#define FE_LDBLPREC     3

extern int fegetprec __P((void));
extern int fesetprec __P((int));

#endif

/*
 * Exception flags
 */
#if defined(__sparc)

#define FE_INEXACT      0x01
#define FE_DIVBYZERO    0x02
#define FE_UNDERFLOW    0x04
#define FE_OVERFLOW     0x08
#define FE_INVALID      0x10
#define FE_ALL_EXCEPT   0x1f

#elif defined(__i386) || defined(__amd64)

#define FE_INVALID      0x01
#define FE_DIVBYZERO    0x04
#define FE_OVERFLOW     0x08
#define FE_UNDERFLOW    0x10
#define FE_INEXACT      0x20
#define FE_ALL_EXCEPT   0x3d

#endif

typedef int fexcept_t;

extern int feclearexcept __P((int));
extern int feraiseexcept __P((int));
extern int fetestexcept __P((int));
extern int fegetexceptflag __P((fexcept_t *, int));
extern int fesetexceptflag __P((const fexcept_t *, int));

#if !defined(_STRICT_STDC) || defined(__EXTENSIONS__)

/*
 * Exception handling extensions
 */
#define FEX_NOHANDLER   -1
#define FEX_NONSTOP     0
#define FEX_ABORT       1
#define FEX_SIGNAL      2
#define FEX_CUSTOM      3

#define FEX_INEXACT     0x001
#define FEX_DIVBYZERO   0x002
#define FEX_UNDERFLOW   0x004
#define FEX_OVERFLOW    0x008
#define FEX_INV_ZDZ     0x010
#define FEX_INV_IDI     0x020
```

```
#define FEX_INV_ISI     0x040
#define FEX_INV_ZMI     0x080
#define FEX_INV_SQRT    0x100
#define FEX_INV_SNAN    0x200
#define FEX_INV_INT     0x400
#define FEX_INV_CMP     0x800
#define FEX_INVALID     0xff0
#define FEX_COMMON      (FEX_INVALID | FEX_DIVBYZERO | FEX_OVERFLOW)
#define FEX_ALL         (FEX_COMMON | FEX_UNDERFLOW | FEX_INEXACT)
#define FEX_NONE        0

#define FEX_NUM_EXC     12

/* structure to hold a numeric value in any format used by the FPU */
typedef struct {
        enum fex_nt {
                fex_nodata      = 0,
                fex_int         = 1,
                fex_llong       = 2,
                fex_float       = 3,
                fex_double      = 4,
                fex_ldouble     = 5
        } type;
        union {
                int             i;
#if !defined(_STRICT_STDC) && !defined(_NO_LONGLONG) || defined(_STDC_C99) || \
        defined(__C99FEATURES__)
                long long       l;
#else
                struct {
                        int     l[2];
                } l;
#endif
                float           f;
                double          d;
                long double     q;
        } val;
} fex_numeric_t;

/* structure to supply information about an exception to a custom handler */
typedef struct {
        enum fex_op {
                fex_add         = 0,
                fex_sub         = 1,
                fex_mul         = 2,
                fex_div         = 3,
                fex_sqrt        = 4,
                fex_cnvt        = 5,
                fex_cmp         = 6,
                fex_other       = 7
        } op;                   /* operation that caused the exception */
        int             flags;  /* flags to be set */
        fex_numeric_t   op1, op2, res;  /* operands and result */
} fex_info_t;

typedef struct fex_handler_data {
        int     __mode;
        void    (*__handler)();
} fex_handler_t[FEX_NUM_EXC];

extern int fex_get_handling __P((int));
extern int fex_set_handling __P((int, int, void (*)()));

extern void fex_getexcepthandler __P((fex_handler_t *, int));
extern void fex_setexcepthandler __P((const fex_handler_t *, int));
```



```
#ifdef __STDC__
#include <stdio_tag.h>
#ifndef _FILEDEFED
#define _FILEDEFED
typedef __FILE FILE;
#endif
#endif
extern FILE *fex_get_log __P((void));
extern int fex_set_log __P((FILE *));
extern int fex_get_log_depth __P((void));
extern int fex_set_log_depth __P((int));
extern void fex_log_entry __P((const char *));

#define __fex_handler_t fex_handler_t

#else

typedef struct {
        int     __mode;
        void    (*__handler)();
} __fex_handler_t[12];

#endif /* !defined(_STRICT_STDC) || defined(__EXTENSIONS__) */

/*
 * Environment as a whole
 */
typedef struct {
        __fex_handler_t __handlers;
        unsigned long   __fsr;
} fenv_t;

#ifdef __STDC__
extern const fenv_t __fenv_dfl_env;
#else
extern fenv_t __fenv_dfl_env;
#endif

#define FE_DFL_ENV      (&__fenv_dfl_env)

extern int fegetenv __P((fenv_t *));
extern int fesetenv __P((const fenv_t *));
extern int feholdexcept __P((fenv_t *));
extern int feupdateenv __P((const fenv_t *));

#if !defined(_STRICT_STDC) || defined(__EXTENSIONS__)
extern void fex_merge_flags __P((const fenv_t *));
#endif

#ifdef __cplusplus
}
#endif

#endif  /* _FENV_H */
```

```
**********************************************************
    6671 Sat May 10 12:08:43 2014
new/usr/src/head/floatingpoint.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 *
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 */

#ifndef _FLOATINGPOINT_H
#define _FLOATINGPOINT_H

#ifdef __STDC__
#include <stdio_tag.h>
#endif
#include <sys/ieeefp.h>

#ifdef __cplusplus
extern "C" {
#endif

/*
 * <floatingpoint.h> contains definitions for constants, types, variables,
 * and functions for:
 *      IEEE floating-point arithmetic base conversion;
 *      IEEE floating-point arithmetic modes;
 *      IEEE floating-point arithmetic exception handling.
 */

#ifndef __P
#ifdef __STDC__
#define __P(p)  p
#else
#define __P(p)  ()
#endif
#endif  /* !defined(__P) */

#if defined(__STDC__) && !defined(_FILEDEFED)
#define _FILEDEFED
```



```
typedef __FILE FILE;
#endif

#define N_IEEE_EXCEPTION 5      /* Number of floating-point exceptions. */

typedef int sigfpe_code_type;   /* Type of SIGFPE code. */

typedef void (*sigfpe_handler_type)();  /* Pointer to exception handler */

#define SIGFPE_DEFAULT (void (*)())0    /* default exception handling */
#define SIGFPE_IGNORE  (void (*)())1    /* ignore this exception or code */
#define SIGFPE_ABORT   (void (*)())2    /* force abort on exception */

extern sigfpe_handler_type sigfpe __P((sigfpe_code_type, sigfpe_handler_type));

/*
 * Types for IEEE floating point.
 */
typedef float single;

#ifndef _EXTENDED
#define _EXTENDED
typedef unsigned extended[3];
#endif

typedef long double quadruple;  /* Quadruple-precision type. */

typedef unsigned fp_exception_field_type;
                                /*
                                 * A field containing fp_exceptions OR'ed
                                 * together.
                                 */
/*
 * Definitions for base conversion.
 */
#define DECIMAL_STRING_LENGTH 512       /* Size of buffer in decimal_record. */

typedef char decimal_string[DECIMAL_STRING_LENGTH];
                                /* Decimal significand. */

typedef struct {
        enum fp_class_type fpclass;
        int     sign;
        int     exponent;
        decimal_string ds;      /* Significand - each char contains an ascii */
                                /* digit, except the string-terminating */
                                /* ascii null. */
        int     more;           /* On conversion from decimal to binary, != 0 */
                                /* indicates more non-zero digits following */
                                /* ds. */
        int     ndigits;        /* On fixed_form conversion from binary to */
                                /* decimal, contains number of digits */
                                /* required for ds. */
} decimal_record;

enum decimal_form {
        fixed_form,             /* Fortran F format: ndigits specifies number */
                                /* of digits after point; if negative, */
                                /* specifies rounding to occur to left of */
                                /* point. */
        floating_form           /* Fortran E format: ndigits specifies number */
                                /* of significant digits. */
};

typedef struct {
        enum fp_direction_type rd;
```

```
128                                 /* Rounding direction. */
129         enum decimal_form df;   /* Format for conversion from binary to */
130                                 /* decimal. */
131         int ndigits;            /* Number of digits for conversion. */
132 } decimal_mode;

134 enum decimal_string_form {      /* Valid decimal number string formats. */
135         invalid_form,           /* Not a valid decimal string format. */
136         whitespace_form,        /* All white space - valid in Fortran! */
137         fixed_int_form,         /* <digs>               */
138         fixed_intdot_form,      /* <digs>.              */
139         fixed_dotfrac_form,     /* .<digs>              */
140         fixed_intdotfrac_form,  /* <digs>.<frac>        */
141         floating_int_form,      /* <digs><exp>          */
142         floating_intdot_form,   /* <digs>.<exp>         */
143         floating_dotfrac_form,  /* .<digs><exp>         */
144         floating_intdotfrac_form, /* <digs>.<digs><exp> */
145         inf_form,               /* inf                  */
146         infinity_form,          /* infinity             */
147         nan_form,               /* nan                  */
148         nanstring_form          /* nan(string)          */
149 };

151 extern void single_to_decimal __P((single *, decimal_mode *, decimal_record *,
152                                 fp_exception_field_type *));
153 extern void double_to_decimal __P((double *, decimal_mode *, decimal_record *,
154                                 fp_exception_field_type *));
155 extern void extended_to_decimal __P((extended *, decimal_mode *,
156                                 decimal_record *, fp_exception_field_type *));
157 extern void quadruple_to_decimal __P((quadruple *, decimal_mode *,
158                                 decimal_record *, fp_exception_field_type *));

160 extern void decimal_to_single __P((single *, decimal_mode *, decimal_record *,
161                                 fp_exception_field_type *));
162 extern void decimal_to_double __P((double *, decimal_mode *, decimal_record *,
163                                 fp_exception_field_type *));
164 extern void decimal_to_extended __P((extended *, decimal_mode *,
165                                 decimal_record *, fp_exception_field_type *));
166 extern void decimal_to_quadruple __P((quadruple *, decimal_mode *,
167                                 decimal_record *, fp_exception_field_type *));

169 extern void string_to_decimal __P((char **, int, int, decimal_record *,
170                                 enum decimal_string_form *, char **));
171 extern void func_to_decimal __P((char **, int, int, decimal_record *,
172                                 enum decimal_string_form *, char **,
173                                 int (*)(void), int *, int (*)(int)));
174 extern void file_to_decimal __P((char **, int, int, decimal_record *,
175                                 enum decimal_string_form *, char **,
176                                 FILE *, int *));

178 extern char *seconvert __P((single *, int, int *, int *, char *));
179 extern char *sfconvert __P((single *, int, int *, int *, char *));
180 extern char *sgconvert __P((single *, int, int, char *));
181 extern char *econvert __P((double, int, int *, int *, char *));
182 extern char *fconvert __P((double, int, int *, int *, char *));
183 extern char *gconvert __P((double, int, int, char *));
184 extern char *qeconvert __P((quadruple *, int, int *, int *, char *));
185 extern char *qfconvert __P((quadruple *, int, int *, int *, char *));
186 extern char *qgconvert __P((quadruple *, int, int, char *));

188 extern char *ecvt __P((double, int, int *, int *));
189 extern char *fcvt __P((double, int, int *, int *));
190 extern char *gcvt __P((double, int, char *));

192 /*
193  * ANSI C Standard says the following entry points should be
```



```
194  * prototyped in <stdlib.h>.  They are now, but weren't before.
195  */
196 extern double atof __P((const char *));
197 extern double strtod __P((const char *, char **));

199 #ifdef __cplusplus
200 }
201 #endif

203 #endif /* _FLOATINGPOINT_H */
```

```
**********************************************************
   19523 Sat May 10 12:08:43 2014
new/usr/src/head/iso/math_c99.h
patch12 - math.h: Align things with GCC
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#ifndef _ISO_MATH_C99_H
#define _ISO_MATH_C99_H

#include <sys/isa_defs.h>
#include <sys/feature_tests.h>

#ifdef __cplusplus
extern "C" {
#endif

#ifndef __P
#ifdef __STDC__
#define __P(p)  p
#else
#define __P(p)  ()
#endif
#endif  /* !defined(__P) */

#if defined(_STDC_C99) || _XOPEN_SOURCE - 0 >= 600 || defined(__C99FEATURES__)
#if defined(__GNUC__)
#undef  HUGE_VAL
#define HUGE_VAL        (__builtin_huge_val())
#undef  HUGE_VALF
#define HUGE_VALF       (__builtin_huge_valf())
#undef  HUGE_VALL
#define HUGE_VALL       (__builtin_huge_vall())
#undef  INFINITY
#define INFINITY        (__builtin_inff())
#undef  NAN
#define NAN             (__builtin_nanf(""))

/*
```



```
 * C99 7.12.3 classification macros
 */
#undef  isnan
#undef  isinf
#if __GNUC__ >= 4
#define isnan(x)        __builtin_isnan(x)
#define isinf(x)        __builtin_isinf(x)
#else
#define isnan(x)        __extension__( \
                        { __typeof(x) __x_n = (x); \
                        __builtin_isunordered(__x_n, __x_n); })
#define isinf(x)        __extension__( \
                        { __typeof(x) __x_i = (x); \
                        __x_i == (__typeof(__x_i)) INFINITY || \
                        __x_i == (__typeof(__x_i)) (-INFINITY); })
#endif
#undef  isfinite
#define isfinite(x)     __extension__( \
                        { __typeof(x) __x_f = (x); \
                        !isnan(__x_f) && !isinf(__x_f); })
#undef  isnormal
#define isnormal(x)     __extension__( \
                        { __typeof(x) __x_r = (x); isfinite(__x_r) && \
                        (sizeof (__x_r) == sizeof (float) ? \
                        __builtin_fabsf(__x_r) >= __FLT_MIN__ : \
                        sizeof (__x_r) == sizeof (double) ? \
                        __builtin_fabs(__x_r) >= __DBL_MIN__ : \
                        __builtin_fabsl(__x_r) >= __LDBL_MIN__); })
#undef  fpclassify
#define fpclassify(x)   __extension__( \
                        { __typeof(x) __x_c = (x); \
                        isnan(__x_c) ? FP_NAN : \
                        isinf(__x_c) ? FP_INFINITE : \
                        isnormal(__x_c) ? FP_NORMAL : \
                        __x_c == (__typeof(__x_c)) 0 ? FP_ZERO : \
                        FP_SUBNORMAL; })
#undef  signbit
#if defined(_BIG_ENDIAN)
#define signbit(x)      __extension__( \
                        { __typeof(x) __x_s = (x); \
                        (int) (*(unsigned *) &__x_s >> 31); })
#elif defined(_LITTLE_ENDIAN)
#define signbit(x)      __extension__( \
                        { __typeof(x) __x_s = (x); \
                        (sizeof (__x_s) == sizeof (float) ? \
                        (int) (*(unsigned *) &__x_s >> 31) : \
                        sizeof (__x_s) == sizeof (double) ? \
                        (int) (((unsigned *) &__x_s)[1] >> 31) : \
                        (int) (((unsigned short *) &__x_s)[4] >> 15)); })
#endif

/*
 * C99 7.12.14 comparison macros
 */
#undef  isgreater
#define isgreater(x, y)         __builtin_isgreater(x, y)
#undef  isgreaterequal
#define isgreaterequal(x, y)    __builtin_isgreaterequal(x, y)
#undef  isless
#define isless(x, y)            __builtin_isless(x, y)
#undef  islessequal
#define islessequal(x, y)       __builtin_islessequal(x, y)
#undef  islessgreater
#define islessgreater(x, y)     __builtin_islessgreater(x, y)
#undef  isunordered
#define isunordered(x, y)       __builtin_isunordered(x, y)
```

```
#else   /* defined(__GNUC__) */
#undef  HUGE_VAL
#define HUGE_VAL        __builtin_huge_val
#undef  HUGE_VALF
#define HUGE_VALF       __builtin_huge_valf
#undef  HUGE_VALL
#define HUGE_VALL       __builtin_huge_vall
#undef  INFINITY
#define INFINITY        __builtin_infinity
#undef  NAN
#define NAN             __builtin_nan

/*
 * C99 7.12.3 classification macros
 */
#undef  fpclassify
#define fpclassify(x)   __builtin_fpclassify(x)
#undef  isfinite
#define isfinite(x)     __builtin_isfinite(x)
#undef  isinf
#define isinf(x)        __builtin_isinf(x)
#undef  isnan
#define isnan(x)        __builtin_isnan(x)
#undef  isnormal
#define isnormal(x)     __builtin_isnormal(x)
#undef  signbit
#define signbit(x)      __builtin_signbit(x)

/*
 * C99 7.12.14 comparison macros
 */
#undef  isgreater
#define isgreater(x, y)         ((x) __builtin_isgreater(y))
#undef  isgreaterequal
#define isgreaterequal(x, y)    ((x) __builtin_isgreaterequal(y))
#undef  isless
#define isless(x, y)            ((x) __builtin_isless(y))
#undef  islessequal
#define islessequal(x, y)       ((x) __builtin_islessequal(y))
#undef  islessgreater
#define islessgreater(x, y)     ((x) __builtin_islessgreater(y))
#undef  isunordered
#define isunordered(x, y)       ((x) __builtin_isunordered(y))
#endif  /* defined(__GNUC__) */
#endif  /* defined(_STDC_C99) || _XOPEN_SOURCE - 0 >= 600 || ... */

#if defined(__EXTENSIONS__) || defined(_STDC_C99) || \
        (!defined(_STRICT_STDC) && !defined(__XOPEN_OR_POSIX)) || \
        defined(__C99FEATURES__)
#if defined(__FLT_EVAL_METHOD__) && __FLT_EVAL_METHOD__ - 0 == 0
typedef float float_t;
typedef double double_t;
#elif __FLT_EVAL_METHOD__ - 0 == 1
typedef double float_t;
typedef double double_t;
#elif __FLT_EVAL_METHOD__ - 0 == 2
typedef long double float_t;
typedef long double double_t;
#elif defined(__sparc) || defined(__amd64)
typedef float float_t;
typedef double double_t;
#elif defined(__i386)
typedef long double float_t;
typedef long double double_t;
#endif
```



```
#undef  FP_ZERO
#define FP_ZERO         0
#undef  FP_SUBNORMAL
#define FP_SUBNORMAL    1
#undef  FP_NORMAL
#define FP_NORMAL       2
#undef  FP_INFINITE
#define FP_INFINITE     3
#undef  FP_NAN
#define FP_NAN          4

#undef  FP_ILOGB0
#define FP_ILOGB0       (-2147483647)
#undef  FP_ILOGBNAN
#define FP_ILOGBNAN     2147483647

#undef  MATH_ERRNO
#define MATH_ERRNO      1
#undef  MATH_ERREXCEPT
#define MATH_ERREXCEPT  2
#undef  math_errhandling
#define math_errhandling        MATH_ERREXCEPT

extern double acosh __P((double));
extern double asinh __P((double));
extern double atanh __P((double));

extern double exp2 __P((double));
extern double expm1 __P((double));
extern int ilogb __P((double));
extern double log1p __P((double));
extern double log2 __P((double));
extern double logb __P((double));
extern double scalbn __P((double, int));
extern double scalbln __P((double, long int));

extern double cbrt __P((double));
extern double hypot __P((double, double));

extern double erf __P((double));
extern double erfc __P((double));
extern double lgamma __P((double));
extern double tgamma __P((double));

extern double nearbyint __P((double));
extern double rint __P((double));
extern long int lrint __P((double));
extern double round __P((double));
extern long int lround __P((double));
extern double trunc __P((double));

extern double remainder __P((double, double));
extern double remquo __P((double, double, int *));

extern double copysign __P((double, double));
extern double nan __P((const char *));
extern double nextafter __P((double, double));
extern double nexttoward __P((double, long double));

extern double fdim __P((double, double));
extern double fmax __P((double, double));
extern double fmin __P((double, double));

extern double fma __P((double, double, double));

extern float acosf __P((float));
```

```
259 extern float asinf __P((float));
260 extern float atanf __P((float));
261 extern float atan2f __P((float, float));
262 extern float cosf __P((float));
263 extern float sinf __P((float));
264 extern float tanf __P((float));

266 extern float acoshf __P((float));
267 extern float asinhf __P((float));
268 extern float atanhf __P((float));
269 extern float coshf __P((float));
270 extern float sinhf __P((float));
271 extern float tanhf __P((float));

273 extern float expf __P((float));
274 extern float exp2f __P((float));
275 extern float expm1f __P((float));
276 extern float frexpf __P((float, int *));
277 extern int ilogbf __P((float));
278 extern float ldexpf __P((float, int));
279 extern float logf __P((float));
280 extern float log10f __P((float));
281 extern float log1pf __P((float));
282 extern float log2f __P((float));
283 extern float logbf __P((float));
284 extern float modff __P((float, float *));
285 extern float scalbnf __P((float, int));
286 extern float scalblnf __P((float, long int));

288 extern float cbrtf __P((float));
289 extern float fabsf __P((float));
290 extern float hypotf __P((float, float));
291 extern float powf __P((float, float));
292 extern float sqrtf __P((float));

294 extern float erff __P((float));
295 extern float erfcf __P((float));
296 extern float lgammaf __P((float));
297 extern float tgammaf __P((float));

299 extern float ceilf __P((float));
300 extern float floorf __P((float));
301 extern float nearbyintf __P((float));
302 extern float rintf __P((float));
303 extern long int lrintf __P((float));
304 extern float roundf __P((float));
305 extern long int lroundf __P((float));
306 extern float truncf __P((float));

308 extern float fmodf __P((float, float));
309 extern float remainderf __P((float, float));
310 extern float remquof __P((float, float, int *));

312 extern float copysignf __P((float, float));
313 extern float nanf __P((const char *));
314 extern float nextafterf __P((float, float));
315 extern float nexttowardf __P((float, long double));

317 extern float fdimf __P((float, float));
318 extern float fmaxf __P((float, float));
319 extern float fminf __P((float, float));

321 extern float fmaf __P((float, float, float));

323 extern long double acosl __P((long double));
324 extern long double asinl __P((long double));
```



```
325 extern long double atanl __P((long double));
326 extern long double atan2l __P((long double, long double));
327 extern long double cosl __P((long double));
328 extern long double sinl __P((long double));
329 extern long double tanl __P((long double));

331 extern long double acoshl __P((long double));
332 extern long double asinhl __P((long double));
333 extern long double atanhl __P((long double));
334 extern long double coshl __P((long double));
335 extern long double sinhl __P((long double));
336 extern long double tanhl __P((long double));

338 extern long double expl __P((long double));
339 extern long double exp2l __P((long double));
340 extern long double expm1l __P((long double));
341 extern long double frexpl __P((long double, int *));
342 extern int ilogbl __P((long double));
343 extern long double ldexpl __P((long double, int));
344 extern long double logl __P((long double));
345 extern long double log10l __P((long double));
346 extern long double log1pl __P((long double));
347 extern long double log2l __P((long double));
348 extern long double logbl __P((long double));
349 extern long double modfl __P((long double, long double *));
350 extern long double scalbnl __P((long double, int));
351 extern long double scalblnl __P((long double, long int));

353 extern long double cbrtl __P((long double));
354 extern long double fabsl __P((long double));
355 extern long double hypotl __P((long double, long double));
356 extern long double powl __P((long double, long double));
357 extern long double sqrtl __P((long double));

359 extern long double erfl __P((long double));
360 extern long double erfcl __P((long double));
361 extern long double lgammal __P((long double));
362 extern long double tgammal __P((long double));

364 extern long double ceill __P((long double));
365 extern long double floorl __P((long double));
366 extern long double nearbyintl __P((long double));
367 extern long double rintl __P((long double));
368 extern long int lrintl __P((long double));
369 extern long double roundl __P((long double));
370 extern long int lroundl __P((long double));
371 extern long double truncl __P((long double));

373 extern long double fmodl __P((long double, long double));
374 extern long double remainderl __P((long double, long double));
375 extern long double remquol __P((long double, long double, int *));

377 extern long double copysignl __P((long double, long double));
378 extern long double nanl __P((const char *));
379 extern long double nextafterl __P((long double, long double));
380 extern long double nexttowardl __P((long double, long double));

382 extern long double fdiml __P((long double, long double));
383 extern long double fmaxl __P((long double, long double));
384 extern long double fminl __P((long double, long double));

386 extern long double fmal __P((long double, long double, long double));

388 #if !defined(_STRICT_STDC) && !defined(_NO_LONGLONG) || defined(_STDC_C99) || \
389         defined(__C99FEATURES__)
390 extern long long int llrint __P((double));
```

```
391 extern long long int llround __P((double));

393 extern long long int llrintf __P((float));
394 extern long long int llroundf __P((float));

396 extern long long int llrintl __P((long double));
397 extern long long int llroundl __P((long double));
398 #endif

400 #if !defined(__cplusplus)
401 #pragma does_not_read_global_data(asinh, exp2, expm1)
402 #pragma does_not_read_global_data(ilogb, log2)
403 #pragma does_not_read_global_data(scalbn, scalbln, cbrt)
404 #pragma does_not_read_global_data(erf, erfc, tgamma)
405 #pragma does_not_read_global_data(nearbyint, rint, lrint, round, lround, trunc)
406 #pragma does_not_read_global_data(remquo)
407 #pragma does_not_read_global_data(copysign, nan, nexttoward)
408 #pragma does_not_read_global_data(fdim, fmax, fmin, fma)
409 #pragma does_not_write_global_data(asinh, exp2, expm1)
410 #pragma does_not_write_global_data(ilogb, log2)
411 #pragma does_not_write_global_data(scalbn, scalbln, cbrt)
412 #pragma does_not_write_global_data(erf, erfc, tgamma)
413 #pragma does_not_write_global_data(nearbyint, rint, lrint, round, lround, trunc)
414 #pragma does_not_write_global_data(copysign, nan, nexttoward)
415 #pragma does_not_write_global_data(fdim, fmax, fmin, fma)

417 #pragma does_not_read_global_data(acosf, asinf, atanf, atan2f)
418 #pragma does_not_read_global_data(cosf, sinf, tanf)
419 #pragma does_not_read_global_data(acoshf, asinhf, atanhf, coshf, sinhf, tanhf)
420 #pragma does_not_read_global_data(expf, exp2f, expm1f, frexpf, ilogbf, ldexpf)
421 #pragma does_not_read_global_data(logf, log10f, log1pf, log2f, logbf)
422 #pragma does_not_read_global_data(modff, scalbnf, scalblnf)
423 #pragma does_not_read_global_data(cbrtf, fabsf, hypotf, powf, sqrtf)
424 #pragma does_not_read_global_data(erff, erfcf, lgammaf, tgammaf)
425 #pragma does_not_read_global_data(ceilf, floorf, nearbyintf)
426 #pragma does_not_read_global_data(rintf, lrintf, roundf, lroundf, truncf)
427 #pragma does_not_read_global_data(fmodf, remainderf, remquof)
428 #pragma does_not_read_global_data(copysignf, nanf, nextafterf, nexttowardf)
429 #pragma does_not_read_global_data(fdimf, fmaxf, fminf, fmaf)
430 #pragma does_not_write_global_data(acosf, asinf, atanf, atan2f)
431 #pragma does_not_write_global_data(cosf, sinf, tanf)
432 #pragma does_not_write_global_data(acoshf, asinhf, atanhf, coshf, sinhf, tanhf)
433 #pragma does_not_write_global_data(expf, exp2f, expm1f, ilogbf, ldexpf)
434 #pragma does_not_write_global_data(logf, log10f, log1pf, log2f, logbf)
435 #pragma does_not_write_global_data(cbrtf, fabsf, hypotf, powf, sqrtf)
436 #pragma does_not_write_global_data(erff, erfcf, tgammaf)
437 #pragma does_not_write_global_data(ceilf, floorf, nearbyintf)
438 #pragma does_not_write_global_data(rintf, lrintf, roundf, lroundf, truncf)
439 #pragma does_not_write_global_data(fmodf, remainderf)
440 #pragma does_not_write_global_data(copysignf, nanf, nextafterf, nexttowardf)
441 #pragma does_not_write_global_data(fdimf, fmaxf, fminf, fmaf)

443 #pragma does_not_read_global_data(acosl, asinl, atanl, atan2l)
444 #pragma does_not_read_global_data(cosl, sinl, tanl)
445 #pragma does_not_read_global_data(acoshl, asinhl, atanhl, coshl, sinhl, tanhl)
446 #pragma does_not_read_global_data(expl, exp2l, expm1l, frexpl, ilogbl, ldexpl)
447 #pragma does_not_read_global_data(logl, log10l, log1pl, log2l, logbl)
448 #pragma does_not_read_global_data(modfl, scalbnl, scalblnl)
449 #pragma does_not_read_global_data(cbrtl, fabsl, hypotl, powl, sqrtl)
450 #pragma does_not_read_global_data(erfl, erfcl, lgammal, tgammal)
451 #pragma does_not_read_global_data(ceill, floorl, nearbyintl)
452 #pragma does_not_read_global_data(rintl, lrintl, roundl, lroundl, truncl)
453 #pragma does_not_read_global_data(fmodl, remainderl, remquol)
454 #pragma does_not_read_global_data(copysignl, nanl, nextafterl, nexttowardl)
455 #pragma does_not_read_global_data(fdiml, fmaxl, fminl, fmal)
456 #pragma does_not_write_global_data(acosl, asinl, atanl, atan2l)
```



```
457 #pragma does_not_write_global_data(cosl, sinl, tanl)
458 #pragma does_not_write_global_data(acoshl, asinhl, atanhl, coshl, sinhl, tanhl)
459 #pragma does_not_write_global_data(expl, exp2l, expm1l, ilogbl, ldexpl)
460 #pragma does_not_write_global_data(logl, log10l, log1pl, log2l, logbl)
461 #pragma does_not_write_global_data(cbrtl, fabsl, hypotl, powl, sqrtl)
462 #pragma does_not_write_global_data(erfl, erfcl, tgammal)
463 #pragma does_not_write_global_data(ceill, floorl, nearbyintl)
464 #pragma does_not_write_global_data(rintl, lrintl, roundl, lroundl, truncl)
465 #pragma does_not_write_global_data(fmodl, remainderl)
466 #pragma does_not_write_global_data(copysignl, nanl, nextafterl, nexttowardl)
467 #pragma does_not_write_global_data(fdiml, fmaxl, fminl, fmal)

469 #if !defined(_STRICT_STDC) && !defined(_NO_LONGLONG) || defined(_STDC_C99) || \
470         defined(__C99FEATURES__)
471 #pragma does_not_read_global_data(llrint, llround)
472 #pragma does_not_read_global_data(llrintf, llroundf, llrintl, llroundl)
473 #pragma does_not_write_global_data(llrint, llround)
474 #pragma does_not_write_global_data(llrintf, llroundf, llrintl, llroundl)
475 #endif
476 #endif  /* !defined(__cplusplus) */

478 #if defined(__MATHERR_ERRNO_DONTCARE)
479 #pragma does_not_read_global_data(acosh, atanh, hypot, lgamma, log1p, logb)
480 #pragma does_not_read_global_data(nextafter, remainder)
481 #pragma does_not_write_global_data(acosh, atanh, hypot, log1p, logb)
482 #pragma does_not_write_global_data(nextafter, remainder)

484 #pragma no_side_effect(acosh, asinh, atanh, exp2, expm1)
485 #pragma no_side_effect(ilogb, log1p, log2, logb)
486 #pragma no_side_effect(scalbn, scalbln, cbrt, hypot)
487 #pragma no_side_effect(erf, erfc, tgamma)
488 #pragma no_side_effect(nearbyint, rint, lrint, round, lround, trunc)
489 #pragma no_side_effect(remainder)
490 #pragma no_side_effect(copysign, nan, nextafter, nexttoward)
491 #pragma no_side_effect(fdim, fmax, fmin, fma)

493 #pragma no_side_effect(acosf, asinf, atanf, atan2f)
494 #pragma no_side_effect(cosf, sinf, tanf, coshf, sinhf, tanhf)
495 #pragma no_side_effect(acoshf, asinhf, atanhf, coshf, sinhf, tanhf)
496 #pragma no_side_effect(expf, exp2f, expm1f, ilogbf, ldexpf)
497 #pragma no_side_effect(logf, log10f, log1pf, log2f, logbf)
498 #pragma no_side_effect(cbrtf, fabsf, hypotf, powf, sqrtf)
499 #pragma no_side_effect(erff, erfcf, tgammaf)
500 #pragma no_side_effect(ceilf, floorf, nearbyintf)
501 #pragma no_side_effect(rintf, lrintf, roundf, lroundf, truncf)
502 #pragma no_side_effect(fmodf, remainderf)
503 #pragma no_side_effect(copysignf, nanf, nextafterf, nexttowardf)
504 #pragma no_side_effect(fdimf, fmaxf, fminf, fmaf)

506 #pragma no_side_effect(acosl, asinl, atanl, atan2l)
507 #pragma no_side_effect(cosl, sinl, tanl, coshl, sinhl, tanhl)
508 #pragma no_side_effect(acoshl, asinhl, atanhl, coshl, sinhl, tanhl)
509 #pragma no_side_effect(expl, exp2l, expm1l, ilogbl, ldexpl)
510 #pragma no_side_effect(logl, log10l, log1pl, log2l, logbl)
511 #pragma no_side_effect(cbrtl, fabsl, hypotl, powl, sqrtl)
512 #pragma no_side_effect(erfl, erfcl, tgammal)
513 #pragma no_side_effect(ceill, floorl, nearbyintl)
514 #pragma no_side_effect(rintl, lrintl, roundl, lroundl, truncl)
515 #pragma no_side_effect(fmodl, remainderl)
516 #pragma no_side_effect(copysignl, nanl, nextafterl, nexttowardl)
517 #pragma no_side_effect(fdiml, fmaxl, fminl, fmal)

519 #if !defined(_STRICT_STDC) && !defined(_NO_LONGLONG) || defined(_STDC_C99) || \
520         defined(__C99FEATURES__)
521 #pragma no_side_effect(llrint, llround, llrintf, llroundf, llrintl, llroundl)
522 #endif
```

```
523 #endif  /* defined(__MATHERR_ERRNO_DONTCARE) */
524 #endif  /* defined(__EXTENSIONS__) || defined(_STDC_C99) || ... */

526 #ifdef __cplusplus
527 }
528 #endif

530 #endif  /* _ISO_MATH_C99_H */
```

```
**********************************************************
    8574 Sat May 10 12:08:43 2014
new/usr/src/head/iso/math_iso.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
 *
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 *
 * CDDL HEADER END
 */
/*
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 */
/*
 * Copyright 2004 Sun Microsystems, Inc.  All rights reserved.
 * Use is subject to license terms.
 */

#ifndef _ISO_MATH_ISO_H
#define _ISO_MATH_ISO_H

#include <sys/feature_tests.h>

#ifdef __cplusplus
extern "C" {
#endif

#ifndef __P
#ifdef __STDC__
#define __P(p)  p
#else
#define __P(p)  ()
#endif
#endif  /* !defined(__P) */

#if !defined(_STDC_C99) && _XOPEN_SOURCE - 0 < 600 && !defined(__C99FEATURES__)
typedef union _h_val {
        unsigned long _i[sizeof (double) / sizeof (unsigned long)];
        double _d;
} _h_val;

#ifdef __STDC__
extern const _h_val __huge_val;
#else
extern _h_val __huge_val;
#endif
#undef  HUGE_VAL
#define HUGE_VAL __huge_val._d
#endif  /* !defined(_STDC_C99) && _XOPEN_SOURCE - 0 < 600 && ... */

#if __cplusplus >= 199711L
```



```
namespace std {
#endif

extern double acos __P((double));
extern double asin __P((double));
extern double atan __P((double));
extern double atan2 __P((double, double));
extern double cos __P((double));
extern double sin __P((double));
extern double tan __P((double));

extern double cosh __P((double));
extern double sinh __P((double));
extern double tanh __P((double));

extern double exp __P((double));
extern double frexp __P((double, int *));
extern double ldexp __P((double, int));
extern double log __P((double));
extern double log10 __P((double));
extern double modf __P((double, double *));

extern double pow __P((double, double));
extern double sqrt __P((double));

extern double ceil __P((double));
extern double fabs __P((double));
extern double floor __P((double));
extern double fmod __P((double, double));

#if defined(__MATHERR_ERRNO_DONTCARE)
#pragma does_not_read_global_data(acos, asin, atan, atan2)
#pragma does_not_read_global_data(cos, sin, tan, cosh, sinh, tanh)
#pragma does_not_read_global_data(exp, log, log10, pow, sqrt)
#pragma does_not_read_global_data(frexp, ldexp, modf)
#pragma does_not_read_global_data(ceil, fabs, floor, fmod)
#pragma does_not_write_global_data(acos, asin, atan, atan2)
#pragma does_not_write_global_data(cos, sin, tan, cosh, sinh, tanh)
#pragma does_not_write_global_data(exp, log, log10, pow, sqrt)
#pragma does_not_write_global_data(ldexp)
#pragma does_not_write_global_data(ceil, fabs, floor, fmod)
#pragma no_side_effect(acos, asin, atan, atan2)
#pragma no_side_effect(cos, sin, tan, cosh, sinh, tanh)
#pragma no_side_effect(exp, log, log10, pow, sqrt)
#pragma no_side_effect(ldexp)
#pragma no_side_effect(ceil, fabs, floor, fmod)
#endif

#if __cplusplus >= 199711L
extern float __acosf(float);
extern float __asinf(float);
extern float __atanf(float);
extern float __atan2f(float, float);
extern float __ceilf(float);
extern float __cosf(float);
extern float __coshf(float);
extern float __expf(float);
extern float __fabsf(float);
extern float __floorf(float);
extern float __fmodf(float, float);
extern float __frexpf(float, int *);
extern float __ldexpf(float, int);
extern float __logf(float);
extern float __log10f(float);
extern float __modff(float, float *);
extern float __powf(float, float);
```

```
128 extern float __sinf(float);
129 extern float __sinhf(float);
130 extern float __sqrtf(float);
131 extern float __tanf(float);
132 extern float __tanhf(float);

134 extern long double __acosl(long double);
135 extern long double __asinl(long double);
136 extern long double __atanl(long double);
137 extern long double __atan2l(long double, long double);
138 extern long double __ceill(long double);
139 extern long double __cosl(long double);
140 extern long double __coshl(long double);
141 extern long double __expl(long double);
142 extern long double __fabsl(long double);
143 extern long double __floorl(long double);
144 extern long double __fmodl(long double, long double);
145 extern long double __frexpl(long double, int *);
146 extern long double __ldexpl(long double, int);
147 extern long double __logl(long double);
148 extern long double __log10l(long double);
149 extern long double __modfl(long double, long double *);
150 extern long double __powl(long double, long double);
151 extern long double __sinl(long double);
152 extern long double __sinhl(long double);
153 extern long double __sqrtl(long double);
154 extern long double __tanl(long double);
155 extern long double __tanhl(long double);

157 extern "C++" {
158 #undef  __X
159 #undef  __Y
160         inline double abs(double __X) { return fabs(__X); }
161         inline double pow(double __X, int __Y) { return
162                 pow(__X, (double) (__Y)); }

164         inline float abs(float __X) { return __fabsf(__X); }
165         inline float acos(float __X) { return __acosf(__X); }
166         inline float asin(float __X) { return __asinf(__X); }
167         inline float atan(float __X) { return __atanf(__X); }
168         inline float atan2(float __X, float __Y) { return __atan2f(__X, __Y); }
169         inline float ceil(float __X) { return __ceilf(__X); }
170         inline float cos(float __X) { return __cosf(__X); }
171         inline float cosh(float __X) { return __coshf(__X); }
172         inline float exp(float __X) { return __expf(__X); }
173         inline float fabs(float __X) { return __fabsf(__X); }
174         inline float floor(float __X) { return __floorf(__X); }
175         inline float fmod(float __X, float __Y) { return __fmodf(__X, __Y); }
176         inline float frexp(float __X, int *__Y) { return __frexpf(__X, __Y); }
177         inline float ldexp(float __X, int __Y) { return __ldexpf(__X, __Y); }
178         inline float log(float __X) { return __logf(__X); }
179         inline float log10(float __X) { return __log10f(__X); }
180         inline float modf(float __X, float *__Y) { return __modff(__X, __Y); }
181         inline float pow(float __X, float __Y) { return __powf(__X, __Y); }
182         inline float pow(float __X, int __Y) { return
183                 pow((double) (__X), (double) (__Y)); }
184         inline float sin(float __X) { return __sinf(__X); }
185         inline float sinh(float __X) { return __sinhf(__X); }
186         inline float sqrt(float __X) { return __sqrtf(__X); }
187         inline float tan(float __X) { return __tanf(__X); }
188         inline float tanh(float __X) { return __tanhf(__X); }

190         inline long double abs(long double __X) { return __fabsl(__X); }
191         inline long double acos(long double __X) { return __acosl(__X); }
192         inline long double asin(long double __X) { return __asinl(__X); }
193         inline long double atan(long double __X) { return __atanl(__X); }
```



```
194         inline long double atan2(long double __X, long double __Y) { return
195                 __atan2l(__X, __Y); }
196         inline long double ceil(long double __X) { return __ceill(__X); }
197         inline long double cos(long double __X) { return __cosl(__X); }
198         inline long double cosh(long double __X) { return __coshl(__X); }
199         inline long double exp(long double __X) { return __expl(__X); }
200         inline long double fabs(long double __X) { return __fabsl(__X); }
201         inline long double floor(long double __X) { return __floorl(__X); }
202         inline long double fmod(long double __X, long double __Y) { return
203                 __fmodl(__X, __Y); }
204         inline long double frexp(long double __X, int *__Y) { return
205                 __frexpl(__X, __Y); }
206         inline long double ldexp(long double __X, int __Y) { return
207                 __ldexpl(__X, __Y); }
208         inline long double log(long double __X) { return __logl(__X); }
209         inline long double log10(long double __X) { return __log10l(__X); }
210         inline long double modf(long double __X, long double *__Y) { return
211                 __modfl(__X, __Y); }
212         inline long double pow(long double __X, long double __Y) { return
213                 __powl(__X, __Y); }
214         inline long double pow(long double __X, int __Y) { return
215                 __powl(__X, (long double) (__Y)); }
216         inline long double sin(long double __X) { return __sinl(__X); }
217         inline long double sinh(long double __X) { return __sinhl(__X); }
218         inline long double sqrt(long double __X) { return __sqrtl(__X); }
219         inline long double tan(long double __X) { return __tanl(__X); }
220         inline long double tanh(long double __X) { return __tanhl(__X); }
221 }       /* end of extern "C++" */
222 #endif  /* __cplusplus >= 199711L */

224 #if __cplusplus >= 199711L
225 }       /* end of namespace std */
226 #endif

228 #ifdef __cplusplus
229 }
230 #endif

232 #endif  /* _ISO_MATH_ISO_H */
```

```
**********************************************************
   10428 Sat May 10 12:08:43 2014
new/usr/src/head/math.h
patch12 - math.h: Align things with GCC
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#ifndef _MATH_H
#define _MATH_H

#include <iso/math_iso.h>
#include <iso/math_c99.h>

#if __cplusplus >= 199711L
using std::abs;
using std::acos;
using std::asin;
using std::atan2;
using std::atan;
using std::ceil;
using std::cos;
using std::cosh;
using std::exp;
using std::fabs;
using std::floor;
using std::fmod;
using std::frexp;
using std::ldexp;
using std::log10;
using std::log;
using std::modf;
using std::pow;
using std::sin;
using std::sinh;
using std::sqrt;
using std::tan;
using std::tanh;
#endif
```



```
#ifdef __cplusplus
extern "C" {
#endif

#if defined(__cplusplus)
#define exception       __math_exception
#endif

#ifndef __P
#ifdef __STDC__
#define __P(p)  p
#else
#define __P(p)  ()
#endif
#endif  /* !defined(__P) */

#if defined(__EXTENSIONS__) || defined(_XOPEN_SOURCE) || \
        !defined(_STRICT_STDC) && !defined(_POSIX_C_SOURCE)
/*
 * SVID & X/Open
 */
#define M_E             2.7182818284590452354
#define M_LOG2E         1.4426950408889634074
#define M_LOG10E        0.43429448190325182765
#define M_LN2           0.69314718055994530942
#define M_LN10          2.3025850929940456802
#define M_PI            3.14159265358979323846
#define M_PI_2          1.57079632679489661923
#define M_PI_4          0.78539816339744830962
#define M_1_PI          0.31830988618379067154
#define M_2_PI          0.63661977236758134308
#define M_2_SQRTPI      1.12837916709551257390
#define M_SQRT2         1.41421356237309504880
#define M_SQRT1_2       0.70710678118654752440

extern int signgam;

#define MAXFLOAT        ((float)3.40282346638528860e+38)

#if defined(__EXTENSIONS__) || !defined(_XOPEN_SOURCE)
/*
 * SVID
 */
enum version {libm_ieee = -1, c_issue_4, ansi_1, strict_ansi};

#ifdef __STDC__
extern const enum version _lib_version;
#else
extern enum version _lib_version;
#endif

struct exception {
        int type;
        char *name;
        double arg1;
        double arg2;
        double retval;
};

#define HUGE            MAXFLOAT

#define _ABS(x)         ((x) < 0 ? -(x) : (x))

#define _REDUCE(TYPE, X, XN, C1, C2)    { \
        double x1 = (double)(TYPE)X, x2 = X - x1; \
        X = x1 - (XN) * (C1); X += x2; X -= (XN) * (C2); }
```

```
128 #define DOMAIN          1
129 #define SING            2
130 #define OVERFLOW        3
131 #define UNDERFLOW       4
132 #define TLOSS           5
133 #define PLOSS           6

135 #define _POLY1(x, c)    ((c)[0] * (x) + (c)[1])
136 #define _POLY2(x, c)    (_POLY1((x), (c)) * (x) + (c)[2])
137 #define _POLY3(x, c)    (_POLY2((x), (c)) * (x) + (c)[3])
138 #define _POLY4(x, c)    (_POLY3((x), (c)) * (x) + (c)[4])
139 #define _POLY5(x, c)    (_POLY4((x), (c)) * (x) + (c)[5])
140 #define _POLY6(x, c)    (_POLY5((x), (c)) * (x) + (c)[6])
141 #define _POLY7(x, c)    (_POLY6((x), (c)) * (x) + (c)[7])
142 #define _POLY8(x, c)    (_POLY7((x), (c)) * (x) + (c)[8])
143 #define _POLY9(x, c)    (_POLY8((x), (c)) * (x) + (c)[9])
144 #endif  /* defined(__EXTENSIONS__) || !defined(_XOPEN_SOURCE) */

146 /*
147  * SVID & X/Open
148  */
149 /* BEGIN adopted by C99 */
150 extern double erf __P((double));
151 extern double erfc __P((double));
152 extern double hypot __P((double, double));
153 extern double lgamma __P((double));

155 #if defined(__MATHERR_ERRNO_DONTCARE)
156 #pragma does_not_read_global_data(erf, erfc, hypot)
157 #pragma does_not_write_global_data(erf, erfc, hypot)
158 #pragma no_side_effect(erf, erfc, hypot)
159 #endif

161 #if !defined(_STDC_C99) && _XOPEN_SOURCE - 0 < 600 && !defined(__C99FEATURES__)
162 extern int isnan __P((double));

164 #pragma does_not_read_global_data(isnan)
165 #pragma does_not_write_global_data(isnan)
166 #pragma no_side_effect(isnan)
167 #endif
168 /* END adopted by C99 */

170 #if defined(__EXTENSIONS__) || _XOPEN_SOURCE - 0 < 600
171 extern double gamma __P((double));              /* deprecated; use lgamma */
172 #endif
173 extern double j0 __P((double));
174 extern double j1 __P((double));
175 extern double jn __P((int, double));
176 extern double y0 __P((double));
177 extern double y1 __P((double));
178 extern double yn __P((int, double));

180 #if defined(__MATHERR_ERRNO_DONTCARE)
181 #pragma does_not_read_global_data(j0, j1, jn, y0, y1, yn)
182 #pragma does_not_write_global_data(j0, j1, jn, y0, y1, yn)
183 #pragma no_side_effect(j0, j1, jn, y0, y1, yn)
184 #endif
185 #if defined(__EXTENSIONS__) || !defined(_XOPEN_SOURCE) || \
186         _XOPEN_SOURCE - 0 >= 500 || \
187         defined(_XOPEN_SOURCE) && _XOPEN_SOURCE_EXTENDED - 0 == 1
188 /*
189  * SVID & XPG 4.2/5
190  */
191 extern double scalb __P((double, double));
```



```
193 #if defined(__MATHERR_ERRNO_DONTCARE)
194 #pragma does_not_read_global_data(scalb)
195 #pragma does_not_write_global_data(scalb)
196 #pragma no_side_effect(scalb)
197 #endif

199 /* BEGIN adopted by C99 */
200 extern double acosh __P((double));
201 extern double asinh __P((double));
202 extern double atanh __P((double));
203 extern double cbrt __P((double));
204 extern double logb __P((double));
205 extern double nextafter __P((double, double));
206 extern double remainder __P((double, double));

208 /*
209  * XPG 4.2/5
210  */
211 extern double expm1 __P((double));
212 extern int ilogb __P((double));
213 extern double log1p __P((double));
214 extern double rint __P((double));

216 #if defined(__MATHERR_ERRNO_DONTCARE)
217 #pragma does_not_read_global_data(acosh, asinh, atanh, cbrt)
218 #pragma does_not_read_global_data(logb, nextafter, remainder)
219 #pragma does_not_read_global_data(expm1, ilogb, log1p, rint)
220 #pragma does_not_write_global_data(acosh, asinh, atanh, cbrt)
221 #pragma does_not_write_global_data(logb, nextafter, remainder)
222 #pragma does_not_write_global_data(expm1, ilogb, log1p, rint)
223 #pragma no_side_effect(acosh, asinh, atanh, cbrt)
224 #pragma no_side_effect(logb, nextafter, remainder)
225 #pragma no_side_effect(expm1, ilogb, log1p, rint)
226 #endif
227 /* END adopted by C99 */
228 #endif  /* defined(__EXTENSIONS__) || !defined(_XOPEN_SOURCE) || ... */

230 #if defined(__EXTENSIONS__) || !defined(_XOPEN_SOURCE)
231 /*
232  * SVID
233  */
234 extern int matherr __P((struct exception *));

236 /*
237  * IEEE Test Vector
238  */
239 extern double significand __P((double));

241 #if defined(__MATHERR_ERRNO_DONTCARE)
242 #pragma does_not_read_global_data(significand)
243 #pragma does_not_write_global_data(significand)
244 #pragma no_side_effect(significand)
245 #endif

247 extern int signgamf;                            /* deprecated; use signgam */
248 extern int signgaml;                            /* deprecated; use signgam */

250 extern int isnanf __P((float));
251 extern int isnanl __P((long double));
252 extern float gammaf __P((float));               /* deprecated; use lgammaf */
253 extern float gammaf_r __P((float, int *));      /* deprecated; use lgammaf_r */
254 extern float j0f __P((float));
255 extern float j1f __P((float));
256 extern float jnf __P((int, float));
257 extern float lgammaf_r __P((float, int *));
258 extern float scalbf __P((float, float));
```

```
259 extern float significandf __P((float));
260 extern float y0f __P((float));
261 extern float y1f __P((float));
262 extern float ynf __P((int, float));
263 extern long double gammal __P((long double));   /* deprecated; use lgammal */
264 extern long double gammal_r __P((long double, int *));  /* deprecated */
265 extern long double j0l __P((long double));
266 extern long double j1l __P((long double));
267 extern long double jnl __P((int, long double));
268 extern long double lgammal_r __P((long double, int *));
269 extern long double scalbl __P((long double, long double));
270 extern long double significandl __P((long double));
271 extern long double y0l __P((long double));
272 extern long double y1l __P((long double));
273 extern long double ynl __P((int, long double));

275 #if defined(__MATHERR_ERRNO_DONTCARE)
276 #pragma does_not_read_global_data(isnanf, isnanl)
277 #pragma does_not_write_global_data(isnanf, isnanl)
278 #pragma no_side_effect(isnanf, isnanl)
279 #pragma does_not_read_global_data(gammaf_r, j0f, j1f, jnf, lgammaf_r, scalbf)
280 #pragma does_not_read_global_data(significandf, y0f, y1f, ynf)
281 #pragma does_not_write_global_data(j0f, j1f, jnf, scalbf)
282 #pragma does_not_write_global_data(significandf, y0f, y1f, ynf)
283 #pragma no_side_effect(j0f, j1f, jnf, scalbf)
284 #pragma no_side_effect(significandf, y0f, y1f, ynf)
285 #pragma does_not_read_global_data(gammal_r, j0l, j1l, jnl, lgammal_r, scalbl)
286 #pragma does_not_read_global_data(significandl, y0l, y1l, ynl)
287 #pragma does_not_write_global_data(j0l, j1l, jnl, scalbl)
288 #pragma does_not_write_global_data(significandl, y0l, y1l, ynl)
289 #pragma no_side_effect(j0l, j1l, jnl, scalbl)
290 #pragma no_side_effect(significandl, y0l, y1l, ynl)
291 #endif

293 /*
294  * for sin+cos->sincos transformation
295  */
296 extern void sincos __P((double, double *, double *));
297 extern void sincosf __P((float, float *, float *));
298 extern void sincosl __P((long double, long double *, long double *));

300 #if defined(__MATHERR_ERRNO_DONTCARE)
301 #pragma does_not_read_global_data(sincos, sincosf, sincosl)
302 #endif

304 /* BEGIN adopted by C99 */
305 /*
306  * Functions callable from C, intended to support IEEE arithmetic.
307  */
308 extern double copysign __P((double, double));
309 extern double scalbn __P((double, int));

311 #if defined(__MATHERR_ERRNO_DONTCARE)
312 #pragma does_not_read_global_data(copysign, scalbn)
313 #pragma does_not_write_global_data(copysign, scalbn)
314 #pragma no_side_effect(copysign, scalbn)
315 #endif
316 /* END adopted by C99 */

318 /*
319  * Reentrant version of gamma & lgamma; passes signgam back by reference
320  * as the second argument; user must allocate space for signgam.
321  */
322 extern double gamma_r __P((double, int *));     /* deprecated; use lgamma_r */
323 extern double lgamma_r __P((double, int *));
```



```
325 #if defined(__MATHERR_ERRNO_DONTCARE)
326 #pragma does_not_read_global_data(gamma_r, lgamma_r)
327 #endif

329 /* BEGIN adopted by C99 */
330 extern float modff __P((float, float *));

332 #if defined(__MATHERR_ERRNO_DONTCARE)
333 #pragma does_not_read_global_data(modff)
334 #endif
335 /* END adopted by C99 */

337 #if defined(__EXTENSIONS__) || !defined(__cplusplus)
338 #include <floatingpoint.h>
339 #endif
340 #endif  /* defined(__EXTENSIONS__) || !defined(_XOPEN_SOURCE) */
341 #endif  /* defined(__EXTENSIONS__) || defined(_XOPEN_SOURCE) || ... */

343 #if defined(__cplusplus) && defined(__GNUC__)
344 #undef  exception
345 #endif

347 #ifdef __cplusplus
348 }
349 #endif

351 #endif  /* _MATH_H */
```

```
**********************************************************
    4308 Sat May 10 12:08:43 2014
new/usr/src/head/tgmath.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */
/*
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 */

#ifndef _TGMATH_H
#define _TGMATH_H

#if !defined(__cplusplus)

#include <math.h>
#include <complex.h>

/*
 * real-floating and complex
 */
#undef  acos
#define acos(x)                 __tgmath_acos(x)
#undef  asin
#define asin(x)                 __tgmath_asin(x)
#undef  atan
#define atan(x)                 __tgmath_atan(x)
#undef  acosh
#define acosh(x)                __tgmath_acosh(x)
#undef  asinh
#define asinh(x)                __tgmath_asinh(x)
#undef  atanh
#define atanh(x)                __tgmath_atanh(x)
#undef  cos
#define cos(x)                  __tgmath_cos(x)
#undef  sin
#define sin(x)                  __tgmath_sin(x)
#undef  tan
#define tan(x)                  __tgmath_tan(x)
#undef  cosh
#define cosh(x)                 __tgmath_cosh(x)
#undef  sinh
#define sinh(x)                 __tgmath_sinh(x)
```



```
#undef  tanh
#define tanh(x)                 __tgmath_tanh(x)
#undef  exp
#define exp(x)                  __tgmath_exp(x)
#undef  log
#define log(x)                  __tgmath_log(x)
#undef  pow
#define pow(x, y)               __tgmath_pow(x, y)
#undef  sqrt
#define sqrt(x)                 __tgmath_sqrt(x)
#undef  fabs
#define fabs(x)                 __tgmath_fabs(x)

/*
 * real-floating only
 */
#undef  atan2
#define atan2(y, x)             __tgmath_atan2(y, x)
#undef  cbrt
#define cbrt(x)                 __tgmath_cbrt(x)
#undef  ceil
#define ceil(x)                 __tgmath_ceil(x)
#undef  copysign
#define copysign(x, y)          __tgmath_copysign(x, y)
#undef  erf
#define erf(x)                  __tgmath_erf(x)
#undef  erfc
#define erfc(x)                 __tgmath_erfc(x)
#undef  exp2
#define exp2(x)                 __tgmath_exp2(x)
#undef  expm1
#define expm1(x)                __tgmath_expm1(x)
#undef  fdim
#define fdim(x, y)              __tgmath_fdim(x, y)
#undef  floor
#define floor(x)                __tgmath_floor(x)
#undef  fma
#define fma(x, y, z)            __tgmath_fma(x, y, z)
#undef  fmax
#define fmax(x, y)              __tgmath_fmax(x, y)
#undef  fmin
#define fmin(x, y)              __tgmath_fmin(x, y)
#undef  fmod
#define fmod(x, y)              __tgmath_fmod(x, y)
#undef  frexp
#define frexp(x, ip)            __tgmath_frexp(x, ip)
#undef  hypot
#define hypot(x, y)             __tgmath_hypot(x, y)
#undef  ilogb
#define ilogb(x)                __tgmath_ilogb(x)
#undef  ldexp
#define ldexp(x, i)             __tgmath_ldexp(x, i)
#undef  lgamma
#define lgamma(x)               __tgmath_lgamma(x)
#undef  llrint
#define llrint(x)               __tgmath_llrint(x)
#undef  llround
#define llround(x)              __tgmath_llround(x)
#undef  log10
#define log10(x)                __tgmath_log10(x)
#undef  log1p
#define log1p(x)                __tgmath_log1p(x)
#undef  log2
#define log2(x)                 __tgmath_log2(x)
#undef  logb
#define logb(x)                 __tgmath_logb(x)
```

```
128 #undef  lrint
129 #define lrint(x)                __tgmath_lrint(x)
130 #undef  lround
131 #define lround(x)               __tgmath_lround(x)
132 #undef  nearbyint
133 #define nearbyint(x)            __tgmath_nearbyint(x)
134 #undef  nextafter
135 #define nextafter(x, y)         __tgmath_nextafter(x, y)
136 #undef  nexttoward
137 #define nexttoward(x, y)        __tgmath_nexttoward(x, y)
138 #undef  remainder
139 #define remainder(x, y)         __tgmath_remainder(x, y)
140 #undef  remquo
141 #define remquo(x, y, ip)        __tgmath_remquo(x, y, ip)
142 #undef  rint
143 #define rint(x)                 __tgmath_rint(x)
144 #undef  round
145 #define round(x)                __tgmath_round(x)
146 #undef  scalbln
147 #define scalbln(x, l)           __tgmath_scalbln(x, l)
148 #undef  scalbn
149 #define scalbn(x, i)            __tgmath_scalbn(x, i)
150 #undef  tgamma
151 #define tgamma(x)               __tgmath_tgamma(x)
152 #undef  trunc
153 #define trunc(x)                __tgmath_trunc(x)

155 /*
156  * complex only
157  */
158 #undef  carg
159 #define carg(x)                 __tgmath_carg(x)
160 #undef  cimag
161 #define cimag(x)                __tgmath_cimag(x)
162 #undef  conj
163 #define conj(x)                 __tgmath_conj(x)
164 #undef  cproj
165 #define cproj(x)                __tgmath_cproj(x)
166 #undef  creal
167 #define creal(x)                __tgmath_creal(x)

169 #endif  /* !defined(__cplusplus) */

171 #endif  /* _TGMATH_H */
```

```
**********************************************************
   13627 Sat May 10 12:08:43 2014
new/usr/src/lib/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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include ../Makefile.master

#       Note that libcurses installs commands along with its library.
#       This is a minor bug which probably should be fixed.
#       Note also that a few extra libraries are kept in cmd source.
#
# Certain libraries are linked with, hence depend on, other libraries.
#
# Although we have historically used .WAIT to express dependencies, it
# reduces the amount of parallelism and thus lengthens the time it
# takes to build the libraries.  Thus, we now require that any new
# libraries explicitly call out their dependencies.  Eventually, all
# the library dependencies will be called out explicitly.  See
# "Library interdependencies" near the end of this file.
#
# Aside from explicit dependencies (and legacy .WAITs), all libraries
# are built in parallel.
#
.PARALLEL:

SUBDIRS= \
        common                  .WAIT   \
        ../cmd/sgs/libconv              \
        ../cmd/sgs/libdl        .WAIT

SUBDIRS += \
        libc                    .WAIT   \
        ../cmd/sgs/libelf       .WAIT   \
        c_synonyms                      \
        libmd                           \
        libmd5                          \
        librsm                          \
        libmp                   .WAIT   \
        libnsl                  \
```



```
        libsecdb                .WAIT   \
        librpcsvc                       \
        libsocket               .WAIT   \
        libsctp                 \
        libsip                  \
        libcommputil            \
        libresolv                       \
        libresolv2              .WAIT   \
        libw                    .WAIT   \
        libintl                 .WAIT   \
        ../cmd/sgs/librtld_db   \
        libaio                  \
        libast                  \
        libdll                  \
        libcmd                  \
        libshell                \
        libsum                  \
        librt                   \
        libadm                  \
        libctf                  \
        libdtrace               \
        libdtrace_jni           \
        libcurses               \
        libtermcap              \
        libgen                  \
        libgss                  \
        libpam                  \
        libuuid                 \
        libthread               \
        libpthread      .WAIT   \
        libslp          \
        libbsdmalloc    \
        libdoor         \
        libdevinfo      \
        libdladm        \
        libdlpi         \
        libeti          \
        libcrypt        \
        libdns_sd       \
        libefi          \
        libfstyp        \
        libwanboot      \
        libwanbootutil  \
        libcryptoutil   \
        libinetutil     \
        libipadm        \
        libipd          \
        libipmp         \
        libiscsit       \
        libkmf          \
        libkstat        \
        libkvm          \
        liblm           \
        libmalloc       \
        libmapmalloc    \
        libmtmalloc     \
        libnls          \
        libnwam         \
        libsmbios       \
        libtecla        \
        libumem         \
        libnvpair       .WAIT   \
        libexacct       \
        libsasl         \
        libldap5        \
        libsldap        .WAIT   \
```

```
128         libbsm          \
129         libsys          \
130         libsysevent     \
131         libnisdb        \
132         libpool         \
133         libpp           \
134         libproc         \
135         libproject      \
136         libsendfile     \
137         nametoaddr      \
138         ncad_addr       \
139         hbaapi          \
140         smhba           \
141         sun_fc          \
142         sun_sas         \
143         gss_mechs/mech_krb5     .WAIT   \
144         libkrb5 .WAIT   \
145         krb5    .WAIT   \
146         libsmbfs        \
147         libfcoe         \
148         libsrpt         \
149         libstmf         \
150         libstmfproxy    \
151         libnsctl        \
152         libunistat      \
153         libdscfg        \
154         librdc          \
155         libinstzones    \
156         libpkg          \
157         libpcidb        \
158         libm1           \
159         libm            \
160         libmvec
157         libpcidb


163 SUBDIRS += \
164         passwdutil      \
165         pam_modules     \
166         crypt_modules   \
167         libadt_jni      \
168         abi             \
169         auditd_plugins  \
170         libvolmgt       \
171         libdevice       \
172         libdevid        \
173         libdhcpsvc      \
174         libc_db         \
175         libndmp         \
176         libsec          \
177         libtnfprobe     \
178         libtnf          \
179         libtnfctl       \
180         libdhcpagent    \
181         libdhcpdu       \
182         libdhcputil     \
183         libxnet         \
184         libipsecutil    \
185         nsswitch        \
186         print           \
187         libuutil        \
188         libscf          \
189         libinetsvc      \
190         librestart      \
191         libsched        \
192         libelfsign      \
```



```
193         pkcs11          .WAIT   \
194         libpctx         .WAIT   \
195         libcpc          \
196         getloginx       \
197         watchmalloc     \
198         extendedFILE    \
199         madv            \
200         mpss            \
201         libdisasm       \
202         libwrap         \
203         libxcurses      \
204         libxcurses2     \
205         libbrand        .WAIT   \
206         libzonecfg      \
207         libzoneinfo     \
208         libzonestat     \
209         libtsnet        \
210         libtsol         \
211         gss_mechs/mech_spnego   \
212         gss_mechs/mech_dummy    \
213         gss_mechs/mech_dh       \
214         rpcsec_gss      \
215         libraidcfg      .WAIT   \
216         librcm          .WAIT   \
217         libcfgadm       .WAIT   \
218         libpicl         .WAIT   \
219         libpicltree     .WAIT \
220         raidcfg_plugins \
221         cfgadm_plugins  \
222         libmail         \
223         lvm             \
224         libsmedia       \
225         libipp          \
226         libdiskmgt      \
227         liblgrp         \
228         libfsmgt        \
229         fm              \
230         libavl          \
231         libcmdutils     \
232         libcontract     \
233         ../cmd/sendmail/libmilter       \
234         sasl_plugins    \
235         udapl           \
236         libzpool        \
237         libzfs_core     \
238         libzfs          \
239         libbe           \
240         pylibbe         \
241         libzfs_jni      \
242         pyzfs           \
243         pysolaris       \
244         libmapid        \
245         brand           \
246         policykit       \
247         hal             \
248         libshare        \
249         libsqlite       \
250         libidmap        \
251         libadutils      \
252         libipmi         \
253         libexacct/demo  \
254         libvrrpadm      \
255         libvscan        \
256         libgrubmgmt     \
257         smbsrv          \
258         libilb          \
```

```
259         scsi            \
260         libima          \
261         libsun_ima      \
262         mpapi           \
263         librstp         \
264         libreparse      \
265         libhotplug      \
266         libfruutils     .WAIT   \
267         libfru          \
268         $($(MACH)_SUBDIRS)

270 i386_SUBDIRS=           \
271         libntfs         \
272         libparted       \
273         libfdisk        \
274         libsaveargs

276 sparc_SUBDIRS= .WAIT    \
277         efcode          \
278         libds           \
279         libdscp         \
280         libprtdiag      .WAIT   \
281         libprtdiag_psr  \
282         libpri          \
283         librsc          \
284         storage         \
285         libpcp          \
286         libtsalarm      \
287         libv12n

289 FM_sparc_DEPLIBS= libpri

291 fm:                     \
292         libexacct       \
293         libipmi         \
294         libzfs          \
295         scsi            \
296         $(FM_$(MACH)_DEPLIBS)

298 #
299 # Create a special version of $(SUBDIRS) with no .WAIT's, for use with the
300 # clean and clobber targets (for more information, see those targets, below).
301 #
302 NOWAIT_SUBDIRS= $(SUBDIRS:.WAIT=)

304 DCSUBDIRS =             \
305         lvm

307 MSGSUBDIRS=             \
308         abi             \
309         auditd_plugins  \
310         brand           \
311         cfgadm_plugins  \
312         gss_mechs/mech_dh       \
313         gss_mechs/mech_krb5     \
314         krb5            \
315         libast          \
316         libbsm          \
317         libc            \
318         libcfgadm       \
319         libcmd          \
320         libcontract     \
321         libcurses       \
322         libdhcpsvc      \
323         libdhcputil     \
324         libipsecutil    \
```



```
325         libdiskmgt      \
326         libdladm        \
327         libdll          \
328         libgrubmgmt     \
329         libgss          \
330         libidmap        \
331         libipmp         \
332         libilb          \
333         libinetutil     \
334         libinstzones    \
335         libipadm        \
336         libnsl          \
337         libnwam         \
338         libpam          \
339         libpicl         \
340         libpool         \
341         libpkg          \
342         libpp           \
343         libscf          \
344         libsasl         \
345         libldap5        \
346         libsecdb        \
347         libshare        \
348         libshell        \
349         libsldap        \
350         libslp          \
351         libsmbfs        \
352         libsmedia       \
353         libsum          \
354         libtsol         \
355         libuutil        \
356         libvrrpadm      \
357         libvscan        \
358         libwanboot      \
359         libwanbootutil  \
360         libzfs          \
361         libzonecfg      \
362         lvm             \
363         madv            \
364         mpss            \
365         pam_modules     \
366         pyzfs           \
367         pysolaris       \
368         rpcsec_gss      \
369         libreparse
370 MSGSUBDIRS += \
371         $($(MACH)_MSGSUBDIRS)

373 sparc_MSGSUBDIRS=       \
374         libprtdiag      \
375         libprtdiag_psr

377 i386_MSGSUBDIRS= libfdisk

379 HDRSUBDIRS=             \
380         auditd_plugins  \
381         libast          \
382         libbrand        \
383         libbsm          \
384         libc            \
385         libcmd          \
386         libcmdutils     \
387         libcommputil    \
388         libcontract     \
389         libcpc          \
390         libctf          \
```

```
391         libcurses       \
392         libtermcap      \
393         libcryptoutil   \
394         libdevice       \
395         libdevid        \
396         libdevinfo      \
397         libdiskmgt      \
398         libdladm        \
399         libdll          \
400         libdlpi         \
401         libdhcpagent    \
402         libdhcpsvc      \
403         libdhcputil     \
404         libdisasm       \
405         libdns_sd       \
406         libdscfg        \
407         libdtrace       \
408         libdtrace_jni   \
409         libelfsign      \
410         libeti          \
411         libfru          \
412         libfstyp        \
413         libgen          \
414         libipadm        \
415         libipd          \
416         libipsecutil    \
417         libinetsvc      \
418         libinetutil     \
419         libinstzones    \
420         libipmi         \
421         libipmp         \
422         libipp          \
423         libiscsit       \
424         libkstat        \
425         libkvm          \
426         libmail         \
427         libmd           \
428         libmtmalloc     \
429         libndmp         \
430         libnvpair       \
431         libnsctl        \
432         libnsl          \
433         libnwam         \
434         libpam          \
435         libpcidb        \
436         libpctx         \
437         libpicl         \
438         libpicltree     \
439         libpool         \
440         libpp           \
441         libproc         \
442         libraidcfg      \
443         librcm          \
444         librdc          \
445         libscf          \
446         libsip          \
447         libsmbios       \
448         librestart      \
449         librpcsvc       \
450         librsm          \
451         librstp         \
452         libsasl         \
453         libsec          \
454         libshell        \
455         libslp          \
456         libsmedia       \
```



```
457         libsocket       \
458         libsqlite       \
459         libfcoe         \
460         libsrpt         \
461         libstmf         \
462         libstmfproxy    \
463         libsum          \
464         libsysevent     \
465         libtecla        \
466         libtnf          \
467         libtnfctl       \
468         libtnfprobe     \
469         libtsnet        \
470         libtsol         \
471         libvrrpadm      \
472         libvolmgt       \
473         libumem         \
474         libunistat      \
475         libuutil        \
476         libwanboot      \
477         libwanbootutil  \
478         libwrap         \
479         libxcurses2     \
480         libzfs          \
481         libzfs_core     \
482         libzfs_jni      \
483         libzoneinfo     \
484         libzonestat     \
485         hal             \
486         policykit       \
487         lvm             \
488         pkcs11          \
489         passwdutil      \
490         ../cmd/sendmail/libmilter       \
491         fm              \
492         udapl           \
493         libmapid        \
494         libkrb5         \
495         libsmbfs        \
496         libshare        \
497         libidmap        \
498         libvscan        \
499         libgrubmgmt     \
500         smbsrv          \
501         libilb          \
502         scsi            \
503         hbaapi          \
504         smhba           \
505         libima          \
506         libsun_ima      \
507         mpapi           \
508         libreparse      \
509         $($(MACH)_HDRSUBDIRS)

511 i386_HDRSUBDIRS=       \
512         libparted       \
513         libfdisk        \
514         libsaveargs

516 sparc_HDRSUBDIRS=       \
517         libds           \
518         libdscp         \
519         libpri          \
520         libv12n         \
521         storage
```

```
523 all :=          TARGET= all
524 check :=        TARGET= check
525 clean :=        TARGET= clean
526 clobber :=      TARGET= clobber
527 install :=      TARGET= install
528 install_h :=    TARGET= install_h
529 lint :=         TARGET= lint
530 _dc :=          TARGET= _dc
531 _msg :=         TARGET= _msg

533 .KEEP_STATE:

535 #
536 # For the all and install targets, we clearly must respect library
537 # dependencies so that the libraries link correctly.  However, for
538 # the remaining targets (check, clean, clobber, install_h, lint, _dc
539 # and _msg), libraries do not have any dependencies on one another
540 # and thus respecting dependencies just slows down the build.
541 # As such, for these rules, we use pattern replacement to explicitly
542 # avoid triggering the dependency information.  Note that for clean,
543 # clobber and lint, we must use $(NOWAIT_SUBDIRS) rather than
544 # $(SUBDIRS), to prevent '.WAIT' from expanding to '.WAIT-nodepend'.
545 #

547 all:                    $(SUBDIRS)

549 install:                $(SUBDIRS) .WAIT install_extra

551 # extra libraries kept in other source areas
552 install_extra:
553         @cd ../cmd/sgs; pwd; $(MAKE) install_lib
554         @pwd

556 clean clobber lint:     $(NOWAIT_SUBDIRS:%=%-nodepend)

558 install_h check:        $(HDRSUBDIRS:%=%-nodepend)

560 _msg:                   $(MSGSUBDIRS:%=%-nodepend) .WAIT _dc

562 _dc:                    $(DCSUBDIRS:%=%-nodepend)

564 #
565 # Library interdependencies are called out explicitly here
566 #
567 auditd_plugins: libbsm libnsl libsecdb
568 gss_mechs/mech_krb5:    libgss libnsl libsocket libresolv pkcs11
569 libadt_jni:     libbsm
570 libast:         libsocket libm
566 libast:         libsocket
571 libadutils:     libldap5 libresolv libsocket libnsl
572 nsswitch:       libadutils libidmap
573 libbe:          libzfs
574 libbsm:         libtsol
575 libcmd:         libsum libast libsocket libnsl
576 libcmdutils:    libavl
577 libcontract:    libnvpair
578 libdevid:       libdevinfo
579 libdevinfo:     libnvpair libsec
580 libdhcpagent:   libsocket libdhcputil libuuid libdlpi libcontract
581 libdhcpsvc:     libinetutil
582 libdhcputil:    libnsl libgen libinetutil libdlpi
583 libdladm:       libdevinfo libinetutil libsocket libscf librcm libnvpair \
584                 libexacct libnsl libkstat libcurses
585 libdll:         libast
586 libdlpi:        libinetutil libdladm
587 libds:          libsysevent
```



```
588 libdscfg:       libnsctl libunistat libsocket libnsl
589 libdtrace:      libproc libgen libctf
590 libdtrace_jni:  libuutil libdtrace
591 libefi:         libuuid
592 libfstyp:       libnvpair
593 libelfsign:     libcryptoutil libkmf
594 libidmap:       libadutils libldap5 libavl libsldap libuutil
595 libipadm:       libnsl libinetutil libsocket libdlpi libnvpair libdhcpagent \
596                 libdladm libsecdb
597 libiscsit:      libc libnvpair libstmf libuuid libnsl
598 libkmf:         libcryptoutil pkcs11
599 libm:           libc
600 libm1:          libc libm
601 libmvec:        libc libm
602 libnsl:         libmd5
603 libmapid:       libresolv
604 librdc:         libsocket libnsl libnsctl libunistat libdscfg
605 libuuid:        libdlpi
606 libinetutil:    libsocket
607 libipsecutil:   libtecla libsocket
608 libinstzones:   libzonecfg libcontract
609 libpkg:         libwanboot libscf libadm
610 libnwam:        libscf
611 libsecdb:       libnsl
612 libsasl:        libgss libsocket pkcs11 libmd
613 sasl_plugins:   pkcs11 libgss libsocket libsasl
614 libsctp:        libsocket
615 libshell:       libast libcmd libdll libsocket libsecdb libm
608 libshell:       libast libcmd libdll libsocket libsecdb
616 libsip:         libmd5
617 libsmbfs:       libcmdutils libsocket libnsl libkrb5
618 libsocket:      libnsl
619 libstmfproxy:   libstmf libsocket libnsl libpthread
620 libsum:         libast
621 libsysevent:    libsecdb
622 libldap5:       libsasl libsocket libnsl libmd
623 libsldap:       libldap5 libtsol libnsl libc libscf libresolv
624 libpool:        libnvpair libexacct
625 libpp:          libast
626 libzonecfg:     libc libsocket libnsl libuuid libnvpair libsysevent libsec \
627                 libbrand libpool libscf
628 libproc:        ../cmd/sgs/librtld_db ../cmd/sgs/libelf libctf libsaveargs
629 libproject:     libpool libproc libsecdb
630 libtermcap:     libcurses
631 libtsnet:       libnsl libtsol libsecdb
632 libwrap:        libnsl libsocket
633 libwanboot:     libnvpair libresolv libnsl libsocket libdevinfo libinetutil \
634                 libdhcputil
635 libwanbootutil: libnsl
636 pam_modules:    libproject passwdutil smbsrv
637 libscf:         libuutil libmd libgen libsmbios libnsl
638 libinetsvc:     libscf
639 librestart:     libuutil libscf
640 libsaveargs:    libdisasm
641 ../cmd/sgs/libdl:       ../cmd/sgs/libconv
642 ../cmd/sgs/libelf:      ../cmd/sgs/libconv
643 pkcs11:         libcryptoutil
644 print:          libldap5
645 udapl/udapl_tavor:      udapl/libdat
646 libzfs:         libdevid libgen libnvpair libuutil \
647                 libadm libavl libefi libidmap libmd libm libzfs_core
640 libadm libavl libefi libidmap libmd libzfs_core
648 libzfs_core:    libnvpair
649 libzfs_jni:     libdiskmgt libnvpair libzfs
650 libzpool:       libavl libumem libnvpair libcmdutils
651 libsec:         libavl libidmap
```

```
652 brand:          libc libsocket
653 libshare:       libscf libzfs libuuid libfsmgt libsecdb libumem libsmbfs
654 libexacct/demo: libexacct libproject libsocket libnsl
655 libtsalarm:     libpcp
656 smbsrv:         libsocket libnsl libmd libxnet libpthread librt \
657                 libshare libidmap pkcs11 libsqlite libcryptoutil \
658                 libreparse libcmdutils
659 libv12n:        libds libuuid
660 libvrrpadm:     libsocket libdladm libscf
661 libvscan:       libscf
662 libfru:         libfruutils
663 scsi:           libnvpair libfru
664 mpapi:          libpthread libdevinfo libsysevent libnvpair
665 sun_fc:         libdevinfo libsysevent libnvpair
666 libsun_ima:     libdevinfo libsysevent libnsl
667 sun_sas:        libdevinfo libsysevent libnvpair libkstat libdevid
668 libgrubmgmt:    libdevinfo libzfs libfstyp
669 pylibbe:        libbe libzfs
670 pyzfs:          libnvpair libzfs
671 pysolaris:      libsec libidmap
672 libreparse:     libnvpair
673 libhotplug:     libnvpair
674 cfgadm_plugins: libhotplug
675 libilb:         libsocket
676 libipmi:        libm
677 libprtdiag:     libm
678 libsqlite:      libm
679 libstmf:        libm
680 libvscan:       libm


683 $(INTEL_BUILD)libdiskmgt:libfdisk

685 #
686 # The reason this rule checks for the existence of the
687 # Makefile is that some of the directories do not exist
688 # in certain situations (e.g., exportable source builds,
689 # OpenSolaris).
690 #
691 $(SUBDIRS): FRC
692         @if [ -f $@/Makefile  ]; then \
693                 cd $@; pwd; $(MAKE) $(TARGET); \
694         else \
695                 true; \
696         fi

698 $(SUBDIRS:%=%-nodepend):
699         @if [ -f $(@:%-nodepend=%)/Makefile  ]; then \
700                 cd $(@:%-nodepend=%); pwd; $(MAKE) $(TARGET); \
701         else \
702                 true; \
703         fi

705 FRC:
```

```
**********************************************************
     925 Sat May 10 12:08:44 2014
new/usr/src/lib/libm/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
#
# This file and its contents are supplied under the terms of the
# Common Development and Distribution License ("CDDL"), version 1.0.
# You may only use this file in accordance with the terms of version
# 1.0 of the CDDL.
#
# A full copy of the text of the CDDL should have accompanied this
# source.  A copy of the CDDL is also available via the Internet at
# http://www.illumos.org/license/CDDL.
#

#
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#

LIBRARY=        libm.a
VERS=           .2

# include common library definitions
include $(SRC)/lib/Makefile.lib

SUBDIRS         = $(MACH)
$(BUILD64)SUBDIRS += $(MACH64)

all     :=      TARGET= all
install :=      TARGET= install
clean   :=      TARGET= clean
clobber :=      TARGET= clobber
lint    :=      TARGET= lint

.KEEP_STATE:

.PARALLEL: $(SUBDIRS)

all clean clobber install lint: $(SUBDIRS)

$(SUBDIRS): FRC
        @cd $@; pwd; VERSION='$(VERSION)' $(MAKE) $(TARGET)

FRC:

include $(SRC)/lib/Makefile.targ
```

```
**********************************************************
   19733 Sat May 10 12:08:44 2014
new/usr/src/lib/libm/Makefile.com
#4625 add cscope.out to the .gitignore
remove -Wno-uninitialized for libm
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
#
# This file and its contents are supplied under the terms of the
# Common Development and Distribution License ("CDDL"), version 1.0.
# You may only use this file in accordance with the terms of version
# 1.0 of the CDDL.
#
# A full copy of the text of the CDDL should have accompanied this
# source.  A copy of the CDDL is also available via the Internet at
# http://www.illumos.org/license/CDDL.
#

#
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#

LIBRARY         = libm.a
VERS            = .2

LIBMDIR         = $(SRC)/lib/libm

m9xsseOBJS_i386 = \
                  __fex_hdlr.o \
                  __fex_i386.o \
                  __fex_sse.o \
                  __fex_sym.o \
                  fex_log.o

m9xsseOBJS      = $(m9xsseOBJS_$(TARGET_ARCH))

m9xOBJS_amd64   = \
                  __fex_sse.o \
                  feprec.o

m9xOBJS_sparc   = \
                  lrint.o \
                  lrintf.o \
                  lrintl.o \
                  lround.o \
                  lroundf.o \
                  lroundl.o

m9xOBJS_i386    = \
                  __fex_sse.o \
                  feprec.o \
                  lrint.o \
                  lrintf.o \
                  lrintl.o \
                  lround.o \
                  lroundf.o \
                  lroundl.o

#
# lrint.o, lrintf.o, lrintl.o, lround.o, lroundf.o & lroundl.o are 32-bit only
#
m9xOBJS         = \
                  $(m9xOBJS_$(TARGET_ARCH)) \
                  __fex_$(MACH).o \
                  __fex_hdlr.o \
```



```
                  __fex_sym.o \
                  fdim.o \
                  fdimf.o \
                  fdiml.o \
                  feexcept.o \
                  fenv.o \
                  feround.o \
                  fex_handler.o \
                  fex_log.o \
                  fma.o \
                  fmaf.o \
                  fmal.o \
                  fmax.o \
                  fmaxf.o \
                  fmaxl.o \
                  fmin.o \
                  fminf.o \
                  fminl.o \
                  frexp.o \
                  frexpf.o \
                  frexpl.o \
                  ldexp.o \
                  ldexpf.o \
                  ldexpl.o \
                  llrint.o \
                  llrintf.o \
                  llrintl.o \
                  llround.o \
                  llroundf.o \
                  llroundl.o \
                  modf.o \
                  modff.o \
                  modfl.o \
                  nan.o \
                  nanf.o \
                  nanl.o \
                  nearbyint.o \
                  nearbyintf.o \
                  nearbyintl.o \
                  nexttoward.o \
                  nexttowardf.o \
                  nexttowardl.o \
                  remquo.o \
                  remquof.o \
                  remquol.o \
                  round.o \
                  roundf.o \
                  roundl.o \
                  scalbln.o \
                  scalblnf.o \
                  scalblnl.o \
                  tgamma.o \
                  tgammaf.o \
                  tgammal.o \
                  trunc.o \
                  truncf.o \
                  truncl.o

OBJS_M9XSSE     = $(m9xsseOBJS:%=pics/%)

COBJS_i386      = \
                  __libx_errno.o

COBJS_sparc     = \
                  $(COBJS_i386) \
                  _TBL_atan.o \
```

```
125                 _TBL_exp2.o \
126                 _TBL_log.o \
127                 _TBL_log2.o \
128                 _TBL_tan.o \
129                 __tan.o \
130                 __tanf.o

132 #
133 # atan2pi.o and sincospi.o is for internal use only
134 #

136 COBJS_amd64 = \
137                 _TBL_atan.o \
138                 _TBL_exp2.o \
139                 _TBL_log.o \
140                 _TBL_log2.o \
141                 __tan.o \
142                 __tanf.o \
143                 _TBL_tan.o \
144                 copysign.o \
145                 exp.o \
146                 fabs.o \
147                 fmod.o \
148                 ilogb.o \
149                 isnan.o \
150                 nextafter.o \
151                 remainder.o \
152                 rint.o \
153                 scalbn.o

155 COBJS_sparcv9 = $(COBJS_amd64)

157 COBJS           = \
158                 $(COBJS_$(TARGET_ARCH)) \
159                 __cos.o \
160                 __lgamma.o \
161                 __rem_pio2.o \
162                 __rem_pio2m.o \
163                 __sin.o \
164                 __sincos.o \
165                 __xpg6.o \
166                 _lib_version.o \
167                 _SVID_error.o \
168                 _TBL_ipio2.o \
169                 _TBL_sin.o \
170                 acos.o \
171                 acosh.o \
172                 asin.o \
173                 asinh.o \
174                 atan.o \
175                 atan2.o \
176                 atan2pi.o \
177                 atanh.o \
178                 cbrt.o \
179                 ceil.o \
180                 cos.o \
181                 cosh.o \
182                 erf.o \
183                 exp10.o \
184                 exp2.o \
185                 expm1.o \
186                 floor.o \
187                 gamma.o \
188                 gamma_r.o \
189                 hypot.o \
190                 j0.o \
```



```
191                 j1.o \
192                 jn.o \
193                 lgamma.o \
194                 lgamma_r.o \
195                 log.o \
196                 log10.o \
197                 log1p.o \
198                 log2.o \
199                 logb.o \
200                 matherr.o \
201                 pow.o \
202                 scalb.o \
203                 signgam.o \
204                 significand.o \
205                 sin.o \
206                 sincos.o \
207                 sincospi.o \
208                 sinh.o \
209                 sqrt.o \
210                 tan.o \
211                 tanh.o

213 #
214 # LSARC/2003/658 adds isnanl
215 #
216 QOBJS_sparc     = \
217                 _TBL_atanl.o \
218                 _TBL_expl.o \
219                 _TBL_expm1l.o \
220                 _TBL_logl.o \
221                 finitel.o \
222                 isnanl.o

224 QOBJS_sparcv9   = $(QOBJS_sparc)

226 QOBJS_amd64     = \
227                 finitel.o \
228                 isnanl.o

230 #
231 # atan2pil.o, ieee_funcl.o, rndintl.o, sinpil.o, sincospil.o
232 # are for internal use only
233 #
234 # LSARC/2003/279 adds the following:
235 #               gammal.o        1
236 #               gammal_r.o      1
237 #               j0l.o           2
238 #               j1l.o           2
239 #               jnl.o           2
240 #               lgammal_r.o     1
241 #               scalbl.o        1
242 #               significandl.o  1
243 #
244 QOBJS           = \
245                 $(QOBJS_$(TARGET_ARCH)) \
246                 __cosl.o \
247                 __lgammal.o \
248                 __poly_libmq.o \
249                 __rem_pio2l.o \
250                 __sincosl.o \
251                 __sinl.o \
252                 __tanl.o \
253                 _TBL_cosl.o \
254                 _TBL_ipio2l.o \
255                 _TBL_sinl.o \
256                 _TBL_tanl.o \
```

```
257                 acoshl.o \
258                 acosl.o \
259                 asinhl.o \
260                 asinl.o \
261                 atan2l.o \
262                 atan2pil.o \
263                 atanhl.o \
264                 atanl.o \
265                 cbrtl.o \
266                 copysignl.o \
267                 coshl.o \
268                 cosl.o \
269                 erfl.o \
270                 exp10l.o \
271                 exp2l.o \
272                 expl.o \
273                 expm1l.o \
274                 fabsl.o \
275                 floorl.o \
276                 fmodl.o \
277                 gammal.o \
278                 gammal_r.o \
279                 hypotl.o \
280                 ieee_funcl.o \
281                 ilogbl.o \
282                 j0l.o \
283                 j1l.o \
284                 jnl.o \
285                 lgammal.o \
286                 lgammal_r.o \
287                 log10l.o \
288                 log1pl.o \
289                 log2l.o \
290                 logbl.o \
291                 logl.o \
292                 nextafterl.o \
293                 powl.o \
294                 remainderl.o \
295                 rintl.o \
296                 rndintl.o \
297                 scalbl.o \
298                 scalbnl.o \
299                 signgaml.o \
300                 significandl.o \
301                 sincosl.o \
302                 sincospil.o \
303                 sinhl.o \
304                 sinl.o \
305                 sinpil.o \
306                 sqrtl.o \
307                 tanhl.o \
308                 tanl.o

310 #
311 # LSARC/2003/658 adds isnanf
312 #
313 ROBJS_sparc     = \
314                 __cosf.o \
315                 __sincosf.o \
316                 __sinf.o \
317                 isnanf.o

319 ROBJS_sparcv9   = $(ROBJS_sparc)

321 ROBJS_amd64     = \
322                 isnanf.o \
```



```
323                 __cosf.o \
324                 __sincosf.o \
325                 __sinf.o

327 #
328 # atan2pif.o, sincosf.o, sincospif.o are for internal use only
329 #
330 # LSARC/2003/279 adds the following:
331 #                 besself.o       6
332 #                 scalbf.o        1
333 #                 gammaf.o        1
334 #                 gammaf_r.o      1
335 #                 lgammaf_r.o     1
336 #                 significandf.o  1
337 #
338 ROBJS           = \
339                 $(ROBJS_$(TARGET_ARCH)) \
340                 _TBL_r_atan_.o \
341                 acosf.o \
342                 acoshf.o \
343                 asinf.o \
344                 asinhf.o \
345                 atan2f.o \
346                 atan2pif.o \
347                 atanf.o \
348                 atanhf.o \
349                 besself.o \
350                 cbrtf.o \
351                 copysignf.o \
352                 cosf.o \
353                 coshf.o \
354                 erff.o \
355                 exp10f.o \
356                 exp2f.o \
357                 expf.o \
358                 expm1f.o \
359                 fabsf.o \
360                 floorf.o \
361                 fmodf.o \
362                 gammaf.o \
363                 gammaf_r.o \
364                 hypotf.o \
365                 ilogbf.o \
366                 lgammaf.o \
367                 lgammaf_r.o \
368                 log10f.o \
369                 log1pf.o \
370                 log2f.o \
371                 logbf.o \
372                 logf.o \
373                 nextafterf.o \
374                 powf.o \
375                 remainderf.o \
376                 rintf.o \
377                 scalbf.o \
378                 scalbnf.o \
379                 signgamf.o \
380                 significandf.o \
381                 sinf.o \
382                 sinhf.o \
383                 sincosf.o \
384                 sincospif.o \
385                 sqrtf.o \
386                 tanf.o \
387                 tanhf.o
```

```
389 #
390 # LSARC/2003/658 adds isnanf/isnanl
391 #

393 SOBJS_sparc     = \
394                 copysign.o \
395                 exp.o \
396                 fabs.o \
397                 fmod.o \
398                 ilogb.o \
399                 isnan.o \
400                 nextafter.o \
401                 remainder.o \
402                 rint.o \
403                 scalbn.o

405 SOBJS_i386      = \
406                 __reduction.o \
407                 finitef.o \
408                 finitel.o \
409                 isnanf.o \
410                 isnanl.o \
411                 $(SOBJS_sparc)

413 SOBJS_amd64     = \
414                 __swapFLAGS.o
415 #               _xtoll.o \
416 #               _xtoull.o \


419 SOBJS           = \
420                 $(SOBJS_$(TARGET_ARCH))

422 complexOBJS     = \
423                 cabs.o \
424                 cabsf.o \
425                 cabsl.o \
426                 cacos.o \
427                 cacosf.o \
428                 cacosh.o \
429                 cacoshf.o \
430                 cacoshl.o \
431                 cacosl.o \
432                 carg.o \
433                 cargf.o \
434                 cargl.o \
435                 casin.o \
436                 casinf.o \
437                 casinh.o \
438                 casinhf.o \
439                 casinhl.o \
440                 casinl.o \
441                 catan.o \
442                 catanf.o \
443                 catanh.o \
444                 catanhf.o \
445                 catanhl.o \
446                 catanl.o \
447                 ccos.o \
448                 ccosf.o \
449                 ccosh.o \
450                 ccoshf.o \
451                 ccoshl.o \
452                 ccosl.o \
453                 cexp.o \
454                 cexpf.o \
```



```
455                 cexpl.o \
456                 cimag.o \
457                 cimagf.o \
458                 cimagl.o \
459                 clog.o \
460                 clogf.o \
461                 clogl.o \
462                 conj.o \
463                 conjf.o \
464                 conjl.o \
465                 cpow.o \
466                 cpowf.o \
467                 cpowl.o \
468                 cproj.o \
469                 cprojf.o \
470                 cprojl.o \
471                 creal.o \
472                 crealf.o \
473                 creall.o \
474                 csin.o \
475                 csinf.o \
476                 csinh.o \
477                 csinhf.o \
478                 csinhl.o \
479                 csinl.o \
480                 csqrt.o \
481                 csqrtf.o \
482                 csqrtl.o \
483                 ctan.o \
484                 ctanf.o \
485                 ctanh.o \
486                 ctanhf.o \
487                 ctanhl.o \
488                 ctanl.o \
489                 k_atan2.o \
490                 k_atan2l.o \
491                 k_cexp.o \
492                 k_cexpl.o \
493                 k_clog_r.o \
494                 k_clog_rl.o

496 OBJECTS         = $(COBJS) $(ROBJS) $(QOBJS) $(SOBJS) $(m9xOBJS) $(complexOBJS)

498 include         $(SRC)/lib/Makefile.lib
499 include         $(LIBMDIR)/Makefile.libm.com
500 include         $(SRC)/lib/Makefile.rootfs

502 SRCDIR          = ../common/
503 LIBS            = $(DYNLIB) $(LINTLIB)

505 LINTERROFF      = -erroff=E_FUNC_SET_NOT_USED
506 LINTERROFF      += -erroff=E_FUNC_RET_ALWAYS_IGNOR2
507 LINTERROFF      += -erroff=E_FUNC_RET_MAYBE_IGNORED2
508 LINTERROFF      += -erroff=E_IMPL_CONV_RETURN
509 LINTERROFF      += -erroff=E_NAME_MULTIPLY_DEF2
510 LINTFLAGS       += $(LINTERROFF)
511 LINTFLAGS64     += $(LINTERROFF)
512 LINTFLAGS64     += -errchk=longptr64

514 CERRWARN        += -_gcc=-Wno-switch
515 CERRWARN        += -_gcc=-Wno-parentheses
516 CERRWARN        += -_gcc=-Wno-unused-variable

518 CPPFLAGS        += -DLIBM_BUILD

520 CFLAGS          += $(C_BIGPICFLAGS)
```

```
CFLAGS64        += $(C_BIGPICFLAGS)

m9x_IL          = $(LIBMDIR)/common/m9x/__fenv_$(TARGET_ARCH).il

SRCS_LD_i386_amd64 = \
        ../common/LD/finitel.c \
        ../common/LD/isnanl.c \
        ../common/LD/nextafterl.c

SRCS_LD = \
        $(SRCS_LD_i386_$(TARGET_ARCH)) \
        ../common/LD/__cosl.c \
        ../common/LD/__lgammal.c \
        ../common/LD/__poly_libmq.c \
        ../common/LD/__rem_pio2l.c \
        ../common/LD/__sincosl.c \
        ../common/LD/__sinl.c \
        ../common/LD/__tanl.c \
        ../common/LD/_TBL_cosl.c \
        ../common/LD/_TBL_ipio2l.c \
        ../common/LD/_TBL_sinl.c \
        ../common/LD/_TBL_tanl.c \
        ../common/LD/acoshl.c \
        ../common/LD/asinhl.c \
        ../common/LD/atan2pil.c \
        ../common/LD/atanhl.c \
        ../common/LD/cbrtl.c \
        ../common/LD/coshl.c \
        ../common/LD/cosl.c \
        ../common/LD/erfl.c \
        ../common/LD/gammal.c \
        ../common/LD/gammal_r.c \
        ../common/LD/hypotl.c \
        ../common/LD/j0l.c \
        ../common/LD/j1l.c \
        ../common/LD/jnl.c \
        ../common/LD/lgammal.c \
        ../common/LD/lgammal_r.c \
        ../common/LD/log1pl.c \
        ../common/LD/logbl.c \
        ../common/LD/scalbl.c \
        ../common/LD/signgaml.c \
        ../common/LD/significandl.c \
        ../common/LD/sincosl.c \
        ../common/LD/sincospil.c \
        ../common/LD/sinhl.c \
        ../common/LD/sinl.c \
        ../common/LD/sinpil.c \
        ../common/LD/tanhl.c \
        ../common/LD/tanl.c

SRCS_LD_i386 = \
        $(SRCS_LD)

SRCS_R_amd64 = \
        ../common/R/__tanf.c \
        ../common/R/isnanf.c \
        ../common/R/__cosf.c \
        ../common/R/__sincosf.c \
        ../common/R/__sinf.c \
        ../common/R/acosf.c \
        ../common/R/asinf.c \
        ../common/R/atan2f.c \
        ../common/R/copysignf.c \
        ../common/R/exp10f.c \
        ../common/R/exp2f.c \
```



```
        ../common/R/expm1f.c \
        ../common/R/fabsf.c \
        ../common/R/hypotf.c \
        ../common/R/ilogbf.c \
        ../common/R/log10f.c \
        ../common/R/log2f.c \
        ../common/R/nextafterf.c \
        ../common/R/powf.c \
        ../common/R/rintf.c \
        ../common/R/scalbnf.c

# sparc + sparcv9
SRCS_R_sparc = \
        ../common/R/__tanf.c \
        ../common/R/__cosf.c \
        ../common/R/__sincosf.c \
        ../common/R/__sinf.c \
        ../common/R/isnanf.c \
        ../common/R/acosf.c \
        ../common/R/asinf.c \
        ../common/R/atan2f.c \
        ../common/R/copysignf.c \
        ../common/R/exp10f.c \
        ../common/R/exp2f.c \
        ../common/R/expm1f.c \
        ../common/R/fabsf.c \
        ../common/R/fmodf.c \
        ../common/R/hypotf.c \
        ../common/R/ilogbf.c \
        ../common/R/log10f.c \
        ../common/R/log2f.c \
        ../common/R/nextafterf.c \
        ../common/R/powf.c \
        ../common/R/remainderf.c \
        ../common/R/rintf.c \
        ../common/R/scalbnf.c

SRCS_R = \
        $(SRCS_R_$(MACH)) \
        $(SRCS_R_$(TARGET_ARCH)) \
        ../common/R/_TBL_r_atan_.c \
        ../common/R/acoshf.c \
        ../common/R/asinhf.c \
        ../common/R/atan2pif.c \
        ../common/R/atanf.c \
        ../common/R/atanhf.c \
        ../common/R/besself.c \
        ../common/R/cbrtf.c \
        ../common/R/cosf.c \
        ../common/R/coshf.c \
        ../common/R/erff.c \
        ../common/R/expf.c \
        ../common/R/floorf.c \
        ../common/R/gammaf.c \
        ../common/R/gammaf_r.c \
        ../common/R/lgammaf.c \
        ../common/R/lgammaf_r.c \
        ../common/R/log1pf.c \
        ../common/R/logbf.c \
        ../common/R/logf.c \
        ../common/R/scalbf.c \
        ../common/R/signgamf.c \
        ../common/R/significandf.c \
        ../common/R/sinf.c \
        ../common/R/sinhf.c \
        ../common/R/sincosf.c \
```

```
653         ../common/R/sincospif.c \
654         ../common/R/sqrtf.c \
655         ../common/R/tanf.c \
656         ../common/R/tanhf.c

658 SRCS_Q = \
659         ../common/Q/_TBL_atanl.c \
660         ../common/Q/_TBL_expl.c \
661         ../common/Q/_TBL_expm1l.c \
662         ../common/Q/_TBL_logl.c \
663         ../common/Q/finitel.c \
664         ../common/Q/isnanl.c \
665         ../common/Q/__cosl.c \
666         ../common/Q/__lgammal.c \
667         ../common/Q/__poly_libmq.c \
668         ../common/Q/__rem_pio2l.c \
669         ../common/Q/__sincosl.c \
670         ../common/Q/__sinl.c \
671         ../common/Q/__tanl.c \
672         ../common/Q/_TBL_cosl.c \
673         ../common/Q/_TBL_ipio2l.c \
674         ../common/Q/_TBL_sinl.c \
675         ../common/Q/_TBL_tanl.c \
676         ../common/Q/acoshl.c \
677         ../common/Q/acosl.c \
678         ../common/Q/asinhl.c \
679         ../common/Q/asinl.c \
680         ../common/Q/atan2l.c \
681         ../common/Q/atan2pil.c \
682         ../common/Q/atanhl.c \
683         ../common/Q/atanl.c \
684         ../common/Q/cbrtl.c \
685         ../common/Q/copysignl.c \
686         ../common/Q/coshl.c \
687         ../common/Q/cosl.c \
688         ../common/Q/erfl.c \
689         ../common/Q/exp10l.c \
690         ../common/Q/exp2l.c \
691         ../common/Q/expl.c \
692         ../common/Q/expm1l.c \
693         ../common/Q/fabsl.c \
694         ../common/Q/floorl.c \
695         ../common/Q/fmodl.c \
696         ../common/Q/gammal.c \
697         ../common/Q/gammal_r.c \
698         ../common/Q/hypotl.c \
699         ../common/Q/ieee_funcl.c \
700         ../common/Q/ilogbl.c \
701         ../common/Q/j0l.c \
702         ../common/Q/j1l.c \
703         ../common/Q/jnl.c \
704         ../common/Q/lgammal.c \
705         ../common/Q/lgammal_r.c \
706         ../common/Q/log10l.c \
707         ../common/Q/log1pl.c \
708         ../common/Q/log2l.c \
709         ../common/Q/logbl.c \
710         ../common/Q/logl.c \
711         ../common/Q/nextafterl.c \
712         ../common/Q/powl.c \
713         ../common/Q/remainderl.c \
714         ../common/Q/rintl.c \
715         ../common/Q/rndintl.c \
716         ../common/Q/scalbl.c \
717         ../common/Q/scalbnl.c \
718         ../common/Q/signgaml.c \
```



```
719         ../common/Q/significandl.c \
720         ../common/Q/sincosl.c \
721         ../common/Q/sincospil.c \
722         ../common/Q/sinhl.c \
723         ../common/Q/sinl.c \
724         ../common/Q/sinpil.c \
725         ../common/Q/sqrtl.c \
726         ../common/Q/tanhl.c \
727         ../common/Q/tanl.c

729 SRCS_Q_sparc = \
730         $(SRCS_Q)

732 SRCS_complex = \
733         ../common/complex/cabs.c \
734         ../common/complex/cabsf.c \
735         ../common/complex/cabsl.c \
736         ../common/complex/cacos.c \
737         ../common/complex/cacosf.c \
738         ../common/complex/cacosh.c \
739         ../common/complex/cacoshf.c \
740         ../common/complex/cacoshl.c \
741         ../common/complex/cacosl.c \
742         ../common/complex/carg.c \
743         ../common/complex/cargf.c \
744         ../common/complex/cargl.c \
745         ../common/complex/casin.c \
746         ../common/complex/casinf.c \
747         ../common/complex/casinh.c \
748         ../common/complex/casinhf.c \
749         ../common/complex/casinhl.c \
750         ../common/complex/casinl.c \
751         ../common/complex/catan.c \
752         ../common/complex/catanf.c \
753         ../common/complex/catanh.c \
754         ../common/complex/catanhf.c \
755         ../common/complex/catanhl.c \
756         ../common/complex/catanl.c \
757         ../common/complex/ccos.c \
758         ../common/complex/ccosf.c \
759         ../common/complex/ccosh.c \
760         ../common/complex/ccoshf.c \
761         ../common/complex/ccoshl.c \
762         ../common/complex/ccosl.c \
763         ../common/complex/cexp.c \
764         ../common/complex/cexpf.c \
765         ../common/complex/cexpl.c \
766         ../common/complex/cimag.c \
767         ../common/complex/cimagf.c \
768         ../common/complex/cimagl.c \
769         ../common/complex/clog.c \
770         ../common/complex/clogf.c \
771         ../common/complex/clogl.c \
772         ../common/complex/conj.c \
773         ../common/complex/conjf.c \
774         ../common/complex/conjl.c \
775         ../common/complex/cpow.c \
776         ../common/complex/cpowf.c \
777         ../common/complex/cpowl.c \
778         ../common/complex/cproj.c \
779         ../common/complex/cprojf.c \
780         ../common/complex/cprojl.c \
781         ../common/complex/creal.c \
782         ../common/complex/crealf.c \
783         ../common/complex/creall.c \
784         ../common/complex/csin.c \
```

```
785         ../common/complex/csinf.c \
786         ../common/complex/csinh.c \
787         ../common/complex/csinhf.c \
788         ../common/complex/csinhl.c \
789         ../common/complex/csinl.c \
790         ../common/complex/csqrt.c \
791         ../common/complex/csqrtf.c \
792         ../common/complex/csqrtl.c \
793         ../common/complex/ctan.c \
794         ../common/complex/ctanf.c \
795         ../common/complex/ctanh.c \
796         ../common/complex/ctanhf.c \
797         ../common/complex/ctanhl.c \
798         ../common/complex/ctanl.c \
799         ../common/complex/k_atan2.c \
800         ../common/complex/k_atan2l.c \
801         ../common/complex/k_cexp.c \
802         ../common/complex/k_cexpl.c \
803         ../common/complex/k_clog_r.c \
804         ../common/complex/k_clog_rl.c

806 SRCS_m9x_i386 = \
807         ../common/m9x/__fex_sse.c \
808         ../common/m9x/feprec.c \
809         ../common/m9x/__fex_i386.c

811 SRCS_m9x_i386_i386 = \
812         ../common/m9x/lroundf.c

814 SRCS_m9x_i386_amd64 = \
815         ../common/m9x/llrint.c \
816         ../common/m9x/llrintf.c \
817         ../common/m9x/llrintl.c \
818         ../common/m9x/nexttowardl.c \
819         ../common/m9x/remquo.c \
820         ../common/m9x/remquof.c \
821         ../common/m9x/round.c \
822         ../common/m9x/roundl.c \
823         ../common/m9x/scalbln.c \
824         ../common/m9x/scalblnf.c \
825         ../common/m9x/scalblnl.c \
826         ../common/m9x/trunc.c \
827         ../common/m9x/truncl.c

829 # sparc
830 SRCS_m9x_sparc_sparc = \
831         ../common/m9x/lrint.c \
832         ../common/m9x/lrintf.c \
833         ../common/m9x/lrintl.c \
834         ../common/m9x/lround.c \
835         ../common/m9x/lroundf.c \
836         ../common/m9x/lroundl.c

838 SRCS_m9x_sparc = \
839         ../common/m9x/__fex_sparc.c \
840         ../common/m9x/llrint.c \
841         ../common/m9x/llrintf.c \
842         ../common/m9x/llrintl.c \
843         ../common/m9x/nexttowardl.c \
844         ../common/m9x/remquo.c \
845         ../common/m9x/remquof.c \
846         ../common/m9x/remquol.c \
847         ../common/m9x/round.c \
848         ../common/m9x/roundl.c \
849         ../common/m9x/scalbln.c \
850         ../common/m9x/scalblnf.c \
```



```
851         ../common/m9x/scalblnl.c \
852         ../common/m9x/trunc.c \
853         ../common/m9x/truncl.c

855 SRCS_m9x = \
856         $(SRCS_m9x_$(MACH)) \
857         $(SRCS_m9x_sparc_$(TARGET_ARCH)) \
858         $(SRCS_m9x_i386_$(TARGET_ARCH)) \
859         ../common/m9x/__fex_hdlr.c \
860         ../common/m9x/__fex_sym.c \
861         ../common/m9x/fdim.c \
862         ../common/m9x/fdimf.c \
863         ../common/m9x/fdiml.c \
864         ../common/m9x/feexcept.c \
865         ../common/m9x/fenv.c \
866         ../common/m9x/feround.c \
867         ../common/m9x/fex_handler.c \
868         ../common/m9x/fex_log.c \
869         ../common/m9x/fma.c \
870         ../common/m9x/fmaf.c \
871         ../common/m9x/fmal.c \
872         ../common/m9x/fmax.c \
873         ../common/m9x/fmaxf.c \
874         ../common/m9x/fmaxl.c \
875         ../common/m9x/fmin.c \
876         ../common/m9x/fminf.c \
877         ../common/m9x/fminl.c \
878         ../common/m9x/frexp.c \
879         ../common/m9x/frexpf.c \
880         ../common/m9x/frexpl.c \
881         ../common/m9x/ldexp.c \
882         ../common/m9x/ldexpf.c \
883         ../common/m9x/ldexpl.c \
884         ../common/m9x/llround.c \
885         ../common/m9x/llroundf.c \
886         ../common/m9x/llroundl.c \
887         ../common/m9x/modf.c \
888         ../common/m9x/modff.c \
889         ../common/m9x/modfl.c \
890         ../common/m9x/nan.c \
891         ../common/m9x/nanf.c \
892         ../common/m9x/nanl.c \
893         ../common/m9x/nearbyint.c \
894         ../common/m9x/nearbyintf.c \
895         ../common/m9x/nearbyintl.c \
896         ../common/m9x/nexttoward.c \
897         ../common/m9x/nexttowardf.c \
898         ../common/m9x/roundf.c \
899         ../common/m9x/tgamma.c \
900         ../common/m9x/tgammaf.c \
901         ../common/m9x/tgammal.c \
902         ../common/m9x/truncf.c

904 SRCS_C_sparc = \
905         ../common/C/__tan.c \
906         ../common/C/_TBL_atan.c \
907         ../common/C/_TBL_exp2.c \
908         ../common/C/_TBL_log.c \
909         ../common/C/_TBL_log2.c \
910         ../common/C/_TBL_tan.c \
911         ../common/C/acos.c \
912         ../common/C/asin.c \
913         ../common/C/atan.c \
914         ../common/C/atan2.c \
915         ../common/C/ceil.c \
916         ../common/C/cos.c \
```

```
917         ../common/C/exp.c \
918         ../common/C/exp10.c \
919         ../common/C/exp2.c \
920         ../common/C/expm1.c \
921         ../common/C/floor.c \
922         ../common/C/fmod.c \
923         ../common/C/hypot.c \
924         ../common/C/ilogb.c \
925         ../common/C/isnan.c \
926         ../common/C/log.c \
927         ../common/C/log10.c \
928         ../common/C/log2.c \
929         ../common/C/pow.c \
930         ../common/C/remainder.c \
931         ../common/C/rint.c \
932         ../common/C/scalbn.c \
933         ../common/C/sin.c \
934         ../common/C/sincos.c \
935         ../common/C/tan.c

937 SRCS_i386_i386  = \
938         ../common/C/__libx_errno.c

940 SRCS_sparc_sparc = \
941         $(SRCS_i386_i386)

943 SRCS_sparc_sparcv9 = \
944         ../common/C/copysign.c \
945         ../common/C/fabs.c \
946         ../common/C/nextafter.c

948 SRCS_i386_amd64 = \
949         ../common/C/_TBL_atan.c \
950         ../common/C/_TBL_exp2.c \
951         ../common/C/_TBL_log.c \
952         ../common/C/_TBL_log2.c \
953         ../common/C/__tan.c \
954         ../common/C/_TBL_tan.c \
955         ../common/C/copysign.c \
956         ../common/C/exp.c \
957         ../common/C/fabs.c \
958         ../common/C/ilogb.c \
959         ../common/C/isnan.c \
960         ../common/C/nextafter.c \
961         ../common/C/rint.c \
962         ../common/C/scalbn.c \
963         ../common/C/acos.c \
964         ../common/C/asin.c \
965         ../common/C/atan.c \
966         ../common/C/atan2.c \
967         ../common/C/ceil.c \
968         ../common/C/cos.c \
969         ../common/C/exp10.c \
970         ../common/C/exp2.c \
971         ../common/C/expm1.c \
972         ../common/C/floor.c \
973         ../common/C/hypot.c \
974         ../common/C/log.c \
975         ../common/C/log10.c \
976         ../common/C/log2.c \
977         ../common/C/pow.c \
978         ../common/C/sin.c \
979         ../common/C/sincos.c \
980         ../common/C/tan.c

982 SRCS_C = \
```



```
983         $(SRCS_C_$(MACH)) \
984         $(SRCS_C_i386_$(TARGET_ARCH)) \
985         ../common/C/__cos.c \
986         ../common/C/__lgamma.c \
987         ../common/C/__rem_pio2.c \
988         ../common/C/__rem_pio2m.c \
989         ../common/C/__sin.c \
990         ../common/C/__sincos.c \
991         ../common/C/__xpg6.c \
992         ../common/C/_lib_version.c \
993         ../common/C/_SVID_error.c \
994         ../common/C/_TBL_ipio2.c \
995         ../common/C/_TBL_sin.c \
996         ../common/C/acosh.c \
997         ../common/C/asinh.c \
998         ../common/C/atan2pi.c \
999         ../common/C/atanh.c \
1000        ../common/C/cbrt.c \
1001        ../common/C/cosh.c \
1002        ../common/C/erf.c \
1003        ../common/C/gamma.c \
1004        ../common/C/gamma_r.c \
1005        ../common/C/j0.c \
1006        ../common/C/j1.c \
1007        ../common/C/jn.c \
1008        ../common/C/lgamma.c \
1009        ../common/C/lgamma_r.c \
1010        ../common/C/log1p.c \
1011        ../common/C/logb.c \
1012        ../common/C/matherr.c \
1013        ../common/C/scalb.c \
1014        ../common/C/signgam.c \
1015        ../common/C/significand.c \
1016        ../common/C/sincospi.c \
1017        ../common/C/sinh.c \
1018        ../common/C/sqrt.c \
1019        ../common/C/tanh.c

1021 SRCS    = \
1022        $(SRCS_Q_$(MACH)) \
1023        $(SRCS_LD_$(MACH)) \
1024        $(SRCS_R) \
1025        $(SRCS_complex) \
1026        $(SRCS_C)

1028 .KEEP_STATE:

1030 all:    $(LIBS)

1032 lint:   lintcheck
```

```
**********************************************************
    2735 Sat May 10 12:08:44 2014
new/usr/src/lib/libm/Makefile.libm.com
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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#

LIBMDIR         = $(SRC)/lib/libm

LIBMSRC         = $(LIBMDIR)/common

CPP_CMD         = $(CC) -E -Xs

ASSUFFIX_sparc  = S
ASSUFFIX_i386   = s
ASSUFFIX        = $(ASSUFFIX_$(MACH))

# C99MODE of neither enabled nor disabled is "no_lib", whereby we expect
# C99-the-language, but don't modify the behaviour of library routines.  This
# is VERY IMPORTANT, as -xc99=%all, for instance, would link us with
# values-xpg6, which would introduce an __xpg6 to our object with the C99
# flags set, causing us to default C99 libm behaviour on, breaking
# compatibility.
C99MODE         =

M4FLAGS         = -D__STDC__ -DELFOBJ -DPIC

LDBLDIR_sparc   = Q
LDBLDIR_i386    = LD
LDBLDIR         = $(LDBLDIR_$(MACH))

LM_IL           = $(LIBMDIR)/$(TARGET_ARCH)/src/locallibm.il

CFLAGS          += $(C_PICFLAGS) -D__INLINE $(XSTRCONST) $(LM_IL)
CFLAGS64        += $(C_PICFLAGS) -D__INLINE $(XSTRCONST) $(LM_IL)
sparc_CFLAGS    += -Wa,-xarch=v8plus

CPPFLAGS        += -DELFOBJ \
                -DLIBM_MT_FEX_SYNC \
                -I$(LIBMSRC)/C \
                -I$(LIBMSRC)/$(LDBLDIR) -I$(LIBMDIR)/$(TARGET_ARCH)/src

# GCC needs __C99FEATURES__ such that the implementations of isunordered,
# isgreaterequal, islessequal, etc, exist.  This is basically equivalent to
# providing no -xc99 to Studio, in that it gets us the C99 language features,
# but not values-xpg6, the reason for which is outline with C99MODE.
CFLAGS          += -_gcc=-D__C99FEATURES__
CFLAGS64        += -_gcc=-D__C99FEATURES__

# libm depends on integer overflow characteristics
CFLAGS          += -_gcc=-fno-strict-overflow
CFLAGS64        += -_gcc=-fno-strict-overflow
```



```
$(DYNLIB)       := LDLIBS += -lc

$(LINTLIB)      := SRCS = $(LIBMSRC)/$(LINTSRC)

CLEANFILES      += pics/*.s pics/*.S

FPDEF_amd64     = -DARCH_amd64
FPDEF_sparc     = -DCG89 -DARCH_v8plus -DFPADD_TRAPS_INCOMPLETE_ON_NAN
FPDEF_sparcv9   = -DARCH_v9 -DFPADD_TRAPS_INCOMPLETE_ON_NAN
FPDEF           = $(FPDEF_$(TARGET_ARCH))

ASFLAGS         = -P -D_ASM $(FPDEF)

XARCH_sparc     = v8plus
XARCH_sparcv9   = v9
XARCH_i386      = f80387
XARCH_amd64     = amd64
XARCH           = $(XARCH_$(TARGET_ARCH))

ASOPT_sparc     = -xarch=$(XARCH) $(AS_PICFLAGS)
ASOPT_sparcv9   = -xarch=$(XARCH) $(AS_PICFLAGS)
ASOPT_i386      =
ASOPT_amd64     = -xarch=$(XARCH) $(AS_PICFLAGS)
ASOPT           = $(ASOPT_$(TARGET_ARCH))

ASFLAGS         += $(ASOPT)

CPPFLAGS_sparc = -DFPADD_TRAPS_INCOMPLETE_ON_NAN \
        -DFDTOS_TRAPS_INCOMPLETE_IN_FNS_MODE

CPPFLAGS        += $(CPPFLAGS_$(MACH))
ASFLAGS         += $(CPPFLAGS)
```

****
1119 Sat May 10 12:08:44 2014
new/usr/src/lib/libm/Makefile.targ
patch01 - 693 import Sun Devpro Math Library
****

```
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#

pics/%.o: $(LIBMDIR)/$(TARGETMACH)/src/%.$(ASSUFFIX)
        $(COMPILE.s) -o $@ $<
        $(POST_PROCESS_O)

pics/%.o: $(SRCDIR)/C/%.c $(LM_IL)
        $(COMPILE.c) -o $@ $<
        $(POST_PROCESS_O)

pics/%.o: $(SRCDIR)/$(LDBLDIR)/%.c $(LM_IL)
        $(COMPILE.c) -o $@ $<
        $(POST_PROCESS_O)

pics/%.o: $(SRCDIR)/R/%.c $(LM_IL)
        $(COMPILE.c) -o $@ $<
        $(POST_PROCESS_O)

pics/%.o: $(SRCDIR)/complex/%.c $(LM_IL)
        $(COMPILE.c) -o $@ $<
        $(POST_PROCESS_O)

pics/%.o: $(SRCDIR)/m9x/%.c $(LM_IL) $(m9x_IL)
        $(COMPILE.c) $(m9x_IL) -o $@ $<
        $(POST_PROCESS_O)

$(ROOTLIBDIR): $(ROOTFS_LIBDIR)
        $(INS.dir)

$(ROOTLIBDIR64): $(ROOTFS_LIBDIR64)
        $(INS.dir)

include $(SRC)/lib/Makefile.targ
```

****
616 Sat May 10 12:08:44 2014
new/usr/src/lib/libm/amd64/Makefile
patch01 - 693 import Sun Devpro Math Library
****

```
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#

TARGET_ARCH=    amd64
include ../Makefile.com
include $(SRC)/lib/Makefile.lib.64

install: all $(ROOTLIBS64) $(ROOTLINKS64)

include ../Makefile.targ
```

```
**********************************************************
    3717 Sat May 10 12:08:44 2014
new/usr/src/lib/libm/amd64/src/__swapFLAGS.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "__swapFLAGS.s"

#include "libm.h"
#include "libm_synonyms.h"

/*
 * swap exception masks
 *
 * Put the complement of bits 5-0 of the argument into FPCW bits 5-0
 * and MXCSR bits 12-7, return the complement of the previous FPCW
 * bits 5-0.
 */
        ENTRY(__swapTE)         / di <-- NOT(desired xcptn_masks)
        subq    $8,%rsp
        fstcw   (%rsp)          / push current_cw on '86 stack
        movq    (%rsp),%rcx     / cx <-- current_cw
        movw    %cx,%ax         / ax <-- current_cw
        orw     $0x3f,%cx       / cx <-- current_cw, but masking all xcptns
        andw    $0x3f,%di       / make sure bits > B5 are all zero
        xorw    %di,%cx         / cx <-- present_cw, with new xcptn_masks
        movw    %cx,(%rsp)
        fldcw   (%rsp)          / load new cw
        stmxcsr (%rsp)
        movq    (%rsp),%rcx
        orw     $0x1f80,%cx     / cx <-- current mxcsr, but masking all xcptns
        shlw    $7,%di
        xorw    %di,%cx         / cx <-- present mxcsr, with new xcptn_masks
        movq    %rcx,(%rsp)
        ldmxcsr (%rsp)
        andq    $0x3f,%rax      / al[5..0] <-- former xcptn_masks
        xorq    $0x3f,%rax      / al[5..0] <-- NOT(former xcptn_masks)
        addq    $8,%rsp
        ret
```



```
        .align  16
        SET_SIZE(__swapTE)

/*
 * swap exception flags
 *
 * Put bits 5-0 of the argument into FPSW bits 5-0 and MXCSR bits 5-0,
 * return the "or" of the previous FPSW bits 5-0 and MXCSR bits 5-0.
 */
        ENTRY(__swapEX)
        fstsw   %ax             / ax = sw
        andq    $0x3f,%rdi
        jnz     .L1
                                / input ex=0, clear all exception
        fnclex
        subq    $8,%rsp
        stmxcsr (%rsp)
        movq    (%rsp),%rcx
        orw     %cx,%ax
        andw    $0xffc0,%cx
        movq    %rcx,(%rsp)
        ldmxcsr (%rsp)
        andq    $0x3f,%rax
        addq    $8,%rsp
        ret
.L1:
                                / input ex !=0, use fnstenv and fldenv
        subq    $32,%rsp        / only needed 28
        fnstenv (%rsp)
        movw    %ax,%dx
        andw    $0xffc0,%dx
        orw     %cx,%dx
        movw    %dx,4(%rsp)     / replace old sw by new one
        fldenv  (%rsp)
        stmxcsr (%rsp)
        movq    (%rsp),%rdx
        orw     %dx,%ax
        andw    $0xffc0,%dx
        orw     %cx,%dx
        movq    %rdx,(%rsp)
        ldmxcsr (%rsp)
        andq    $0x3f,%rax
        addq    $32,%rsp
        ret
        .align  16
        SET_SIZE(__swapEX)

/*
 * swap rounding precision
 *
 * Put bits 1-0 of the argument into FPCW bits 9-8, return the
 * previous FPCW bits 9-8.
 */
        ENTRY(__swapRP)
        subq    $8,%rsp
        fstcw   (%rsp)
        movw    (%rsp),%ax
        movw    %ax,%cx
        andw    $0xfcff,%cx
        andq    $0x3,%rdi
        shlw    $8,%di
        orw     %di,%cx
        movq    %rcx,(%rsp)
        fldcw   (%rsp)
        shrw    $8,%ax
        andq    $0x3,%rax
```

```
128         addq    $8,%rsp
129         ret
130         .align  16
131         SET_SIZE(__swapRP)

133 /*
134  * swap rounding direction
135  *
136  * Put bits 1-0 of the argument into FPCW bits 11-10 and MXCSR
137  * bits 14-13, return the previous FPCW bits 11-10.
138  */
139         ENTRY(__swapRD)
140         subq    $8,%rsp
141         fstcw   (%rsp)
142         movw    (%rsp),%ax
143         movw    %ax,%cx
144         andw    $0xf3ff,%cx
145         andq    $0x3,%rdi
146         shlw    $10,%di
147         orw     %di,%cx
148         movq    %rcx,(%rsp)
149         fldcw   (%rsp)
150         stmxcsr (%rsp)
151         movq    (%rsp),%rcx
152         andw    $0x9fff,%cx
153         shlw    $3,%di
154         orw     %di,%cx
155         movq    %rcx,(%rsp)
156         ldmxcsr (%rsp)
157         shrw    $10,%ax
158         andq    $0x3,%rax
159         addq    $8,%rsp
160         ret
161         .align  16
162         SET_SIZE(__swapRD)
```

```
**********************************************************
    1719 Sat May 10 12:08:44 2014
new/usr/src/lib/libm/amd64/src/acosl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "acosl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(acosl,function)
#include "libm_synonyms.h"

#undef fabs

        ENTRY(acosl)
        fldt    8(%rsp)                 / push x
        fld1                            / push 1
        fld     %st(1)                  / x , 1 , x
        fabs                            / |x| , 1 , x
        fucomip %st(1),%st
        ja      9f
        fadd    %st(1),%st              / 1+x,x
        fldz
        fucomip %st(1),%st
        jp      .L1
        jne     .L1
        / x is -1
        fstp    %st(0)                  / -1
        fstp    %st(0)                  / empty NPX stack
        fldpi
        ret
.L1:
        fxch    %st(1)                  / x,1+x
        fld1                            / 1,x,1+x
        fsubp   %st,%st(1)              / 1-x,1+x
        fdivp   %st,%st(1)              / (1-x)/(1+x)
        fsqrt
        fld1                            / 1,sqrt((1-x)/(1+x))
        fpatan
```



```
        fadd    %st(0),%st
        ret
9:
        / |x| > 1
        fstp    %st(0)                  / x
        fsub    %st,%st(0)              / +/-0 or NaN+invalid
        fdiv    %st,%st(0)              / NaN+invalid or NaN
        ret
        .align  16
        SET_SIZE(acosl)
```

```
**********************************************************
    1575 Sat May 10 12:08:44 2014
new/usr/src/lib/libm/amd64/src/asinl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "asinl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(asinl,function)
#include "libm_synonyms.h"

#undef fabs

        ENTRY(asinl)
        fldt    8(%rsp)                 / push x
        fld1                            / push 1
        fld     %st(1)                  / x , 1 , x
        fabs                            / |x| , 1 , x
        fucomip %st(1),%st
        ja      9f
        fadd    %st(1),%st              / 1+x,x
        fld1                            / 1,1+x,x
        fsub    %st(2),%st              / 1-x,1+x,x
        fmulp   %st,%st(1)              / (1-x)*(1+x),x
        fsqrt                           / sqrt((1-x)*(1+x)),x
        fpatan                          / atan(x/sqrt((1-x)*(1+x)))
        ret
9:
        / |x| > 1
        fstp    %st(0)                  / x
        fsub    %st,%st(0)              / +/-0 or NaN+invalid
        fdiv    %st,%st(0)              / NaN+invalid or NaN
        ret
        .align  16
        SET_SIZE(asinl)
```

```
**********************************************************
    1230 Sat May 10 12:08:45 2014
new/usr/src/lib/libm/amd64/src/atan2l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "atan2l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(atan2l,function)
#include "libm_synonyms.h"

        ENTRY(atan2l)
        fldt    8(%rsp)                 / push y
        fldt    24(%rsp)                / push x
        fpatan                          / return atan2(y,x)
        ret
        .align  16
        SET_SIZE(atan2l)
```

****
1219 Sat May 10 12:08:45 2014
new/usr/src/lib/libm/amd64/src/atanl.s
patch01 - 693 import Sun Devpro Math Library
****

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 */

        .file   "atanl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(atanl,function)
#include "libm_synonyms.h"

        ENTRY(atanl)
        fldt    8(%rsp)                 / push arg
        fld1                            / push 1.0
        fpatan                          / atan(arg/1.0)
        ret
        .align  16
        SET_SIZE(atanl)
```

```
**********************************************************
    1288 Sat May 10 12:08:45 2014
new/usr/src/lib/libm/amd64/src/copysignl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "copysignl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(copysignl,function)
#include "libm_synonyms.h"

        ENTRY(copysignl)
        movl    16(%rsp),%eax
        movl    32(%rsp),%ecx
        andl    $0x7fff,%eax
        andl    $0x8000,%ecx
        orl     %ecx,%eax
        movl    %eax,16(%rsp)
        fldt    8(%rsp)
        ret
        .align  16
        SET_SIZE(copysignl)
```

```
**********************************************************
    3585 Sat May 10 12:08:45 2014
new/usr/src/lib/libm/amd64/src/exp10l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "exp10l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(exp10l,function)
#include "libm_synonyms.h"

        .data
        .align  16
lt2_hi: .4byte  0xfbd00000, 0x9a209a84, 0x3ffd, 0x0
lt2_lo: .4byte  0x653f4837, 0x8677076a, 0xbfc9, 0x0

        ENTRY(exp10l)
        movl    16(%rsp),%ecx           / cx <--sign&bexp(x)
        andl    $0x7fff,%ecx            / ecx <-- zero_xtnd(bexp(x))
        cmpl    $0x3ffd,%ecx            / Is |x| < log10(2)?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / maybe |x| only slightly < log10(2)
.general_case:                          / Here, |x| > log10(2) or x is NaN
        cmpl    $0x7fff,%ecx            / bexp(|x|) = bexp(INF)?
        je      .not_finite             / if so, x is not finite
        cmpl    $0x400e,%ecx            / |x| < 32768 = 2^15?
        jb      .finite_non_special     / if so, proceed with argument reduction
        fldt    8(%rsp)                 / x
        fld1                            / 1, x
        jmp     1f
.finite_non_special:                    / Here, log10(2) < |x| < 2^15
        fldt    8(%rsp)                 / x
        fld     %st(0)                  / x, x
        fldl2t                          / log2(10), x, x
        fmulp                           / z := x*log2(10), x
        frndint                         / [z], x
        fst     %st(2)                  / [z], x, [z]
        PIC_SETUP(1)
```



```
        fldt    PIC_L(lt2_hi)           / lt2_hi, [z], x, [z]
        fmulp                           / [z]*lt2_hi, x, [z]
        fsubrp  %st,%st(1)              / x-[z]*lt2_hi, [z]
        fldt    PIC_L(lt2_lo)           / lt2_lo, x-[z]*lt2_hi, [z]
        PIC_WRAPUP
        fmul    %st(2),%st              / [z]*lt2_lo, x-[z]*lt2_hi, [z]
        fsubrp  %st,%st(1)              / r := x-[z]*log10(2), [z]
        fldl2t                          / log2(10), r, [z]
        fmulp                           / f := r*log2(10), [z]
        f2xm1                           / 2^f-1,[z]
        fld1                            / 1, 2^f-1, [z]
        faddp   %st,%st(1)              / 2^f, [z]
1:
        fscale                          / 10^x, [z]
        fstp    %st(1)
        ret

.check_tail:
        movl    12(%rsp),%ecx           / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x9a209a84,%ecx        / Is |x| < log10(2)?
        ja      .finite_non_special
        jb      .shortcut
        movl    8(%rsp),%edx            / edx <-- lo_32(sgnfcnd(x))
        cmpl    $0xfbcff798,%edx        / Is |x| slightly > log10(2)?
        ja      .finite_non_special     / branch if |x| slightly > log10(2)
.shortcut:
        / Here, |x| < log10(2), so |z| = |x/log10(2)| < 1
        / whence z is in f2xm1's domain.
        fldt    8(%rsp)                 / x
        fldl2t                          / log2(10), x
        fmulp                           / z := x*log2(10)
        f2xm1                           / 2^z-1
        fld1                            / 1, 2^z-1
        faddp   %st,%st(1)              / 10^x
        ret

.not_finite:
        movl    12(%rsp),%ecx           / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / hi_32(sgnfcnd(x)) = hi_32(sgnfcnd(INF)
        jne     .NaN_or_pinf            / if not, x is NaN or unsupp.
        movl    8(%rsp),%edx            / edx <-- lo_32(sgnfcnd(x))
        cmpl    $0,%edx                 / lo_32(sgnfcnd(x)) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    16(%rsp),%eax           / ax <-- sign&bexp((x))
        andl    $0x8000,%eax            / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldt    8(%rsp)
        ret
        .align  16
        SET_SIZE(exp10l)
```

```
**********************************************************
    2977 Sat May 10 12:08:45 2014
new/usr/src/lib/libm/amd64/src/exp2l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "exp2l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(exp2l,function)
#include "libm_synonyms.h"

        ENTRY(exp2l)
        movl    16(%rsp),%ecx           / cx <--sign&bexp(x)
        andl    $0x7fff,%ecx            / ecx <-- zero_xtnd(bexp(x))
        cmpl    $0x3fff,%ecx            / Is |x| <= 1?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / |x| may be slightly > 1
.general_case:                          / Here, |x| > 1 or x is NaN
        cmpl    $0x7fff,%ecx            / bexp(|x|) = bexp(INF)?
        je      .not_finite             / if so, x is not finite
.finite_non_special:                    / Here, 1 < |x| < INF
        fldt    8(%rsp)                 / push arg
        fld     %st(0)                  / duplicate stack top
        frndint                         / [x],x
        fucomi  %st(1),%st              / x integral?
        je      .x_integral             / branch if x integral
        fxch                            / x, [x]
        fsub    %st(1),%st              / x-[x], [x]
        f2xm1                           / 2**(x-[x])-1, [x]
        fld1                            / 1,2**(x-[x])-1, [x]
        faddp   %st,%st(1)              / 2**(x-[x]), [x]
        fscale                          / 2**x = 2**(arg), [x]
        fstp    %st(1)
        ret

.x_integral:
        fstp    %st(0)                  / ,x
        fld1                            / 1 = 2**0, x
```



```
        fscale                          / 2**(0 + x) = 2**x, x
        fstp    %st(1)                  / 2**x
        ret

.check_tail:
        movl    12(%rsp),%ecx           / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / Is |x| <= 1?
        ja      .finite_non_special
        movl    8(%rsp),%edx            / edx <-- lo_32(sgnfcnd(x))
        cmpl    $0x0,%edx               / Is |x| slightly > 1?
        ja      .finite_non_special     / branch if |x| slightly > 1
.shortcut:
        / Here, |x| < 1,
        / whence x is in f2xm1's domain.
        fldt    8(%rsp)                 / push x
        f2xm1                           / 2**x - 1
        fld1                            / 1,2**x - 1
        faddp   %st,%st(1)              / 2**x
        ret

.not_finite:
        movl    12(%rsp),%ecx           / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / hi_32(|x|) = hi_32(INF)?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    8(%rsp),%edx            / edx <-- lo_32(x)
        cmpl    $0,%edx                 / lo_32(x) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    16(%rsp),%eax           / ax <-- sign&bexp((x))
        andl    $0x8000,%eax            / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldt    8(%rsp)
        ret
        .align  16
        SET_SIZE(exp2l)
```

```
**********************************************************
    3735 Sat May 10 12:08:45 2014
new/usr/src/lib/libm/amd64/src/expl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "expl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(expl,function)
#include "libm_synonyms.h"

        .data
        .align  16
ln2_hi: .4byte  0xd1d00000, 0xb17217f7, 0x3ffe, 0x0
ln2_lo: .4byte  0x4c67fc0d, 0x8654361c, 0xbfce, 0x0

        ENTRY(expl)
        movl    16(%rsp),%ecx           / cx <--sign&bexp(x)
        andl    $0x7fff,%ecx            / ecx <-- zero_xtnd(bexp(x))
        cmpl    $0x3ffe,%ecx            / Is |x| < 0.5?
        jb      2f                      / If so, see which shortcut to take
        je      .check_tail             / More checking if 0.5 <= |x| < 1
.general_case:                          / Here, |x| >= 1 or x is NaN
        cmpl    $0x7fff,%ecx            / bexp(|x|) = bexp(INF)?
        je      .not_finite             / if so, x is not finite
        cmpl    $0x400e,%ecx            / |x| < 32768 = 2^15?
        jb      .finite_non_special     / if so, proceed with argument reduction
        fldt    8(%rsp)                 / x
        fld1                            / 1, x
        jmp     1f
.finite_non_special:                    / Here, ln(2) < |x| < 2^15
        fldt    8(%rsp)                 / x
        fld     %st(0)                  / x, x
        fldl2e                          / log2(e), x, x
        fmulp                           / z := x*log2(e), x
        frndint                         / [z], x
        fst     %st(2)                  / [z], x, [z]
        PIC_SETUP(1)
```



```
        fldt    PIC_L(ln2_hi)           / ln2_hi, [z], x, [z]
        fmulp                           / [z]*ln2_hi, x, [z]
        fsubrp  %st,%st(1)              / x-[z]*ln2_hi, [z]
        fldt    PIC_L(ln2_lo)           / ln2_lo, x-[z]*ln2_hi, [z]
        PIC_WRAPUP
        fmul    %st(2),%st              / [z]*ln2_lo, x-[z]*ln2_hi, [z]
        fsubrp  %st,%st(1)              / r := x-[z]*ln(2), [z]
        fldl2e                          / log2(e), r, [z]
        fmulp                           / f := r*log2(e), [z]
        f2xm1                           / 2^f-1,[z]
        fld1                            / 1, 2^f-1, [z]
        faddp   %st,%st(1)              / 2^f, [z]
1:
        fscale                          / e^x, [z]
        fstp    %st(1)
        ret

2:                                      / Here, |x| < 0.5
        cmpl    $0x3fbe,%ecx            / Is |x| >= 2^-65?
        jae     .shortcut               / If so, take a shortcut
        fldt    8(%rsp)                 / x
        fld1                            / 1, x
        faddp   %st,%st(1)              / 1+x (for inexact & directed rounding)
        ret

.check_tail:
        movl    12(%rsp),%ecx           / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0xb17217f7,%ecx        / Is |x| < ln(2)?
        ja      .finite_non_special
        jb      .shortcut
        movl    8(%rsp),%edx            / edx <-- lo_32(x)
        cmpl    $0xd1cf79ab,%edx        / Is |x| slightly < ln(2)?
        ja      .finite_non_special     / branch if |x| slightly > ln(2)
.shortcut:
        / Here, |x| < ln(2), so |z| = |x/ln(2)| < 1,
        / whence z is in f2xm1's domain.
        fldt    8(%rsp)                 / x
        fldl2e                          / log2(e), x
        fmulp                           / x*log2(e)
        f2xm1                           / 2^(x*log2(e))-1 = e^x-1
        fld1                            / 1, e^x-1
        faddp   %st,%st(1)              / e^x
        ret

.not_finite:
        movl    12(%rsp),%ecx           / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / hi_32(|x|) = hi_32(INF)?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    8(%rsp),%edx            / edx <-- lo_32(x)
        cmpl    $0,%edx                 / lo_32(x) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    16(%rsp),%eax           / ax <-- sign&bexp((x))
        andl    $0x8000,%eax            / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldt    8(%rsp)
        fadd    %st(0),%st              / quiet SNaN
        ret
        .align  16
        SET_SIZE(expl)
```

```
**********************************************************
    3746 Sat May 10 12:08:45 2014
new/usr/src/lib/libm/amd64/src/expm1l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "expm1l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(expm1l,function)
#include "libm_synonyms.h"

        .data
        .align  16
ln2_hi: .4byte  0xd1d00000, 0xb17217f7, 0x3ffe, 0x0
ln2_lo: .4byte  0x4c67fc0d, 0x8654361c, 0xbfce, 0x0

        ENTRY(expm1l)
        movl    16(%rsp),%ecx           / cx <--sign&bexp(x)
        movl    %ecx,%eax               / ax <--sign&bexp(x)
        andl    $0x7fff,%ecx            / ecx <-- zero_xtnd(bexp(x))
        cmpl    $0x3ffe,%ecx            / Is |x| < ln(2)?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / |x| may be only slightly < ln(2)
.general_case:                          / Here, |x| > ln(2) or x is NaN
        cmpl    $0x7fff,%ecx            / bexp(|x|) = bexp(INF)?
        je      .not_finite             / if so, x is not finite
        andl    $0xffff,%eax            / eax <-- sign&bexp(x)
        cmpl    $0xc006,%eax            / x <= -128?
        jae     1f                      / if so, simply return -1
        cmpl    $0x400d,%ecx            / |x| < 16384 = 2^14?
        jb      .finite_non_special     / if so, proceed with argument reduction
        fldt    8(%rsp)                 / x >= 16384; x
        fld1                            / 1, x
        fscale                          / +Inf, x
        fstp    %st(1)                  / +Inf
        ret

.finite_non_special:                    / -128 < x < -ln(2) || ln(2) < x < 2^14
```



```
        fldt    8(%rsp)                 / x
        fld     %st(0)                  / x, x
        fldl2e                          / log2(e), x, x
        fmulp                           / z := x*log2(e), x
        frndint                         / [z], x
        fst     %st(2)                  / [z], x, [z]
        PIC_SETUP(1)
        fldt    PIC_L(ln2_hi)           / ln2_hi, [z], x, [z]
        fmulp                           / [z]*ln2_hi, x, [z]
        fsubrp  %st,%st(1)              / x-[z]*ln2_hi, [z]
        fldt    PIC_L(ln2_lo)           / ln2_lo, x-[z]*ln2_hi, [z]
        PIC_WRAPUP
        fmul    %st(2),%st              / [z]*ln2_lo, x-[z]*ln2_hi, [z]
        fsubrp  %st,%st(1)              / r := x-[z]*ln(2), [z]
        fldl2e                          / log2(e), r, [z]
        fmulp                           / f := r*log2(e), [z]
        f2xm1                           / 2^f-1,[z]
        fld1                            / 1, 2^f-1, [z]
        faddp   %st,%st(1)              / 2^f, [z]
        fscale                          / e^x, [z]
        fstp    %st(1)                  / e^x
        fld1                            / 1, e^x
        fsubrp  %st,%st(1)              / e^x-1
        ret

.check_tail:
        movl    12(%rsp),%ecx           / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0xb17217f7,%ecx        / Is |x| < ln(2)?
        ja      .finite_non_special
        jb      .shortcut
        movl    8(%rsp),%edx            / edx <-- lo_32(x)
        cmpl    $0xd1cf79ab,%edx        / Is |x| slightly < ln(2)?
        ja      .finite_non_special     / branch if |x| slightly > ln(2)
.shortcut:
        / Here, |x| < ln(2), so |z| = |x/ln(2)| < 1,
        / whence z is in f2xm1's domain.
        fldt    8(%rsp)                 / x
        fldl2e                          / log2(e), x
        fmulp                           / z := x*log2(e)
        f2xm1                           / 2^(x*log2(e))-1 = e^x-1
        ret

.not_finite:
        movl    12(%rsp),%ecx           / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / hi_32(|x|) = hi_32(INF)?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    8(%rsp),%edx            / edx <-- lo_32(x)
        cmpl    $0,%edx                 / lo_32(x) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    16(%rsp),%eax           / ax <-- sign&bexp((x))
        andl    $0x8000,%eax            / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
1:
        fld1                            / Here, x = -inf, so return -1
        fchs
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldt    8(%rsp)
        ret
        .align  16
        SET_SIZE(expm1l)
```

****
1180 Sat May 10 12:08:45 2014
new/usr/src/lib/libm/amd64/src/fabsl.s
patch01 - 693 import Sun Devpro Math Library
****

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 */

        .file   "fabsl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fabsl,function)
#include "libm_synonyms.h"

        ENTRY(fabsl)
        fldt    8(%rsp)
#undef  fabs
        fabs
        ret
        .align  16
        SET_SIZE(fabsl)
```

```
**********************************************************
    1896 Sat May 10 12:08:45 2014
new/usr/src/lib/libm/amd64/src/floorl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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        .file   "floorl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(ceill,function)
LIBM_ANSI_PRAGMA_WEAK(floorl,function)
#include "libm_synonyms.h"

        ENTRY(ceill)
        subq    $16,%rsp
        fstcw   (%rsp)
        fldt    24(%rsp)
        movw    (%rsp),%cx
        orw     $0x0c00,%cx
        xorw    $0x0400,%cx
        movw    %cx,4(%rsp)
        fldcw   4(%rsp)                 / set RD = up
        frndint
        fstcw   4(%rsp)                 / restore RD
        movw    4(%rsp),%dx
        andw    $0xf3ff,%dx
        movw    (%rsp),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,(%rsp)
        fldcw   (%rsp)                  / restore RD
        addq    $16,%rsp
        ret
        .align  16
        SET_SIZE(ceill)


        ENTRY(floorl)
        subq    $16,%rsp
```



```
        fstcw   (%rsp)
        fldt    24(%rsp)
        movw    (%rsp),%cx
        orw     $0x0c00,%cx
        xorw    $0x0800,%cx
        movw    %cx,4(%rsp)
        fldcw   4(%rsp)                 / set RD = down
        frndint
        fstcw   4(%rsp)                 / restore RD
        movw    4(%rsp),%dx
        andw    $0xf3ff,%dx
        movw    (%rsp),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,(%rsp)
        fldcw   (%rsp)                  / restore RD
        addq    $16,%rsp
        ret
        .align  16
        SET_SIZE(floorl)
```

```
**********************************************************
    1781 Sat May 10 12:08:46 2014
new/usr/src/lib/libm/amd64/src/fmod.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "fmod.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fmod,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(fmod)
        push    %rbp
        movq    %rsp,%rbp
        subq    $16,%rsp
        movlpd  %xmm1,-16(%rbp)
        movlpd  %xmm0,-8(%rbp)

        movl    -12(%rbp),%eax          / eax <-- hi_32(y)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(|y|)
        orl     -16(%rbp),%eax          / eax <-- lo_32(y)|hi_32(|y|)
        je      .yzero

        fldl    -16(%rbp)               / y
        fldl    -8(%rbp)                / x
.loop:
        fprem                           / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check for incomplete reduction
        jne     .loop                   / loop while reduction incomplete
        fstpl   -8(%rbp)
        movsd   -8(%rbp),%xmm0
        fstp    %st(0)
        leave
        ret

.yzero:
```



```
        PIC_SETUP(1)
        movl    $27,%edi
        movl    $2,%eax
        call    PIC_F(_SVID_libm_err)
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(fmod)
```

```
**********************************************************
    1523 Sat May 10 12:08:46 2014
new/usr/src/lib/libm/amd64/src/fmodf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "fmodf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fmodf,function)
#include "libm_synonyms.h"

        ENTRY(fmodf)
        push    %rbp
        movq    %rsp,%rbp
        subq    $16,%rsp
        movss   %xmm1,-8(%rbp)
        movss   %xmm0,-4(%rbp)
        flds    -8(%rbp)                / load arg y
        flds    -4(%rbp)                / load arg x
.loop:
        fprem                           / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check whether reduction complete
        jne     .loop                   / loop while reduction incomplete
        fstps   -4(%rbp)
        movss   -4(%rbp),%xmm0
        fstp    %st(0)
        leave
        ret
        .align  4
        SET_SIZE(fmodf)
```

```
**********************************************************
    1394 Sat May 10 12:08:46 2014
new/usr/src/lib/libm/amd64/src/fmodl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "fmodl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fmodl,function)
#include "libm_synonyms.h"

        ENTRY(fmodl)
        fldt    24(%rsp)                / load arg y
        fldt    8(%rsp)                 / load arg x
.mod_loop:
        fprem                           / partial fmod
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check for incomplete reduction
        jne     .mod_loop               / while incomplete, do fprem again
        fstp    %st(1)
        ret
        .align  16
        SET_SIZE(fmodl)
```

```
**********************************************************
    3415 Sat May 10 12:08:46 2014
new/usr/src/lib/libm/amd64/src/ieee_funcl.s
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "ieee_funcl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(isinfl,function)
LIBM_ANSI_PRAGMA_WEAK(isnormall,function)
LIBM_ANSI_PRAGMA_WEAK(issubnormall,function)
LIBM_ANSI_PRAGMA_WEAK(iszerol,function)
LIBM_ANSI_PRAGMA_WEAK(signbitl,function)
#include "libm_synonyms.h"

        ENTRY(isinfl)
        movl    16(%rsp),%eax           / ax <-- sign and bexp of x
        notl    %eax
        andq    $0x7fff,%rax
        jz      .L6
        movq    $0,%rax
.not_inf:
        ret

.L6:                                    / here, (eax) = 0.0
        movl    12(%rsp),%ecx
        xorl    $0x80000000,%ecx        / handle unsupported implicitly
        orl     8(%rsp), %ecx
        jnz     .not_inf
        movq    $1,%rax
        ret
        .align  16
        SET_SIZE(isinfl)

        ENTRY(isnormall)
                                        / TRUE iff (x is finite, but
                                        /           neither subnormal nor zero)
```



```
                                        /      iff (msb(sgnfcnd(x) /= 0
                                        /           &  0 < bexp(x) < 0x7fff)
        movl    12(%rsp),%eax           / eax <-- hi_32(sgnfcnd(x))
        andl    $-0x80000000,%eax       / eax[31]  <-- msb(sgnfcnd(x)),
                                        / rest_of(eax) <-- 0
        jz      .L8                     / jump iff msb(sgnfcnd(x)) = 0
        movl    16(%rsp),%eax           / ax <-- sign and bexp of x
        notl    %eax                    / ax[0..14] <-- not(bexp(x))
        andq    $0x7fff,%rax            / eax  <-- zero_xtnd(not(bexp(x)))
        jz      .L8                     / jump  iff bexp(x) = 0x7fff or 0
        xorq    $0x7fff,%rax            / treat pseudo-denormal as subnormal
        jz      .L8
        movq    $1,%rax
.L8:
        ret
        .align  16
        SET_SIZE(isnormall)

        ENTRY(issubnormall)
                                        / TRUE iff (bexp(x) = 0 &
                                        / msb(sgnfcnd(x)) = 0 & frac(x) /= 0)
        movl    12(%rsp),%eax           / eax <-- hi_32(sgnfcnd(x))
        testl   $0x80000000,%eax        / eax[31] = msb(sgnfcnd(x));
                                        / set ZF if it's 0.
        jz      .may_be_subnorm         / jump iff msb(sgnfcnd(x)) = 0
.not_subnorm:
        movq    $0,%rax
        ret
.may_be_subnorm:
        testl   $0x7fff,16(%rsp)        / set ZF iff bexp(x)  = 0
        jnz     .not_subnorm            / jump   iff bexp(x) /= 0
        orl     8(%rsp),%eax            / (eax) = 0 iff sgnfcnd(x) = 0
        jz      .not_subnorm
        movq    $1,%rax
        ret
        .align  16
        SET_SIZE(issubnormall)

        ENTRY(iszerol)
        movl    16(%rsp),%eax           / ax <-- sign and bexp of x
        andl    $0x7fff,%eax            / eax <-- zero_xtnd(bexp(x))
        jz      .may_be_zero            / jump iff bexp(x) = 0
.not_zero:
        movq    $0,%rax
        ret
.may_be_zero:                           / here, (eax) = 0
        orl     12(%rsp),%eax           / is hi_32(sgnfcnd(x)) = 0?
        jnz     .not_zero               / jump iff hi_32(sgnfcnd(x)) /= 0
        orl     8(%rsp),%eax            / is lo_32(sgnfcnd(x)) = 0?
        jnz     .not_zero               / jump iff lo_32(sgnfcnd(x)) /= 0
        movq    $1,%rax
        ret
        .align  16
        SET_SIZE(iszerol)

        ENTRY(signbitl)
        movl    16(%rsp),%eax           / eax[15] <-- sign_bit(x)
        shrl    $15,%eax                / eax <-- zero_xtnd(sign_bit(x))
        andq    $1,%rax
        ret
        .align  16
        SET_SIZE(signbitl)
```

```
*********************************************************
    2405 Sat May 10 12:08:46 2014
new/usr/src/lib/libm/amd64/src/ilogbl.s
patch01 - 693 import Sun Devpro Math Library
*********************************************************
```

```
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        .file "ilogbl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(ilogbl,function)
#include "libm_synonyms.h"
#include "xpg6.h"

        .data
        .align  16
two63:  .4byte  0x0,0x43d00000          / 2**63

        ENTRY(ilogbl)
        movq    16(%rsp),%rax           / eax <-- sign and bexp of x
        andq    $0x7fff,%rax            / eax <-- bexp(x)
        jz      .bexp_0                 / jump iff x is 0 or subnormal
                                        / here, biased exponent is non-zero
        testl   $0x80000000,12(%rsp)    / test msb of hi_32(sgnfcnd(x))
        jz      .ilogbl_not_finite      / jump if unsupported format
        cmpq    $0x7fff,%rax
        je      .ilogbl_not_finite
        subq    $16383,%rax             / unbias exponent by 16383 = 0x3fff
        ret

.ilogbl_not_finite:
        movq    $0x7fffffff,%rax        / x is NaN/inf/unsup
        jmp     0f

.bexp_0:
        movq    8(%rsp),%rax            / rax <-- sgnfcnd(x)
        orq     %rax,%rax
        jnz     .ilogbl_subnorm         / jump iff x is subnormal
        movq    $-2147483647,%rax       / x is +/-0, so return 1-2^31
0:
```



```
        PIC_SETUP(0)
        PIC_G_LOAD(movzwq,__xpg6,rcx)
        PIC_WRAPUP
        andl    $_C99SUSv3_ilogb_0InfNaN_raises_invalid,%ecx
        cmpl    $0,%ecx
        je      1f
        fldz
        fdivp   %st,%st(0)              / raise invalid as per SUSv3
1:
        ret


.ilogbl_subnorm:                        / subnormal or pseudo-denormal input
        fldt    8(%rsp)                 / push x, setting D-flag
        PIC_SETUP(1)
        fmull   PIC_L(two63)            / x*2**63
        PIC_WRAPUP
        subq    $16,%rsp
        fstpt   (%rsp)
        movq    $0x7fff,%rax
        andq    8(%rsp),%rax            / eax <-- sign and bexp of x*2**63
        subq    $16445,%rax             / unbias it by (16,383 + 63)
        addq    $16,%rsp
        ret
        .align  16
        SET_SIZE(ilogbl)
```

```
**********************************************************
    3962 Sat May 10 12:08:46 2014
new/usr/src/lib/libm/amd64/src/libm_inlines.h
fix tmpd in copysign()
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/* Functions in this file are duplicated in locallibm.il.  Keep them in sync */

#ifndef _LIBM_INLINES_H
#define _LIBM_INLINES_H

#ifdef __GNUC__

#ifdef __cplusplus
extern "C" {
#endif

#include <sys/types.h>
#include <sys/ieeefp.h>

extern __inline__ float
__inline_sqrtf(float a)
{
        float ret;

        __asm__ __volatile__("sqrtss %1, %0\n\t" : "=x" (ret) : "x" (a));
        return (ret);
}

extern __inline__ double
__inline_sqrt(double a)
{
```



```
        double ret;

        __asm__ __volatile__("sqrtsd %1, %0\n\t" : "=x" (ret) : "x" (a));
        return (ret);
}

extern __inline__ double
__ieee754_sqrt(double a)
{
        return (__inline_sqrt(a));
}

/*
 * 00 - 24 bits
 * 01 - reserved
 * 10 - 53 bits
 * 11 - 64 bits
 */
extern __inline__ int
__swapRP(int i)
{
        int ret;
        uint16_t cw;

        __asm__ __volatile__("fstcw %0\n\t" : "=m" (cw));

        ret = (cw >> 8) & 0x3;
        cw = (cw & 0xfcff) | ((i & 0x3) << 8);

        __asm__ __volatile__("fldcw %0\n\t" : : "m" (cw));

        return (ret);
}

/*
 * 00 - Round to nearest, with even preferred
 * 01 - Round down
 * 10 - Round up
 * 11 - Chop
 */
extern __inline__ enum fp_direction_type
__swap87RD(enum fp_direction_type i)
{
        int ret;
        uint16_t cw;

        __asm__ __volatile__("fstcw %0\n\t" : "=m" (cw));

        ret = (cw >> 10) & 0x3;
        cw = (cw & 0xf3ff) | ((i & 0x3) << 10);

        __asm__ __volatile__("fldcw %0\n\t" : : "m" (cw));

        return (ret);
}

extern __inline__ int
abs(int i)
{
        int ret;
        __asm__ __volatile__(
            "movl    %1, %0\n\t"
            "negl    %1\n\t"
            "cmovnsl %1, %0\n\t"
            : "=r" (ret), "+r" (i)
            :
```

```
126             : "cc");
127         return (ret);
128 }

130 extern __inline__ double
131 copysign(double d1, double d2)
132 {
133         double tmpd;

135         __asm__ __volatile__(
136             "movd %3, %1\n\t"
137             "andpd %1, %0\n\t"
138             "andnpd %2, %1\n\t"
139             "orpd %1, %0\n\t"
140             : "+x" (d1), "=x" (tmpd)
141             : "x" (d2), "r" (0x7fffffffffffffff));

143         return (d1);
144 }

146 extern __inline__ double
147 fabs(double d)
148 {
149         double tmp;

151         __asm__ __volatile__(
152             "movd  %2, %1\n\t"
153             "andpd %1, %0"
154             : "+x" (d), "=x" (tmp)
155             : "r" (0x7fffffffffffffff));

157         return (d);
158 }

160 extern __inline__ float
161 fabsf(float d)
162 {
163         __asm__ __volatile__(
164             "andpd %1, %0"
165             : "+x" (d)
166             : "x" (0x7fffffff));

168         return (d);
169 }

171 extern __inline__ int
172 finite(double d)
173 {
174     long ret = 0x7fffffffffffffff;
175         uint64_t tmp;

177         __asm__ __volatile__(
178             "movq %2, %1\n\t"
179             "andq %1, %0\n\t"
180             "movq $0x7ff0000000000000, %1\n\t"
181             "subq %1, %0\n\t"
182             "shrq $63, %0\n\t"
183             : "+r" (ret), "=r" (tmp)
184             : "x" (d)
185             : "cc");

187         return (ret);
188 }

190 extern __inline__ int
191 signbit(double d)
```



```
192 {
193         long ret;
194         __asm__ __volatile__(
195             "movmskpd %1, %0\n\t"
196             "andq     $1, %0\n\t"
197             : "=r" (ret)
198             : "x" (d)
199             : "cc");
200         return (ret);
201 }

203 extern __inline__ double
204 sqrt(double d)
205 {
206         return (__inline_sqrt(d));
207 }

209 extern __inline__ float
210 sqrtf(float f)
211 {
212         return (__inline_sqrtf(f));
213 }

215 #ifdef __cplusplus
216 }
217 #endif

219 #endif  /* __GNUC__ */

221 #endif /* _LIBM_INLINES_H */
```

```
**********************************************************
    3242 Sat May 10 12:08:46 2014
new/usr/src/lib/libm/amd64/src/locallibm.il
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/ Portions of this file are duplicated as GCC inline assembly in
/ libm_inlines.h.  Keep them in sync.

        .inline __ieee754_sqrt,0
        sqrtsd  %xmm0,%xmm0
        .end

        .inline __inline_sqrtf,0
        sqrtss  %xmm0,%xmm0
        .end

        .inline __inline_sqrt,0
        sqrtsd  %xmm0,%xmm0
        .end

/
/ 00 - 24 bits
/ 01 - reserved
/ 10 - 53 bits
/ 11 - 64 bits
/
        .inline __swapRP,0
        subq    $16,%rsp
        fstcw   (%rsp)
        movw    (%rsp),%ax
        movw    %ax,%cx
        andw    $0xfcff,%cx
        andl    $0x3,%edi
        shlw    $8,%di
        orw     %di,%cx
        movl    %ecx,(%rsp)
        fldcw   (%rsp)
        shrw    $8,%ax
```



```
        andq    $0x3,%rax
        addq    $16,%rsp
        .end

/
/ 00 - Round to nearest, with even preferred
/ 01 - Round down
/ 10 - Round up
/ 11 - Chop
/
        .inline __swap87RD,0
        subq    $16,%rsp
        fstcw   (%rsp)
        movw    (%rsp),%ax
        movw    %ax,%cx
        andw    $0xf3ff,%cx
        andl    $0x3,%edi
        shlw    $10,%di
        orw     %di,%cx
        movl    %ecx,(%rsp)
        fldcw   (%rsp)
        shrw    $10,%ax
        andq    $0x3,%rax
        addq    $16,%rsp
        .end

        .inline abs,0
        cmpl    $0,%edi
        jge     1f
        negl    %edi
1:      movl    %edi,%eax
        .end

        .inline __copysign,0
        movq    $0x7fffffffffffffff,%rax
        movdq   %rax,%xmm2
        andpd   %xmm2,%xmm0
        andnpd  %xmm1,%xmm2
        orpd    %xmm2,%xmm0
        .end

        .inline __fabs,0
        movq    $0x7fffffffffffffff,%rax
        movdq   %rax,%xmm1
        andpd   %xmm1,%xmm0
        .end

        .inline __fabsf,0
        movl    $0x7fffffff,%eax
        movdl   %eax,%xmm1
        andps   %xmm1,%xmm0
        .end

        .inline _finite,0
        subq    $16,%rsp
        movlpd  %xmm0,(%rsp)
        movq    (%rsp),%rcx
        movq    $0x7fffffffffffffff,%rax
        andq    %rcx,%rax
        movq    $0x7ff0000000000000,%rcx
        subq    %rcx,%rax
        shrq    $63,%rax
        addq    $16,%rsp
        .end

        .inline __signbit,0
```

```
127         movmskpd %xmm0,%eax
128         andq    $1,%rax
129         .end

131         .inline __sqrt,0
132         sqrtsd  %xmm0,%xmm0
133         .end

135         .inline __sqrtf,0
136         sqrtss  %xmm0,%xmm0
137         .end

139         .inline __f95_signf,0
140         movl    (%rdi),%eax
141         movl    (%rsi),%ecx
142         andl    $0x7fffffff,%eax
143         andl    $0x80000000,%ecx
144         orl     %ecx,%eax
145         movdl   %eax,%xmm0
146         .end

148         .inline __f95_sign,0
149         movq    (%rsi),%rax
150         movq    $0x7fffffffffffffff,%rdx
151         shrq    $63,%rax
152         shlq    $63,%rax
153         andq    (%rdi),%rdx
154         orq     %rdx,%rax
155         movdq   %rax,%xmm0
156         .end

158         .inline __r_sign,0
159         movl    $0x7fffffff,%eax
160         movl    $0x80000000,%edx
161         andl    (%rdi),%eax
162         cmpl    (%rsi),%edx
163         cmovel  %eax,%edx
164         andl    (%rsi),%edx
165         orl     %edx,%eax
166         movdl   %eax,%xmm0
167         .end

169         .inline __d_sign,0
170         movq    $0x7fffffffffffffff,%rax
171         movq    $0x8000000000000000,%rdx
172         andq    (%rdi),%rax
173         cmpq    (%rsi),%rdx
174         cmoveq  %rax,%rdx
175         andq    (%rsi),%rdx
176         orq     %rdx,%rax
177         movdq   %rax,%xmm0
178         .end
```

```
**********************************************************
    1252 Sat May 10 12:08:46 2014
new/usr/src/lib/libm/amd64/src/log10l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "log10l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(log10l,function)
#include "libm_synonyms.h"

        ENTRY(log10l)
        fldlg2
        fldt    8(%rsp)                 / st = arg, st(1) = log10(2)
        fyl2x                           / st = log10(arg) = log10(2)*log2(arg)
        ret
        .align  16
        SET_SIZE(log10l)
```

```
**********************************************************
    1218 Sat May 10 12:08:46 2014
new/usr/src/lib/libm/amd64/src/log2l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "log2l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(log2l,function)
#include "libm_synonyms.h"

        ENTRY(log2l)
        fld1                    / push 1.0
        fldt    8(%rsp)         / push x
        fyl2x                   / st = 1.0*log2(arg)
        ret
        .align  16
        SET_SIZE(log2l)
```

```
**********************************************************
    1239 Sat May 10 12:08:47 2014
new/usr/src/lib/libm/amd64/src/logl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "logl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(logl,function)
#include "libm_synonyms.h"

        ENTRY(logl)
        fldln2
        fldt    8(%rsp)                 / st = arg, st(1) = loge(2)
        fyl2x                           / st = ln(arg) = loge(2)*log2(arg)
        ret
        .align  16
        SET_SIZE(logl)
```

```
**********************************************************
    9533 Sat May 10 12:08:47 2014
new/usr/src/lib/libm/amd64/src/powl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "powl.s"

/ Special cases:
/
/ x ** 0 is 1
/ 1 ** y is 1                           (C99)
/ x ** NaN is NaN
/ NaN ** y (except 0) is NaN
/ x ** 1 is x
/ +-(|x| > 1) **  +inf is +inf
/ +-(|x| > 1) **  -inf is +0
/ +-(|x| < 1) **  +inf is +0
/ +-(|x| < 1) **  -inf is +inf
/ (-1) ** +-inf is +1                   (C99)
/ +0 ** +y (except 0, NaN)              is +0
/ -0 ** +y (except 0, NaN, odd int)     is +0
/ +0 ** -y (except 0, NaN)              is +inf (z flag)
/ -0 ** -y (except 0, NaN, odd int)     is +inf (z flag)
/ -0 ** y (odd int)                     is - (+0 ** x)
/ +inf ** +y (except 0, NaN)            is +inf
/ +inf ** -y (except 0, NaN)            is +0
/ -inf ** +-y (except 0, NaN)           is -0 ** -+y (NO z flag)
/ x ** -1 is 1/x
/ x ** 2 is x*x
/ -x ** y (an integer) is (-1)**(y) * (+x)**(y)
/ x ** y (x negative & y not integer) is NaN (i flag)

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(powl,function)
#include "libm_synonyms.h"
#include "xpg6.h"

#undef fabs
```



```
        .data
        .align  16
negzero:
        .float  -0.0
half:
        .float  0.5
one:
        .float  1.0
negone:
        .float  -1.0
two:
        .float  2.0
Snan:
        .4byte  0x7f800001
pinfinity:
        .4byte  0x7f800000
ninfinity:
        .4byte  0xff800000


        ENTRY(powl)
        pushq   %rbp
        movq    %rsp,%rbp
        PIC_SETUP(1)

        fldt    16(%rbp)                / x
        fxam                            / determine class of x
        fnstsw  %ax                     / store status in %ax
        movb    %ah,%dh                 / %dh <- condition code of x

        fldt    32(%rbp)                / y , x
        fxam                            / determine class of y
        fnstsw  %ax                     / store status in %ax
        movb    %ah,%dl                 / %dl <- condition code of y

        call    .pow_main               /// LOCAL
        PIC_WRAPUP
        leave
        ret

.pow_main:
        / x ** 0 is 1
        movb    %dl,%cl
        andb    $0x45,%cl
        cmpb    $0x40,%cl               / C3=1 C2=0 C1=? C0=0 when +-0
        jne     1f
        fstp    %st(0)                  / x
        fstp    %st(0)                  / stack empty
        fld1                            / 1
        ret

1:      / y is not zero
        PIC_G_LOAD(movzwq,__xpg6,rax)
        andl    $_C99SUSv3_pow_treats_Inf_as_an_even_int,%eax
        cmpl    $0,%eax
        je      1f

        / C99: 1 ** anything is 1
        fld1                            / 1, y, x
        fucomip %st(2),%st              / y, x
        jp      1f                      / so that pow(NaN1,NaN2) returns NaN2
        jne     1f
        fstp    %st(0)                  / x
        ret
```

```
128 1:
129         / x ** NaN is NaN
130         movb    %dl,%cl
131         andb    $0x45,%cl
132         cmpb    $0x01,%cl               / C3=0 C2=0 C1=? C0=1 when +-NaN
133         jne     1f
134         fstp    %st(1)                  / y
135         ret
136
137 1:      / y is not NaN
138         / NaN ** y (except 0) is NaN
139         movb    %dh,%cl
140         andb    $0x45,%cl
141         cmpb    $0x01,%cl               / C3=0 C2=0 C1=? C0=1 when +-NaN
142         jne     1f
143         fstp    %st(0)                  / x
144         ret
145
146 1:      / x is not NaN
147         / x ** 1 is x
148         fld1                            / 1, y, x
149         fcomip  %st(1),%st              / y, x
150         jne     1f
151         fstp    %st(0)                  / x
152         ret
153
154 1:      / y is not 1
155         / +-(|x| > 1) **  +inf is +inf
156         / +-(|x| > 1) **  -inf is +0
157         / +-(|x| < 1) **  +inf is +0
158         / +-(|x| < 1) **  -inf is +inf
159         / +-(|x| = 1) ** +-inf is NaN
160         movb    %dl,%cl
161         andb    $0x47,%cl
162         cmpb    $0x05,%cl               / C3=0 C2=1 C1=0 C0=1 when +inf
163         je      .yispinf
164         cmpb    $0x07,%cl               / C3=0 C2=1 C1=1 C0=1 when -inf
165         je      .yisninf
166
167         / +0 ** +y (except 0, NaN)              is +0
168         / -0 ** +y (except 0, NaN, odd int)     is +0
169         / +0 ** -y (except 0, NaN)              is +inf (z flag)
170         / -0 ** -y (except 0, NaN, odd int)     is +inf (z flag)
171         / -0 ** y (odd int)                     is - (+0 ** x)
172         movb    %dh,%cl
173         andb    $0x47,%cl
174         cmpb    $0x40,%cl               / C3=1 C2=0 C1=0 C0=0 when +0
175         je      .xispzero
176         cmpb    $0x42,%cl               / C3=1 C2=0 C1=1 C0=0 when -0
177         je      .xisnzero
178
179         / +inf ** +y (except 0, NaN)    is +inf
180         / +inf ** -y (except 0, NaN)    is +0
181         / -inf ** +-y (except 0, NaN)   is -0 ** -+y (NO z flag)
182         movb    %dh,%cl
183         andb    $0x47,%cl
184         cmpb    $0x05,%cl               / C3=0 C2=1 C1=0 C0=1 when +inf
185         je      .xispinf
186         cmpb    $0x07,%cl               / C3=0 C2=1 C1=1 C0=1 when -inf
187         je      .xisninf
188
189         / x ** -1 is 1/x
190         flds    PIC_L(negone)           / -1, y, x
191         fcomip  %st(1),%st              / y, x
192         jne     1f
193         fld     %st(1)                  / x , y , x
```



```
194         fdivrs  PIC_L(one)              / 1/x , y , x
195         jmp     .signok                 / check for over/underflow
196
197 1:      / y is not -1
198         / x ** 2 is x*x
199         flds    PIC_L(two)              / 2, y , x
200         fcomip  %st(1),%st              / y, x
201         jne     1f
202         fld     %st(1)                  / x , y , x
203         fld     %st(0)                  / x , x , y , x
204         fmulp                           / x^2 , y , x
205         jmp     .signok                 / check for over/underflow
206
207 1:      / y is not 2
208         / x ** 1/2 is sqrt(x)
209         flds    PIC_L(half)             / 1/2, y , x
210         fcomip  %st(1),%st              / y, x
211         jne     1f
212         fld     %st(1)                  / x , y , x
213         fsqrt                           / sqrt(x) , y , x
214         jmp     .signok                 / check for over/underflow
215
216 1:      / y is not 1/2
217         / make copies of x & y
218         fld     %st(1)                  / x , y , x
219         fld     %st(1)                  / y , x , y , x
220
221         / -x ** y (an integer) is (-1)**(y) * (+x)**(y)
222         / x ** y (x negative & y not integer) is  NaN
223         movl    $0,%ecx                 / track whether to flip sign of result
224         fldz                            / 0 , y , x , y , x
225         fcomip  %st(2),%st              / compare 0 with %st(2)
226         jb      .merge                  / 0 < x
227         / x < 0
228         call    .y_is_int
229         cmpl    $0,%ecx
230         jne     1f
231         / x < 0 & y != int so x**y = NaN (i flag)
232         fstp    %st(0)                  / x , y , x
233         fstp    %st(0)                  / y , x
234         fstp    %st(0)                  / x
235         fstp    %st(0)                  / stack empty
236         fldz
237         fdiv    %st,%st(0)              / 0/0
238         ret
239
240 1:      / x < 0 & y = int
241         fxch                            / x , y , y , x
242         fchs                            / px = -x , y , y , x
243         fxch                            / y , px , y , x
244 .merge:
245         / px > 0
246         fxch                            / px , y , y , x
247
248         / x**y   =   exp(y*ln(x))
249         fyl2x                           / t=y*log2(px) , y , x
250         fld     %st(0)                  / t , t , y , x
251         frndint                         / [t] , t , y , x
252         fxch                            / t , [t] , y , x
253         fucomi  %st(1),%st
254         je      1f                      / t is integral
255         fsub    %st(1),%st              / t-[t] , [t] , y , x
256         f2xm1                           / 2**(t-[t])-1 , [t] , y , x
257         fadds   PIC_L(one)              / 2**(t-[t]) , [t] , y , x
258         fscale                          / 2**t = px**y , [t] , y , x
259         jmp     2f
```

```
260 1:
261         fstp    %st(0)                  / t=[t] , y , x
262         fld1                            / 1 , t , y , x
263         fscale                          / 1*2**t = x**y , t , y , x
264 2:
265         fstp    %st(1)                  / x**y , y , x
266         cmpl    $1,%ecx
267         jne     .signok
268         fchs                            / change sign since x<0 & y=-int
269 .signok:
270         fstp    %st(2)                  / y , x**y
271         fstp    %st(0)                  / x**y
272         ret

274 / ------------------------------------------------------------------------

276 .xispinf:
277         fldz
278         fcomip  %st(1),%st              / compare 0 with %st(1)
279         jb      .retpinf                / 0 < y
280         jmp     .retpzero               / y < 0

282 .xisninf:
283         / -inf ** +-y is -0 ** -+y
284         fchs                            / -y , x
285         flds    PIC_L(negzero)          / -0 , -y , x
286         fstp    %st(2)                  / -y , -0
287         jmp     .xisnzero

289 .yispinf:
290         fld     %st(1)                  / x , y , x
291         fabs                            / |x| , y , x
292         flds    PIC_L(one)              / 1 , |x| , y , x
293         fcomip  %st(1),%st              / |x| , y , x
294         fstp    %st(0)                  / y , x
295         je      .retponeorinvalid       / x == -1       C99
296         jb      .retpinf                / 1 < |x|
297         jmp     .retpzero               / |x| < 1

299 .yisninf:
300         fld     %st(1)                  / x , y , x
301         fabs                            / |x| , y , x
302         flds    PIC_L(one)              / 1 , |x| , y , x
303         fcomip  %st(1),%st              / |x| , y , x
304         fstp    %st(0)                  / y , x
305         je      .retponeorinvalid       / x == -1       C99
306         jb      .retpzero               / 1 < |x|
307         jmp     .retpinf                / |x| < 1

309 .xispzero:
310         / y cannot be 0 or NaN ; stack has      y , x
311         fldz                            / 0 , y , x
312         fcomip  %st(1),%st              / compare 0 with %st(1)
313         jb      .retpzero               / 0 < y
314         / x = +0 & y < 0 so x**y = +inf
315         jmp     .retpinfzflag           / ret +inf & z flag

317 .xisnzero:
318         / y cannot be 0 or NaN ; stack has      y , x
319         call    .y_is_int
320         cmpl    $1,%ecx
321         jne     1f                      / y is not an odd integer
322         / y is an odd integer
323         fldz
324         fcomip  %st(1),%st              / compare 0 with %st(1)
325         jb      .retnzero               / 0 < y
```



```
326         / x = -0 & y < 0 (odd int)      return -inf (z flag)
327         / x = -inf & y != 0 or NaN      return -inf (NO z flag)
328         movb    %dh,%cl
329         andb    $0x45,%cl
330         cmpb    $0x05,%cl               / C3=0 C2=1 C1=? C0=1 when +-inf
331         je      2f
332         fdiv    %st,%st(1)              / y / x, x (raise z flag)
333 2:
334         fstp    %st(0)                  / x
335         fstp    %st(0)                  / stack empty
336         flds    PIC_L(ninfinity)        / -inf
337         ret

339 1:      / y is not an odd integer
340         fldz
341         fcomip  %st(1),%st              / compare 0 with %st(1)
342         jb      .retpzero               / 0 < y
343         / x = -0 & y < 0 (not odd int)  return +inf (z flag)
344         / x = -inf & y not 0 or NaN     return +inf (NO z flag)
345         movb    %dh,%cl
346         andb    $0x45,%cl
347         cmpb    $0x05,%cl               / C3=0 C2=1 C1=? C0=1 when +-inf
348         jne     .retpinfzflag           / ret +inf & divide-by-0 flag
349         jmp     .retpinf                / return +inf (NO z flag)

351 .retpzero:
352         fstp    %st(0)                  / x
353         fstp    %st(0)                  / stack empty
354         fldz                            / +0
355         ret

357 .retnzero:
358         fstp    %st(0)                  / x
359         fstp    %st(0)                  / stack empty
360         flds    PIC_L(negzero)          / -0
361         ret

363 .retponeorinvalid:
364         PIC_G_LOAD(movzwq,__xpg6,rax)
365         andl    $_C99SUSv3_pow_treats_Inf_as_an_even_int,%eax
366         cmpl    $0,%eax
367         je      1f
368         fstp    %st(0)                  / x
369         fstp    %st(0)                  / stack empty
370         fld1                            / 1
371         ret

373 1:
374         fstp    %st(0)                  / x
375         fstp    %st(0)                  / stack empty
376         flds    PIC_L(Snan)             / Q NaN (i flag)
377         fwait
378         ret

380 .retpinf:
381         fstp    %st(0)                  / x
382         fstp    %st(0)                  / stack empty
383         flds    PIC_L(pinfinity)        / +inf
384         ret

386 .retpinfzflag:
387         fstp    %st(0)                  / x
388         fstp    %st(0)                  / stack empty
389         fldz
390         fdivrs  PIC_L(one)              / 1/0
391         ret
```

```
393 / Set %ecx to 2 if y is an even integer, 1 if y is an odd integer,
394 / 0 otherwise.  Assume y is not zero.  Do not raise inexact or modify
395 / %edx.
396 .y_is_int:
397         movl    40(%rbp),%eax
398         andl    $0x7fff,%eax            / exponent of y
399         cmpl    $0x403f,%eax
400         jae     1f                      / |y| >= 2^64, an even int
401         cmpl    $0x3fff,%eax
402         jb      2f                      / |y| < 1, can't be an int
403         movl    %eax,%ecx
404         subl    $0x403e,%ecx
405         negl    %ecx                    / 63 - unbiased exponent of y
406         movq    32(%rbp),%rax
407         bsfq    %rax,%rax               / index of least sig. 1 bit
408         cmpl    %ecx,%eax
409         jb      2f
410         ja      1f
411         movl    $1,%ecx
412         ret
413 1:
414         movl    $2,%ecx
415         ret
416 2:
417         xorl    %ecx,%ecx
418         ret
419         .align  16
420         SET_SIZE(powl)
```

```
**********************************************************
    2043 Sat May 10 12:08:47 2014
new/usr/src/lib/libm/amd64/src/remainder.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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        .file "remainder.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remainder,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(remainder)
        push    %rbp
        movq    %rsp,%rbp
        subq    $16,%rsp
        movlpd  %xmm1,-16(%rbp)
        movlpd  %xmm0,-8(%rbp)

        ucomisd %xmm0,%xmm1             / if x or y is NaN, use fprem1
        jp      1f

        movl    -12(%rbp),%eax          / eax <-- hi_32(y)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(|y|)
        orl     -16(%rbp),%eax          / eax <-- lo_32(y)|hi_32(|y|)
        je      .yzero_or_xinf

        movl    -4(%rbp),%eax           / eax <-- hi_32(x)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(|x|)
        cmpl    $0x7ff00000,%eax
        jne     1f
        cmpl    $0,-8(%rbp)
        je      .yzero_or_xinf
1:
        fldl    -16(%rbp)               / y
        fldl    -8(%rbp)                / x
.rem_loop:
        fprem1                          / partial remainder
```



```
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check for incomplete reduction
        jne     .rem_loop               / while incomplete, do fprem1 again
        fstpl   -8(%rbp)
        movsd   -8(%rbp),%xmm0
        fstp    %st(0)
        leave
        ret

.yzero_or_xinf:
        PIC_SETUP(1)
        movl    $28,%edi
        movl    $2,%eax
        call    PIC_F(_SVID_libm_err)
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(remainder)
```

```
**********************************************************
    1557 Sat May 10 12:08:47 2014
new/usr/src/lib/libm/amd64/src/remainderf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "remainderf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remainderf,function)
#include "libm_synonyms.h"

        ENTRY(remainderf)
        push    %rbp
        movq    %rsp,%rbp
        subq    $16,%rsp
        movss   %xmm1,-8(%rbp)
        movss   %xmm0,-4(%rbp)
        flds    -8(%rbp)                / load arg y
        flds    -4(%rbp)                / load arg x
.rem_loop:
        fprem1                          / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check whether reduction complete
        jne     .rem_loop               / while reduction incomplete, do fprem1
        fstps   -4(%rbp)
        movss   -4(%rbp),%xmm0
        fstp    %st(0)
        leave
        ret
        .align  4
        SET_SIZE(remainderf)
```

```
**********************************************************
    1427 Sat May 10 12:08:47 2014
new/usr/src/lib/libm/amd64/src/remainderl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "remainderl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remainderl,function)
#include "libm_synonyms.h"

        ENTRY(remainderl)
        fldt    24(%rsp)                / load arg y
        fldt    8(%rsp)                 / load arg x
.rem_loop:
        fprem1                          / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check whether reduction complete
        jne     .rem_loop               / while reduction incomplete, do fprem1
        fstp    %st(1)
        ret
        .align  16
        SET_SIZE(remainderl)
```

```
**********************************************************
    1906 Sat May 10 12:08:47 2014
new/usr/src/lib/libm/amd64/src/remquol.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "remquol.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remquol,function)
#include "libm_synonyms.h"
#include "libm_protos.h"
        ENTRY(remquol)
        fldt    24(%rsp)                / load arg y
        fldt    8(%rsp)                 / load arg x
.Lreml_loop:
        fprem1                          / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check whether reduction complete
        jne     .Lreml_loop             / while reduction incomplete, do fprem1
        fstsw   %ax
        fwait
        fstp    %st(1)
        movw    %ax,%dx
        andw    $0x4000,%dx             / get C3
        sarw    $13,%dx
        movw    %ax,%cx
        andw    $0x100,%cx              / get C0
        sarw    $6,%cx
        addw    %cx,%dx
        andw    $0x200,%ax              / get C1
        sarw    $9,%ax
        addw    %dx,%ax
        cwtl
        movl    16(%rsp),%edx           / sign and bexp of x
        movl    32(%rsp),%ecx           / sign and bexp of y
        andl    $0x8000,%edx            / edx <- sign(x)
        andl    $0x8000,%ecx            / ecx <- sign(y)
        cmpl    %edx,%ecx
```



```
        je      1f
        negl    %eax                    / negative n
1:
        movl    %eax,(%rdi)             / last 3 significant bits of quotient
        ret
        .align  16
        SET_SIZE(remquol)
```

****
1214 Sat May 10 12:08:47 2014
new/usr/src/lib/libm/amd64/src/rintl.s
patch01 - 693 import Sun Devpro Math Library
****

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        .file   "rintl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(rintl,function)
#include "libm_synonyms.h"

        ENTRY(rintl)
        fldt    8(%rsp)                 / load x
        frndint                         / [x], per rounding mode
        fwait
        ret
        .align  16
        SET_SIZE(rintl)
```

```
**********************************************************
    3109 Sat May 10 12:08:47 2014
new/usr/src/lib/libm/amd64/src/rndintl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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        .file "rndintl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(aintl,function)
LIBM_ANSI_PRAGMA_WEAK(irintl,function)
LIBM_ANSI_PRAGMA_WEAK(anintl,function)
LIBM_ANSI_PRAGMA_WEAK(nintl,function)
#include "libm_synonyms.h"

#undef fabs

        ENTRY(aintl)
        movq    %rsp,%rax
        subq    $16,%rsp
        fstcw   -8(%rax)
        fldt    8(%rax)
        movw    -8(%rax),%cx
        orw     $0x0c00,%cx
        movw    %cx,-4(%rax)
        fldcw   -4(%rax)                / set RD = to_zero
        frndint
        fstcw   -4(%rax)
        movw    -4(%rax),%dx
        andw    $0xf3ff,%dx
        movw    -8(%rax),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,-8(%rax)
        fldcw   -8(%rax)                / restore RD
        addq    $16,%rsp
        ret
        .align  16
        SET_SIZE(aintl)
```



```
        ENTRY(irintl)
        movq    %rsp,%rcx
        subq    $16,%rsp
        fldt    8(%rcx)                 / load x
        fistpl  -8(%rcx)                / [x]
        fwait
        movslq  -8(%rcx),%rax
        addq    $16,%rsp
        ret
        .align  16
        SET_SIZE(irintl)

        .data
        .align  16
half:   .float  0.5

        ENTRY(anintl)
.Lanintl:
        movq    %rsp,%rcx
        subq    $16,%rsp
        fstcw   -8(%rcx)
        fldt    8(%rcx)
        movw    -8(%rcx),%dx
        andw    $0xf3ff,%dx
        movw    %dx,-4(%rcx)
        fldcw   -4(%rcx)                / set RD = to_nearest
        fld     %st(0)
        frndint                         / [x],x
        fstcw   -4(%rcx)
        movw    -4(%rcx),%dx
        andw    $0xf3ff,%dx
        movw    -8(%rcx),%ax
        andw    $0x0c00,%ax
        orw     %dx,%ax
        movw    %ax,-8(%rcx)
        fldcw   -8(%rcx)                / restore RD
        fucomi  %st(1),%st              / check if x is already an integer
        jp      .L0
        je      .L0
        fxch                            / x,[x]
        fsub    %st(1),%st              / x-[x],[x]
        fabs                            / |x-[x]|,[x]
        PIC_SETUP(1)
        flds    PIC_L(half)
        fcomip  %st(1),%st              / compare 0.5 with |x-[x]|
        PIC_WRAPUP
        je      .halfway                / if 0.5 = |x-[x]| goto halfway,
                                        / most cases will not take branch.
.L0:
        addq    $16,%rsp
        fstp    %st(0)
        ret
.halfway:
        / x = n+0.5, recompute anint(x) as x+sign(x)*0.5
        fldt    8(%rcx)                 / x, 0.5, [x]
        movw    16(%rcx),%ax            / sign+exp part of x
        andw    $0x8000,%ax             / look at sign bit
        jnz     .x_neg
        faddp
        addq    $16,%rsp
        fstp    %st(1)
        ret
.x_neg:
        / here, x is negative, so return x-0.5
        fsubp   %st,%st(1)              / x-0.5,[x]
```

```
128         addq    $16,%rsp
129         fstp    %st(1)
130         ret
131         .align  16
132         SET_SIZE(anintl)

134         ENTRY(nintl)
135         pushq   %rbp
136         movq    %rsp,%rbp
137         subq    $16,%rsp
138         pushq   24(%rbp)
139         pushq   16(%rbp)
140         call    .Lanintl                /// LOCAL
141         fistpl  -8(%rbp)
142         fwait
143         movslq  -8(%rbp),%rax
144         leave
145         ret
146         .align  16
147         SET_SIZE(nintl)
```

****
1251 Sat May 10 12:08:48 2014
new/usr/src/lib/libm/amd64/src/scalbnl.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file   "scalbnl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(scalbnl,function)
#include "libm_synonyms.h"

        ENTRY(scalbnl)
        subq    $16,%rsp
        movl    %edi,(%rsp)
        fildl   (%rsp)
        fldt    24(%rsp)
        addq    $16,%rsp
        fscale
        fstp    %st(1)
        ret
        .align  16
        SET_SIZE(scalbnl)
```

```
**********************************************************
    1166 Sat May 10 12:08:48 2014
new/usr/src/lib/libm/amd64/src/sqrtl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "sqrtl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(sqrtl,function)
#include "libm_synonyms.h"

        ENTRY(sqrtl)
        fldt    8(%rsp)
        fsqrt
        ret
        .align  16
        SET_SIZE(sqrtl)
```

```
**********************************************************
   22354 Sat May 10 12:08:48 2014
new/usr/src/lib/libm/common/C/_SVID_error.c
patch06 - libm: fixed compilation issues after updates
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */
#include <stdio.h>
#include <float.h>              /* DBL_MAX, DBL_MIN */
#include <unistd.h>             /* write */
#if defined(__x86)
#include <ieeefp.h>
#undef  fp_class
#define fp_class        fpclass
#define fp_quiet        FP_QNAN
#endif
#include <errno.h>
#undef fflush
#include <sys/isa_defs.h>

/* INDENT OFF */
/*
 * Report libm exception error according to System V Interface Definition
 * (SVID).
 * Error mapping:
 *      1 -- acos(|x|>1)
 *      2 -- asin(|x|>1)
 *      3 -- atan2(+-0,+-0)
 *      4 -- hypot overflow
 *      5 -- cosh overflow
 *      6 -- exp overflow
 *      7 -- exp underflow
 *      8 -- y0(0)
 *      9 -- y0(-ve)
 *      10-- y1(0)
 *      11-- y1(-ve)
```



```
 *      12-- yn(0)
 *      13-- yn(-ve)
 *      14-- lgamma(finite) overflow
 *      15-- lgamma(-integer)
 *      16-- log(0)
 *      17-- log(x<0)
 *      18-- log10(0)
 *      19-- log10(x<0)
 *      20-- pow(0.0,0.0)
 *      21-- pow(x,y) overflow
 *      22-- pow(x,y) underflow
 *      23-- pow(0,negative)
 *      24-- pow(neg,non-integral)
 *      25-- sinh(finite) overflow
 *      26-- sqrt(negative)
 *      27-- fmod(x,0)
 *      28-- remainder(x,0)
 *      29-- acosh(x<1)
 *      30-- atanh(|x|>1)
 *      31-- atanh(|x|=1)
 *      32-- scalb overflow
 *      33-- scalb underflow
 *      34-- j0(|x|>X_TLOSS)
 *      35-- y0(x>X_TLOSS)
 *      36-- j1(|x|>X_TLOSS)
 *      37-- y1(x>X_TLOSS)
 *      38-- jn(|x|>X_TLOSS, n)
 *      39-- yn(x>X_TLOSS, n)
 *      40-- gamma(finite) overflow
 *      41-- gamma(-integer)
 *      42-- pow(NaN,0.0) return NaN for SVID/XOPEN
 *      43-- log1p(-1)
 *      44-- log1p(x<-1)
 *      45-- logb(0)
 *      46-- nextafter overflow
 *      47-- scalb(x,inf)
 */
/* INDENT ON */

static double setexception(int, double);

static const union {
        unsigned        x[2];
        double          d;
} C[] = {
#ifdef _LITTLE_ENDIAN
        { 0xffffffff, 0x7fffffff },
        { 0x54442d18, 0x400921fb },
#else
        { 0x7fffffff, 0xffffffff },
        { 0x400921fb, 0x54442d18 },
#endif
};

#define NaN     C[0].d
#define PI_RZ   C[1].d

#define __HI(x) ((unsigned *)&x)[HIWORD]
#define __LO(x) ((unsigned *)&x)[LOWORD]
#undef  Inf
#define Inf     HUGE_VAL

double
_SVID_libm_err(double x, double y, int type) {
        struct exception        exc;
        double                  t, w, ieee_retval = 0;
```

```
126         enum version            lib_version = _lib_version;
127         int                     iy;
128
129         /* force libm_ieee behavior in SUSv3 mode */
130         if ((__xpg6 & _C99SUSv3_math_errexcept) != 0)
131                 lib_version = libm_ieee;
132         if (lib_version == c_issue_4) {
133                 (void) fflush(stdout);
134         }
135         exc.arg1 = x;
136         exc.arg2 = y;
137         switch (type) {
138         case 1:
139                 /* acos(|x|>1) */
140                 exc.type = DOMAIN;
141                 exc.name = "acos";
142                 ieee_retval = setexception(3, 1.0);
143                 exc.retval = 0.0;
144                 if (lib_version == strict_ansi) {
145                         errno = EDOM;
146                 } else if (!matherr(&exc)) {
147                         if (lib_version == c_issue_4) {
148                                 (void) write(2, "acos: DOMAIN error\n", 19);
149                         }
150                         errno = EDOM;
151                 }
152                 break;
153         case 2:
154                 /* asin(|x|>1) */
155                 exc.type = DOMAIN;
156                 exc.name = "asin";
157                 exc.retval = 0.0;
158                 ieee_retval = setexception(3, 1.0);
159                 if (lib_version == strict_ansi) {
160                         errno = EDOM;
161                 } else if (!matherr(&exc)) {
162                         if (lib_version == c_issue_4) {
163                                 (void) write(2, "asin: DOMAIN error\n", 19);
164                         }
165                         errno = EDOM;
166                 }
167                 break;
168         case 3:
169                 /* atan2(+-0,+-0) */
170                 exc.arg1 = y;
171                 exc.arg2 = x;
172                 exc.type = DOMAIN;
173                 exc.name = "atan2";
174                 ieee_retval = copysign(1.0, x) == 1.0 ? y :
175                         copysign(PI_RZ + DBL_MIN, y);
176                 exc.retval = 0.0;
177                 if (lib_version == strict_ansi) {
178                         errno = EDOM;
179                 } else if (!matherr(&exc)) {
180                         if (lib_version == c_issue_4) {
181                                 (void) write(2, "atan2: DOMAIN error\n", 20);
182                         }
183                         errno = EDOM;
184                 }
185                 break;
186         case 4:
187                 /* hypot(finite,finite) overflow */
188                 exc.type = OVERFLOW;
189                 exc.name = "hypot";
190                 ieee_retval = Inf;
191                 if (lib_version == c_issue_4)
```



```
192                         exc.retval = HUGE;
193                 else
194                         exc.retval = HUGE_VAL;
195                 if (lib_version == strict_ansi)
196                         errno = ERANGE;
197                 else if (!matherr(&exc))
198                         errno = ERANGE;
199                 break;
200         case 5:
201                 /* cosh(finite) overflow */
202                 exc.type = OVERFLOW;
203                 exc.name = "cosh";
204                 ieee_retval = setexception(2, 1.0);
205                 if (lib_version == c_issue_4)
206                         exc.retval = HUGE;
207                 else
208                         exc.retval = HUGE_VAL;
209                 if (lib_version == strict_ansi)
210                         errno = ERANGE;
211                 else if (!matherr(&exc))
212                         errno = ERANGE;
213                 break;
214         case 6:
215                 /* exp(finite) overflow */
216                 exc.type = OVERFLOW;
217                 exc.name = "exp";
218                 ieee_retval = setexception(2, 1.0);
219                 if (lib_version == c_issue_4)
220                         exc.retval = HUGE;
221                 else
222                         exc.retval = HUGE_VAL;
223                 if (lib_version == strict_ansi)
224                         errno = ERANGE;
225                 else if (!matherr(&exc))
226                         errno = ERANGE;
227                 break;
228         case 7:
229                 /* exp(finite) underflow */
230                 exc.type = UNDERFLOW;
231                 exc.name = "exp";
232                 ieee_retval = setexception(1, 1.0);
233                 exc.retval = 0.0;
234                 if (lib_version == strict_ansi)
235                         errno = ERANGE;
236                 else if (!matherr(&exc))
237                         errno = ERANGE;
238                 break;
239         case 8:
240                 /* y0(0) = -inf */
241                 exc.type = DOMAIN;      /* should be SING for IEEE */
242                 exc.name = "y0";
243                 ieee_retval = setexception(0, -1.0);
244                 if (lib_version == c_issue_4)
245                         exc.retval = -HUGE;
246                 else
247                         exc.retval = -HUGE_VAL;
248                 if (lib_version == strict_ansi) {
249                         errno = EDOM;
250                 } else if (!matherr(&exc)) {
251                         if (lib_version == c_issue_4) {
252                                 (void) write(2, "y0: DOMAIN error\n", 17);
253                         }
254                         errno = EDOM;
255                 }
256                 break;
257         case 9:
```

```
258                 /* y0(x<0) = NaN */
259                 exc.type = DOMAIN;
260                 exc.name = "y0";
261                 ieee_retval = setexception(3, 1.0);
262                 if (lib_version == c_issue_4)
263                         exc.retval = -HUGE;
264                 else
265                         exc.retval = -HUGE_VAL;
266                 if (lib_version == strict_ansi) {
267                         errno = EDOM;
268                 } else if (!matherr(&exc)) {
269                         if (lib_version == c_issue_4) {
270                                 (void) write(2, "y0: DOMAIN error\n", 17);
271                         }
272                         errno = EDOM;
273                 }
274                 break;
275         case 10:
276                 /* y1(0) = -inf */
277                 exc.type = DOMAIN;      /* should be SING for IEEE */
278                 exc.name = "y1";
279                 ieee_retval = setexception(0, -1.0);
280                 if (lib_version == c_issue_4)
281                         exc.retval = -HUGE;
282                 else
283                         exc.retval = -HUGE_VAL;
284                 if (lib_version == strict_ansi) {
285                         errno = EDOM;
286                 } else if (!matherr(&exc)) {
287                         if (lib_version == c_issue_4) {
288                                 (void) write(2, "y1: DOMAIN error\n", 17);
289                         }
290                         errno = EDOM;
291                 }
292                 break;
293         case 11:
294                 /* y1(x<0) = NaN */
295                 exc.type = DOMAIN;
296                 exc.name = "y1";
297                 ieee_retval = setexception(3, 1.0);
298                 if (lib_version == c_issue_4)
299                         exc.retval = -HUGE;
300                 else
301                         exc.retval = -HUGE_VAL;
302                 if (lib_version == strict_ansi) {
303                         errno = EDOM;
304                 } else if (!matherr(&exc)) {
305                         if (lib_version == c_issue_4) {
306                                 (void) write(2, "y1: DOMAIN error\n", 17);
307                         }
308                         errno = EDOM;
309                 }
310                 break;
311         case 12:
312                 /* yn(n,0) = -inf */
313                 exc.type = DOMAIN;      /* should be SING for IEEE */
314                 exc.name = "yn";
315                 ieee_retval = setexception(0, -1.0);
316                 if (lib_version == c_issue_4)
317                         exc.retval = -HUGE;
318                 else
319                         exc.retval = -HUGE_VAL;
320                 if (lib_version == strict_ansi) {
321                         errno = EDOM;
322                 } else if (!matherr(&exc)) {
323                         if (lib_version == c_issue_4) {
```



```
324                                 (void) write(2, "yn: DOMAIN error\n", 17);
325                         }
326                         errno = EDOM;
327                 }
328                 break;
329         case 13:
330                 /* yn(x<0) = NaN */
331                 exc.type = DOMAIN;
332                 exc.name = "yn";
333                 ieee_retval = setexception(3, 1.0);
334                 if (lib_version == c_issue_4)
335                         exc.retval = -HUGE;
336                 else
337                         exc.retval = -HUGE_VAL;
338                 if (lib_version == strict_ansi) {
339                         errno = EDOM;
340                 } else if (!matherr(&exc)) {
341                         if (lib_version == c_issue_4) {
342                                 (void) write(2, "yn: DOMAIN error\n", 17);
343                         }
344                         errno = EDOM;
345                 }
346                 break;
347         case 14:
348                 /* lgamma(finite) overflow */
349                 exc.type = OVERFLOW;
350                 exc.name = "lgamma";
351                 ieee_retval = setexception(2, 1.0);
352                 if (lib_version == c_issue_4)
353                         exc.retval = HUGE;
354                 else
355                         exc.retval = HUGE_VAL;
356                 if (lib_version == strict_ansi)
357                         errno = ERANGE;
358                 else if (!matherr(&exc))
359                         errno = ERANGE;
360                 break;
361         case 15:
362                 /* lgamma(-integer) or lgamma(0) */
363                 exc.type = SING;
364                 exc.name = "lgamma";
365                 ieee_retval = setexception(0, 1.0);
366                 if (lib_version == c_issue_4)
367                         exc.retval = HUGE;
368                 else
369                         exc.retval = HUGE_VAL;
370                 if (lib_version == strict_ansi) {
371                         errno = EDOM;
372                 } else if (!matherr(&exc)) {
373                         if (lib_version == c_issue_4) {
374                                 (void) write(2, "lgamma: SING error\n", 19);
375                         }
376                         errno = EDOM;
377                 }
378                 break;
379         case 16:
380                 /* log(0) */
381                 exc.type = SING;
382                 exc.name = "log";
383                 ieee_retval = setexception(0, -1.0);
384                 if (lib_version == c_issue_4)
385                         exc.retval = -HUGE;
386                 else
387                         exc.retval = -HUGE_VAL;
388                 if (lib_version == strict_ansi) {
389                         errno = ERANGE;
```

```
390                 } else if (!matherr(&exc)) {
391                         if (lib_version == c_issue_4) {
392                                 (void) write(2, "log: SING error\n", 16);
393                                 errno = EDOM;
394                         } else {
395                                 errno = ERANGE;
396                         }
397                 }
398                 break;
399         case 17:
400                 /* log(x<0) */
401                 exc.type = DOMAIN;
402                 exc.name = "log";
403                 ieee_retval = setexception(3, 1.0);
404                 if (lib_version == c_issue_4)
405                         exc.retval = -HUGE;
406                 else
407                         exc.retval = -HUGE_VAL;
408                 if (lib_version == strict_ansi) {
409                         errno = EDOM;
410                 } else if (!matherr(&exc)) {
411                         if (lib_version == c_issue_4) {
412                                 (void) write(2, "log: DOMAIN error\n", 18);
413                         }
414                         errno = EDOM;
415                 }
416                 break;
417         case 18:
418                 /* log10(0) */
419                 exc.type = SING;
420                 exc.name = "log10";
421                 ieee_retval = setexception(0, -1.0);
422                 if (lib_version == c_issue_4)
423                         exc.retval = -HUGE;
424                 else
425                         exc.retval = -HUGE_VAL;
426                 if (lib_version == strict_ansi) {
427                         errno = ERANGE;
428                 } else if (!matherr(&exc)) {
429                         if (lib_version == c_issue_4) {
430                                 (void) write(2, "log10: SING error\n", 18);
431                                 errno = EDOM;
432                         } else {
433                                 errno = ERANGE;
434                         }
435                 }
436                 break;
437         case 19:
438                 /* log10(x<0) */
439                 exc.type = DOMAIN;
440                 exc.name = "log10";
441                 ieee_retval = setexception(3, 1.0);
442                 if (lib_version == c_issue_4)
443                         exc.retval = -HUGE;
444                 else
445                         exc.retval = -HUGE_VAL;
446                 if (lib_version == strict_ansi) {
447                         errno = EDOM;
448                 } else if (!matherr(&exc)) {
449                         if (lib_version == c_issue_4) {
450                                 (void) write(2, "log10: DOMAIN error\n", 20);
451                         }
452                         errno = EDOM;
453                 }
454                 break;
455         case 20:
```



```
456                 /* pow(0.0,0.0) */
457                 /* error only if lib_version == c_issue_4 */
458                 exc.type = DOMAIN;
459                 exc.name = "pow";
460                 exc.retval = 0.0;
461                 ieee_retval = 1.0;
462                 if (lib_version != c_issue_4) {
463                         exc.retval = 1.0;
464                 } else if (!matherr(&exc)) {
465                         (void) write(2, "pow(0,0): DOMAIN error\n", 23);
466                         errno = EDOM;
467                 }
468                 break;
469         case 21:
470                 /* pow(x,y) overflow */
471                 exc.type = OVERFLOW;
472                 exc.name = "pow";
473                 exc.retval = (lib_version == c_issue_4)? HUGE : HUGE_VAL;
474                 if (signbit(x)) {
475                         t = rint(y);
476                         if (t == y) {
477                                 w = rint(0.5 * y);
478                                 if (t != w + w) {       /* y is odd */
479                                         exc.retval = -exc.retval;
480                                 }
481                         }
482                 }
483                 ieee_retval = setexception(2, exc.retval);
484                 if (lib_version == strict_ansi)
485                         errno = ERANGE;
486                 else if (!matherr(&exc))
487                         errno = ERANGE;
488                 break;
489         case 22:
490                 /* pow(x,y) underflow */
491                 exc.type = UNDERFLOW;
492                 exc.name = "pow";
493                 exc.retval = 0.0;
494                 if (signbit(x)) {
495                         t = rint(y);
496                         if (t == y) {
497                                 w = rint(0.5 * y);
498                                 if (t != w + w) /* y is odd */
499                                         exc.retval = -exc.retval;
500                         }
501                 }
502                 ieee_retval = setexception(1, exc.retval);
503                 if (lib_version == strict_ansi)
504                         errno = ERANGE;
505                 else if (!matherr(&exc))
506                         errno = ERANGE;
507                 break;
508         case 23:
509                 /* (+-0)**neg */
510                 exc.type = DOMAIN;
511                 exc.name = "pow";
512                 ieee_retval = setexception(0, 1.0);
513                 {
514                         int ahy, k, j, yisint, ly, hx;
515                         /* INDENT OFF */
516                         /*
517                          * determine if y is an odd int when x = -0
518                          * yisint = 0       ... y is not an integer
519                          * yisint = 1       ... y is an odd int
520                          * yisint = 2       ... y is an even int
521                          */
```

```
522                     /* INDENT ON */
523                     hx  = __HI(x);
524                     ahy = __HI(y)&0x7fffffff;
525                     ly  = __LO(y);

527                     yisint = 0;
528                     if (ahy >= 0x43400000) {
529                             yisint = 2;     /* even integer y */
530                     } else if (ahy >= 0x3ff00000) {
531                             k = (ahy >> 20) - 0x3ff;        /* exponent */
532                             if (k > 20) {
533                                     j = ly >> (52 - k);
534                                     if ((j << (52 - k)) == ly)
535                                             yisint = 2 - (j & 1);
536                             } else if (ly == 0) {
537                                     j = ahy >> (20 - k);
538                                     if ((j << (20 - k)) == ahy)
539                                             yisint = 2 - (j & 1);
540                             }
541                     }
542                     if (hx < 0 && yisint == 1)
543                             ieee_retval = -ieee_retval;
544             }
545             if (lib_version == c_issue_4)
546                     exc.retval = 0.0;
547             else
548                     exc.retval = -HUGE_VAL;
549             if (lib_version == strict_ansi) {
550                     errno = EDOM;
551             } else if (!matherr(&exc)) {
552                     if (lib_version == c_issue_4) {
553                             (void) write(2, "pow(0,neg): DOMAIN error\n",
554                                 25);
555                     }
556                     errno = EDOM;
557             }
558             break;
559     case 24:
560             /* neg**non-integral */
561             exc.type = DOMAIN;
562             exc.name = "pow";
563             ieee_retval = setexception(3, 1.0);
564             if (lib_version == c_issue_4)
565                     exc.retval = 0.0;
566             else
567                     exc.retval = ieee_retval;       /* X/Open allow NaN */
568             if (lib_version == strict_ansi) {
569                     errno = EDOM;
570             } else if (!matherr(&exc)) {
571                     if (lib_version == c_issue_4) {
572                             (void) write(2,
573                                 "neg**non-integral: DOMAIN error\n", 32);
574                     }
575                     errno = EDOM;
576             }
577             break;
578     case 25:
579             /* sinh(finite) overflow */
580             exc.type = OVERFLOW;
581             exc.name = "sinh";
582             ieee_retval = copysign(Inf, x);
583             if (lib_version == c_issue_4)
584                     exc.retval = x > 0.0 ? HUGE : -HUGE;
585             else
586                     exc.retval = x > 0.0 ? HUGE_VAL : -HUGE_VAL;
587             if (lib_version == strict_ansi)
```



```
588                     errno = ERANGE;
589             else if (!matherr(&exc))
590                     errno = ERANGE;
591             break;
592     case 26:
593             /* sqrt(x<0) */
594             exc.type = DOMAIN;
595             exc.name = "sqrt";
596             ieee_retval = setexception(3, 1.0);
597             if (lib_version == c_issue_4)
598                     exc.retval = 0.0;
599             else
600                     exc.retval = ieee_retval;       /* quiet NaN */
601             if (lib_version == strict_ansi) {
602                     errno = EDOM;
603             } else if (!matherr(&exc)) {
604                     if (lib_version == c_issue_4) {
605                             (void) write(2, "sqrt: DOMAIN error\n", 19);
606                     }
607                     errno = EDOM;
608             }
609             break;
610     case 27:
611             /* fmod(x,0) */
612             exc.type = DOMAIN;
613             exc.name = "fmod";
614             if (fp_class(x) == fp_quiet)
615                     ieee_retval = NaN;
616             else
617                     ieee_retval = setexception(3, 1.0);
618             if (lib_version == c_issue_4)
619                     exc.retval = x;
620             else
621                     exc.retval = ieee_retval;
622             if (lib_version == strict_ansi) {
623                     errno = EDOM;
624             } else if (!matherr(&exc)) {
625                     if (lib_version == c_issue_4) {
626                             (void) write(2, "fmod:  DOMAIN error\n", 20);
627                     }
628                     errno = EDOM;
629             }
630             break;
631     case 28:
632             /* remainder(x,0) */
633             exc.type = DOMAIN;
634             exc.name = "remainder";
635             if (fp_class(x) == fp_quiet)
636                     ieee_retval = NaN;
637             else
638                     ieee_retval = setexception(3, 1.0);
639             exc.retval = NaN;
640             if (lib_version == strict_ansi) {
641                     errno = EDOM;
642             } else if (!matherr(&exc)) {
643                     if (lib_version == c_issue_4) {
644                             (void) write(2, "remainder: DOMAIN error\n",
645                                 24);
646                     }
647                     errno = EDOM;
648             }
649             break;
650     case 29:
651             /* acosh(x<1) */
652             exc.type = DOMAIN;
653             exc.name = "acosh";
```

```
654                 ieee_retval = setexception(3, 1.0);
655                 exc.retval = NaN;
656                 if (lib_version == strict_ansi) {
657                         errno = EDOM;
658                 } else if (!matherr(&exc)) {
659                         if (lib_version == c_issue_4) {
660                                 (void) write(2, "acosh: DOMAIN error\n", 20);
661                         }
662                         errno = EDOM;
663                 }
664                 break;
665         case 30:
666                 /* atanh(|x|>1) */
667                 exc.type = DOMAIN;
668                 exc.name = "atanh";
669                 ieee_retval = setexception(3, 1.0);
670                 exc.retval = NaN;
671                 if (lib_version == strict_ansi) {
672                         errno = EDOM;
673                 } else if (!matherr(&exc)) {
674                         if (lib_version == c_issue_4) {
675                                 (void) write(2, "atanh: DOMAIN error\n", 20);
676                         }
677                         errno = EDOM;
678                 }
679                 break;
680         case 31:
681                 /* atanh(|x|=1) */
682                 exc.type = SING;
683                 exc.name = "atanh";
684                 ieee_retval = setexception(0, x);
685                 exc.retval = ieee_retval;
686                 if (lib_version == strict_ansi) {
687                         errno = ERANGE;
688                 } else if (!matherr(&exc)) {
689                         if (lib_version == c_issue_4) {
690                                 (void) write(2, "atanh: SING error\n", 18);
691                                 errno = EDOM;
692                         } else {
693                                 errno = ERANGE;
694                         }
695                 }
696                 break;
697         case 32:
698                 /* scalb overflow; SVID also returns +-HUGE_VAL */
699                 exc.type = OVERFLOW;
700                 exc.name = "scalb";
701                 ieee_retval = setexception(2, x);
702                 exc.retval = x > 0.0 ? HUGE_VAL : -HUGE_VAL;
703                 if (lib_version == strict_ansi)
704                         errno = ERANGE;
705                 else if (!matherr(&exc))
706                         errno = ERANGE;
707                 break;
708         case 33:
709                 /* scalb underflow */
710                 exc.type = UNDERFLOW;
711                 exc.name = "scalb";
712                 ieee_retval = setexception(1, x);
713                 exc.retval = ieee_retval;       /* +-0.0 */
714                 if (lib_version == strict_ansi)
715                         errno = ERANGE;
716                 else if (!matherr(&exc))
717                         errno = ERANGE;
718                 break;
719         case 34:
```



```
720                 /* j0(|x|>X_TLOSS) */
721                 exc.type = TLOSS;
722                 exc.name = "j0";
723                 exc.retval = 0.0;
724                 ieee_retval = y;
725                 if (lib_version == strict_ansi) {
726                         errno = ERANGE;
727                 } else if (!matherr(&exc)) {
728                         if (lib_version == c_issue_4) {
729                                 (void) write(2, exc.name, 2);
730                                 (void) write(2, ": TLOSS error\n", 14);
731                         }
732                         errno = ERANGE;
733                 }
734                 break;
735         case 35:
736                 /* y0(x>X_TLOSS) */
737                 exc.type = TLOSS;
738                 exc.name = "y0";
739                 exc.retval = 0.0;
740                 ieee_retval = y;
741                 if (lib_version == strict_ansi) {
742                         errno = ERANGE;
743                 } else if (!matherr(&exc)) {
744                         if (lib_version == c_issue_4) {
745                                 (void) write(2, exc.name, 2);
746                                 (void) write(2, ": TLOSS error\n", 14);
747                         }
748                         errno = ERANGE;
749                 }
750                 break;
751         case 36:
752                 /* j1(|x|>X_TLOSS) */
753                 exc.type = TLOSS;
754                 exc.name = "j1";
755                 exc.retval = 0.0;
756                 ieee_retval = y;
757                 if (lib_version == strict_ansi) {
758                         errno = ERANGE;
759                 } else if (!matherr(&exc)) {
760                         if (lib_version == c_issue_4) {
761                                 (void) write(2, exc.name, 2);
762                                 (void) write(2, ": TLOSS error\n", 14);
763                         }
764                         errno = ERANGE;
765                 }
766                 break;
767         case 37:
768                 /* y1(x>X_TLOSS) */
769                 exc.type = TLOSS;
770                 exc.name = "y1";
771                 exc.retval = 0.0;
772                 ieee_retval = y;
773                 if (lib_version == strict_ansi) {
774                         errno = ERANGE;
775                 } else if (!matherr(&exc)) {
776                         if (lib_version == c_issue_4) {
777                                 (void) write(2, exc.name, 2);
778                                 (void) write(2, ": TLOSS error\n", 14);
779                         }
780                         errno = ERANGE;
781                 }
782                 break;
783         case 38:
784                 /* jn(|x|>X_TLOSS) */
785                 /* incorrect ieee value: ieee should never be here */
```

```
786                 exc.type = TLOSS;
787                 exc.name = "jn";
788                 exc.retval = 0.0;
789                 ieee_retval = 0.0;      /* shall not be used */
790                 if (lib_version == strict_ansi) {
791                         errno = ERANGE;
792                 } else if (!matherr(&exc)) {
793                         if (lib_version == c_issue_4) {
794                                 (void) write(2, exc.name, 2);
795                                 (void) write(2, ": TLOSS error\n", 14);
796                         }
797                         errno = ERANGE;
798                 }
799                 break;
800         case 39:
801                 /* yn(x>X_TLOSS) */
802                 /* incorrect ieee value: ieee should never be here */
803                 exc.type = TLOSS;
804                 exc.name = "yn";
805                 exc.retval = 0.0;
806                 ieee_retval = 0.0;      /* shall not be used */
807                 if (lib_version == strict_ansi) {
808                         errno = ERANGE;
809                 } else if (!matherr(&exc)) {
810                         if (lib_version == c_issue_4) {
811                                 (void) write(2, exc.name, 2);
812                                 (void) write(2, ": TLOSS error\n", 14);
813                         }
814                         errno = ERANGE;
815                 }
816                 break;
817         case 40:
818                 /* gamma(finite) overflow */
819                 exc.type = OVERFLOW;
820                 exc.name = "gamma";
821                 ieee_retval = setexception(2, 1.0);
822                 if (lib_version == c_issue_4)
823                         exc.retval = HUGE;
824                 else
825                         exc.retval = HUGE_VAL;
826                 if (lib_version == strict_ansi)
827                         errno = ERANGE;
828                 else if (!matherr(&exc))
829                         errno = ERANGE;
830                 break;
831         case 41:
832                 /* gamma(-integer) or gamma(0) */
833                 exc.type = SING;
834                 exc.name = "gamma";
835                 ieee_retval = setexception(0, 1.0);
836                 if (lib_version == c_issue_4)
837                         exc.retval = HUGE;
838                 else
839                         exc.retval = HUGE_VAL;
840                 if (lib_version == strict_ansi) {
841                         errno = EDOM;
842                 } else if (!matherr(&exc)) {
843                         if (lib_version == c_issue_4) {
844                                 (void) write(2, "gamma: SING error\n", 18);
845                         }
846                         errno = EDOM;
847                 }
848                 break;
849         case 42:
850                 /* pow(NaN,0.0) */
851                 /* error if lib_version == c_issue_4 or ansi_1 */
```



```
852                 exc.type = DOMAIN;
853                 exc.name = "pow";
854                 exc.retval = x;
855                 ieee_retval = 1.0;
856                 if (lib_version == strict_ansi) {
857                         exc.retval = 1.0;
858                 } else if (!matherr(&exc)) {
859                         if ((lib_version == c_issue_4) || (lib_version == ansi_1
860                                 errno = EDOM;
861                 }
862                 break;
863         case 43:
864                 /* log1p(-1) */
865                 exc.type = SING;
866                 exc.name = "log1p";
867                 ieee_retval = setexception(0, -1.0);
868                 if (lib_version == c_issue_4)
869                         exc.retval = -HUGE;
870                 else
871                         exc.retval = -HUGE_VAL;
872                 if (lib_version == strict_ansi) {
873                         errno = ERANGE;
874                 } else if (!matherr(&exc)) {
875                         if (lib_version == c_issue_4) {
876                                 (void) write(2, "log1p: SING error\n", 18);
877                                 errno = EDOM;
878                         } else {
879                                 errno = ERANGE;
880                         }
881                 }
882                 break;
883         case 44:
884                 /* log1p(x<-1) */
885                 exc.type = DOMAIN;
886                 exc.name = "log1p";
887                 ieee_retval = setexception(3, 1.0);
888                 exc.retval = ieee_retval;
889                 if (lib_version == strict_ansi) {
890                         errno = EDOM;
891                 } else if (!matherr(&exc)) {
892                         if (lib_version == c_issue_4) {
893                                 (void) write(2, "log1p: DOMAIN error\n", 20);
894                         }
895                         errno = EDOM;
896                 }
897                 break;
898         case 45:
899                 /* logb(0) */
900                 exc.type = DOMAIN;
901                 exc.name = "logb";
902                 ieee_retval = setexception(0, -1.0);
903                 exc.retval = -HUGE_VAL;
904                 if (lib_version == strict_ansi)
905                         errno = EDOM;
906                 else if (!matherr(&exc))
907                         errno = EDOM;
908                 break;
909         case 46:
910                 /* nextafter overflow */
911                 exc.type = OVERFLOW;
912                 exc.name = "nextafter";
913                 /*
914                  * The value as returned by setexception is +/-DBL_MAX in
915                  * round-to-{zero,-/+Inf} mode respectively, which is not
916                  * usable.
917                  */
```

```
                (void) setexception(2, x);
                ieee_retval = x > 0 ? Inf : -Inf;
                exc.retval = x > 0 ? HUGE_VAL : -HUGE_VAL;
                if (lib_version == strict_ansi)
                        errno = ERANGE;
                else if (!matherr(&exc))
                        errno = ERANGE;
                break;
        case 47:
                /* scalb(x,inf) */
                iy = ((int *)&y)[HIWORD];
                if (lib_version == c_issue_4)
                        /* SVID3: ERANGE in all cases */
                        errno = ERANGE;
                else if ((x == 0.0 && iy > 0) || (!finite(x) && iy < 0))
                        /* EDOM for scalb(0,+inf) or scalb(inf,-inf) */
                        errno = EDOM;
                exc.retval = ieee_retval = ((iy < 0)? x / -y : x * y);
                break;
        }
        switch (lib_version) {
        case c_issue_4:
        case ansi_1:
        case strict_ansi:
                return (exc.retval);
                /* NOTREACHED */
        default:
                return (ieee_retval);
        }
        /* NOTREACHED */
}

static double
setexception(int n, double x) {
        /*
         * n =
         * 0    division by zero
         * 1    underflow
         * 2    overflow
         * 3    invalid
         */
        volatile double one = 1.0, zero = 0.0, retv;

        switch (n) {
        case 0:         /* division by zero */
                retv = copysign(one / zero, x);
                break;
        case 1:         /* underflow */
                retv = DBL_MIN * copysign(DBL_MIN, x);
                break;
        case 2:         /* overflow */
                retv = DBL_MAX * copysign(DBL_MAX, x);
                break;
        case 3:         /* invalid */
                retv = zero * Inf;      /* for Cheetah */
                break;
        }
        return (retv);
}
```

```
**********************************************************
    6858 Sat May 10 12:08:48 2014
new/usr/src/lib/libm/common/C/_TBL_atan.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

#include "libm_protos.h"

/*
 * Let y[j] = _TBL_atan[2j], atan_y[j] = _TBL_atan[2j+1], j = 0, 1, ..., 95.
 * {y[j], 0 <= j < 96} is a set of break points in (-1/8, 8) chosen so that
 * the high part of y[j] is very close to 0x3fc08000 + (j << 16),
 * and atan_y[j] = atan(y[j]) rounded has relative error bounded by 2^-60.
 *
 * -- K.C. Ng, 10/17/2004
 */

const double _TBL_atan[] = {
1.28906287871928065814e-01,  1.28199318484201185697e-01,
1.36718905591866640714e-01,  1.35876480966603985223e-01,
1.44531257606217988787e-01,  1.43537301152401930437e-01,
1.52343679482641575218e-01,  1.51181262880709432750e-01,
1.60156177403962790562e-01,  1.58807537535115006477e-01,
1.67968772982362929413e-01,  1.66415323534856884891e-01,
1.75781211596017922227e-01,  1.74003563682464612583e-01,
1.83593807762862160082e-01,  1.81571767039387044207e-01,
1.91406205589629646591e-01,  1.89118806085245338977e-01,
1.99218440148815872925e-01,  1.96643947167121080355e-01,
2.07031180070658488157e-01,  2.04147078126891479144e-01,
2.14843557086546094181e-01,  2.11626624363759674452e-01,
2.22656308649619494311e-01,  2.19082566659412503185e-01,
2.30468759807905931858e-01,  2.26513550670145669130e-01,
2.38281413377399470255e-01,  2.33919360814280885563e-01,
2.46093763828156536499e-01,  2.41298839969374956382e-01,
2.57812599322508773092e-01,  2.52318074018685223336e-01,
2.73437443946477509726e-01,  2.66912935433335718471e-01,
2.89062532292519769328e-01,  2.81392462451501401688e-01,
3.04687577351389293767e-01,  2.95751756530947318424e-01,
```



```
3.20312405527377053183e-01,  3.09986305565206343715e-01,
3.35937715576634265968e-01,  3.24092664204967739749e-01,
3.51562621385942464247e-01,  3.38066230870244233131e-01,
3.67187719833070636000e-01,  3.51904019130060419229e-01,
3.82812538440931826589e-01,  3.65602365234580339859e-01,
3.98437724467857745658e-01,  3.79158862748537828224e-01,
4.14062683287296784407e-01,  3.92570291474021892952e-01,
4.29687654458357937148e-01,  4.05834423459965343284e-01,
4.45312642848883721847e-01,  4.18949086342842669239e-01,
4.60937644536906665493e-01,  4.31912354681638355203e-01,
4.76563149131543906112e-01,  4.44722952952162131623e-01,
4.92187842452541601812e-01,  4.57378374341803173309e-01,
5.15624825518001039804e-01,  4.76069192487019954285e-01,
5.46874516057966109095e-01,  5.00440440618262982753e-01,
5.78125566624434150675e-01,  5.24180053466007933594e-01,
6.09375102172641347487e-01,  5.47284455493244337276e-01,
6.40624936950189516338e-01,  5.69756408779493739303e-01,
6.71875248719545625775e-01,  5.91599881698465779323e-01,
7.03124988865964306584e-01,  6.12820194714659649549e-01,
7.34376295967088421612e-01,  6.33426724884753156175e-01,
7.65624929092156736310e-01,  6.53426296477277901431e-01,
7.96874196003358736817e-01,  6.72832055855442590087e-01,
8.28125565205639735389e-01,  6.91656957129326954714e-01,
8.59375453355927021448e-01,  7.09911879233846576653e-01,
8.90625694745052709500e-01,  7.27611720056701827275e-01,
9.21875110259870345075e-01,  7.44770185320721367361e-01,
9.53125042657123722201e-01,  7.61402792157321428590e-01,
9.84374765277631902372e-01,  7.77524191164056688308e-01,
1.03126494373528343473e+00,  8.00788807142382097481e-01,
1.09374968909110092952e+00,  8.30144253291031475328e-01,
1.15625019152505204012e+00,  8.57735575892430546219e-01,
1.21874985186151341132e+00,  8.83672057048812575886e-01,
1.28124876006842702836e+00,  9.08066349515326720621e-01,
1.34375006271148444981e+00,  9.31026566320014126177e-01,
1.40627222899692072566e+00,  9.52659566341466756967e-01,
1.46874957658300542285e+00,  9.73037801091363618866e-01,
1.53124999999999555911e+00,  9.92272112377190040888e-01,
1.59375089676214143353e+00,  1.01043670320979472876e+00,
1.65624949800269094524e+00,  1.02760661639661776690e+00,
1.71874946971376685312e+00,  1.04385296549501305208e+00,
1.78125111924655166185e+00,  1.05924046784549474864e+00,
1.84374921332370989013e+00,  1.07382754310190620117e+00,
1.90625055239083862624e+00,  1.08767078118685489585e+00,
1.96874992734227549640e+00,  1.10081967347672460278e+00,
2.06250046973591683042e+00,  1.11934332464931074469e+00,
2.18749905173933534286e+00,  1.14201813543610697366e+00,
2.31249933788800232648e+00,  1.16264711873167669864e+00,
2.43749855191054187742e+00,  1.18147939634549814514e+00,
2.56251104936881235474e+00,  1.19873002825057639598e+00,
2.68750036758144528193e+00,  1.21457671610223272296e+00,
2.81249907059852954916e+00,  1.22918073183895870670e+00,
2.93749583903062294610e+00,  1.24267599964591468620e+00,
3.06250108260464948273e+00,  1.25518076906426045980e+00,
3.18750016629930410517e+00,  1.26679540235591403530e+00,
3.31250071362610132297e+00,  1.27760948984166233799e+00,
3.43749999999999333866e+00,  1.28770054149540058575e+00,
3.56249877589327157423e+00,  1.29713691630583838332e+00,
3.68750696071718842006e+00,  1.30597947372626776996e+00,
3.81250023149192607264e+00,  1.31427972905173717777e+00,
3.93749827850909683846e+00,  1.32208623339324304879e+00,
4.12500187917697846984e+00,  1.33296050364557672196e+00,
4.37499759905160701123e+00,  1.34608503917096200553e+00,
4.62500066729278191957e+00,  1.35785800701782477518e+00,
4.87499852385410648026e+00,  1.36847463881194641999e+00,
5.12499918742110072145e+00,  1.37809553833018583191e+00,
5.37500000000004529710e+00,  1.38685287025772296943e+00,
```

```
128 5.624999999999991828759e+00,  1.394856701342366278 60e+00,
129 5.874994178540966949 24e+00,  1.402199223272692307 77e+00,
130 6.125000000000132338 58e+00,  1.408958895556477131 09e+00,
131 6.374999999999918287 59e+00,  1.415201498817864944 61e+00,
132 6.624999331077615849 49e+00,  1.420983855320837818 68e+00,
133 6.875004315285937472 88e+00,  1.426354837827222610 26e+00,
134 7.124992286328838630 99e+00,  1.431356120691944511 24e+00,
135 7.374992571545472053 17e+00,  1.436024908206711359 07e+00,
136 7.624999118736074166 24e+00,  1.440393004004601351 65e+00,
137 7.875000000000189182 00e+00,  1.444488209731659367 21e+00,
138 };
```

```
**********************************************************
    4337 Sat May 10 12:08:48 2014
new/usr/src/lib/libm/common/C/_TBL_exp2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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#include "libm_protos.h"

const double _TBL_exp2_hi[] = {
 1.0000000000000000e+00, 1.0108892605170048e+00, 1.0218971486541166 3e+00,
 1.0330248790212284 1e+00, 1.0442737824274137 5e+00, 1.0556451783605571 6e+00,
 1.0671404006768237 0e+00, 1.0787607977571198 6e+00, 1.0905077326652576 9e+00,
 1.1023825833078408 9e+00, 1.1143867425958924 3e+00, 1.1265216186082418 5e+00,
 1.1387886347566915 6e+00, 1.1511892299529826 7e+00, 1.1637248587775774 8e+00,
 1.1763969916502812 2e+00, 1.1892071150027210 3e+00, 1.2021567314527030 8e+00,
 1.2152473599804689 6e+00, 1.2284805361068700 2e+00, 1.2418578120734840 0e+00,
 1.2553807570246911 0e+00, 1.2690509571917332 2e+00, 1.2828700160787782 6e+00,
 1.2968395546510096 4e+00, 1.3109612115247644 1e+00, 1.3252366431597413 2e+00,
 1.3396675240533029 2e+00, 1.3542555469368926 5e+00, 1.3690024229745905 2e+00,
 1.3839098819638320 2e+00, 1.3989796725383112 4e+00, 1.4142135623730951 5e+00,
 1.4296133383919700 2e+00, 1.4451808069770466 5e+00, 1.4609177941806470 4e+00,
 1.4768261459394993 5e+00, 1.4929077282912648 4e+00, 1.5091644275934228 4e+00,
 1.5255981507445382 0e+00, 1.5422108254079407 4e+00, 1.5590044002378369 3e+00,
 1.5759808451078865 0e+00, 1.5931421513422670 0e+00, 1.6104903319492542 8e+00,
 1.6280274218573478 3e+00, 1.6457554781539649 5e+00, 1.6636765803267363 8e+00,
 1.6817928305074290 0e+00, 1.7001063537185234 8e+00, 1.7186192981224779 3e+00,
 1.7373338352737062 2e+00, 1.7562521603732994 5e+00, 1.7753764925265211 9e+00,
 1.7947090750031071 7e+00, 1.8142521755003988 6e+00, 1.8340080864093424 3e+00,
 1.8539791250833854 7e+00, 1.8741676341102999 6e+00, 1.8945759815869656 1e+00,
 1.9152065613971474 0e+00, 1.9360617934922943 5e+00, 1.9571441241754001 8e+00,
 1.9784560263879509 3e+00,
};
const double _TBL_exp2_lo[] = {
 0.0000000000000000e+00,-1.5234778603368577 2e-17, 5.1092250289734438 9e-17,
 7.6008388740270884 9e-18, 8.5518897055379636 6e-18, 1.7593257387720919 8e-18,
-7.8998539668415821 2e-17,-6.6566604360565926 0e-17,-3.0467820798124711 5e-17,
 5.2660368715706943 9e-17, 1.0410278456845571 0e-16, 5.1658567587954561 2e-17,
 8.9128126760254077 8e-17, 3.2507102188638272 1e-17, 3.8292048369240935 0e-17,
```



```
 5.5542032542180789 6e-17, 3.9820152314656461 1e-17, 6.6449814992523012 4e-17,
-7.7126306926814881 3e-17,-1.8987816313025299 5e-17, 4.6580275918369367 9e-17,
-6.7113898212968784 2e-18, 2.6679321313421861 0e-18, 1.7135949182435609 7e-17,
 2.5382502794888315 0e-17,-7.1815361355194538 6e-17,-2.8587312100388607 6e-17,
 8.9272825948317319 8e-17, 7.7009483798029894 6e-17, 9.5937979191188487 7e-17,
-6.7705116587947862 9e-17,-9.6142132090513230 7e-17,-9.6672933134529134 5e-17,
-1.2031642489053655 2e-17,-3.0237581349939873 2e-17,-5.6003771860752158 0e-17,
-3.4839945568927958 0e-17, 1.4192920154284035 8e-17,-1.0164553277542950 4e-16,
 1.1179518780160569 9e-16, 7.9498348096976208 6e-17, 3.7812070533575275 0e-17,
-1.0136916471278304 0e-17,-1.0094406542311962 5e-16, 2.4707192569797887 9e-17,
-6.7129550847070840 9e-17,-1.0125679913674772 6e-16, 5.8909926967130996 7e-17,
 8.1990100205814965 2e-17,-8.0237193703977002 5e-18,-1.8513804182631109 9e-17,
 3.1643892992929569 5e-17, 2.9601406954488733 1e-17, 6.4297317965565720 3e-17,
 1.8227458427912086 8e-17,-9.9695315389203488 2e-17, 3.2831072242456265 9e-17,
 9.7618874907275935 4e-17,-6.1227634130041425 6e-17, 3.4034035352165296 7e-17,
-1.0619946056195962 6e-16, 1.0332385960676325 7e-16, 8.9607677910366677 7e-17,
 4.0388753109278166 6e-17,
};
```

```
**********************************************************
    3399 Sat May 10 12:08:48 2014
new/usr/src/lib/libm/common/C/_TBL_ipio2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include "libm_protos.h"

/*
 * Table of constants for 2/pi, used in __rem_pio2 (trigl) function.
 */

/*
 * 396 Hex digits (476 decimal) of 2/pi
 */
const int _TBL_ipio2_inf[] = {
0xA2F983, 0x6E4E44, 0x1529FC, 0x2757D1, 0xF534DD, 0xC0DB62,
0x95993C, 0x439041, 0xFE5163, 0xABDEBB, 0xC561B7, 0x246E3A,
0x424DD2, 0xE00649, 0x2EEA09, 0xD1921C, 0xFE1DEB, 0x1CB129,
0xA73EE8, 0x8235F5, 0x2EBB44, 0x84E99C, 0x7026B4, 0x5F7E41,
0x3991D6, 0x398353, 0x39F49C, 0x845F8B, 0xBDF928, 0x3B1FF8,
0x97FFDE, 0x05980F, 0xEF2F11, 0x8B5A0A, 0x6D1F6D, 0x367ECF,
0x27CB09, 0xB74F46, 0x3F669E, 0x5FEA2D, 0x7527BA, 0xC7EBE5,
0xF17B3D, 0x0739F7, 0x8A5292, 0xEA6BFB, 0x5FB11F, 0x8D5D08,
0x560330, 0x46FC7B, 0x6BABF0, 0xCFBC20, 0x9AF436, 0x1DA9E3,
0x91615E, 0xE61B08, 0x659985, 0x5F14A0, 0x68408D, 0xFFD880,
0x4D7327, 0x310606, 0x1556CA, 0x73A8C9, 0x60E27B, 0xC08C6B,
};

#if 0   /* remove from SVR4 */
/*
 * 396 Hex digits (476 decimal) of 2/PI, PI = 66 bits of pi
 */
const int _TBL_ipio2_66[] = {
0xA2F983, 0x6E4E44, 0x152A00, 0x062BC4, 0x0DA276, 0xBED4C1,
0xFDF905, 0x5CD5BA, 0x767CEC, 0x1F80D6, 0xC26053, 0x3A0070,
0x107C2A, 0xF68EE9, 0x687B7A, 0xB990AA, 0x38DE4B, 0x96CFF3,
0x92735E, 0x8B34F6, 0x195BFC, 0x27F88E, 0xA93EC5, 0x3958A5,
```



```
0x3E5D13, 0x1C55A8, 0x5B4A8B, 0xA42E04, 0x12D105, 0x35580D,
0xF62347, 0x450900, 0xB98BCA, 0xF7E8A4, 0xA2E5D5, 0x69BC52,
0xF0381D, 0x1A0A88, 0xFE8714, 0x7F6735, 0xBB7D4D, 0xC6F642,
0xB27E80, 0x6191BF, 0xB6B750, 0x52776E, 0xD60FD0, 0x607DCC,
0x68BFAF, 0xED69FC, 0x6EB305, 0xD2557D, 0x25BDFB, 0x3E4AA1,
0x84472D, 0x8B0376, 0xF77740, 0xD290DF, 0x15EC8C, 0x45A5C3,
0x6181EF, 0xC5E7E8, 0xD8909C, 0xF62144, 0x298428, 0x6E5D9D,
};

/*
 * 396 Hex digits (476 decimal) of 2/PI, PI = 53 bits of pi
 */
const int _TBL_ipio2_53[] = {
0xA2F983, 0x6E4E44, 0x16F3C4, 0xEA69B5, 0xD3E131, 0x60E1D2,
0xD7982A, 0xC031F5, 0xD67BCC, 0xFD1375, 0x60919B, 0x3FA0BB,
0x612ABB, 0x714F9B, 0x03DA8A, 0xC05948, 0xD023F4, 0x5AFA37,
0x51631D, 0xCD7A90, 0xC0474A, 0xF6A6F3, 0x1A52E1, 0x5C3927,
0x3ADA45, 0x4E2DB5, 0x64E8C4, 0x274A5B, 0xB74ADC, 0x1E6591,
0x2822BE, 0x4771F5, 0x12A63F, 0x83BD35, 0x2488CA, 0x1FE1BE,
0x42C21A, 0x682569, 0x2AFB91, 0x68ADE1, 0x4A42E5, 0x9BE357,
0xB79675, 0xCE998A, 0x83AF8B, 0xE645E6, 0xDF0789, 0x9E9747,
0xAA15FF, 0x358C3F, 0xAF3141, 0x72A3F7, 0x2BF1D4, 0xF3AD96,
0x7D759F, 0x257FCE, 0x29FB69, 0xB1B42C, 0xC32DE1, 0x8C0BBD,
0x31EC2F, 0x942026, 0x85DCE7, 0x653FF3, 0x136FA7, 0x0D7A5F,
};
#endif
```

```
**********************************************************
   20895 Sat May 10 12:08:48 2014
new/usr/src/lib/libm/common/C/_TBL_log.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include "libm_protos.h"

/*
 * Table of constants for log, log2, and log10
 * By K.C. Ng, November 21, 2004
 *
 * Y[j], 1/Y[j], log(Y[j]) for j = 0 to 255
 * where HIWORD(Y[j]) ~ 0x3fb8400 + (j<<15)
 * That is, 256 Y[j] space out logrithmically between 0.09375 and 24, and
 * each is chosen so that 1/Y[j] and log(Y[j]) are very close to a IEEE
 * double. In addition, each log(Y[j]) has 3 trailing zeros.
 */
const double _TBL_log[] = {
9.47265623608246343e-02, 1.05567010464380857e+01, -2.35676082856530300e+00,
9.66796869131412717e-02, 1.03433444062203838e+01, -2.33635196153499791e+00,
9.86328118117651004e-02, 1.01386139321308306e+01, -2.31635129573594156e+00,
1.00585936733578435e-01, 9.94174764856737347e+00, -2.29674282498938709e+00,
1.02539062499949152e-01, 9.75238095238578850e+00, -2.27751145544242561e+00,
1.04492186859904843e-01, 9.57009351656812157e+00, -2.25864297726331742e+00,
1.06445312294918631e-01, 9.39449543094380957e+00, -2.24012392529694537e+00,
1.08398437050250693e-01, 9.22522526350104144e+00, -2.22194160843615762e+00,
1.10351562442130582e-01, 9.06194690740703912e+00, -2.20408398741152212e+00,
1.12304686894746625e-01, 8.90434787407592943e+00, -2.18653968262558962e+00,
1.14257811990227776e-01, 8.75213679118525256e+00, -2.16929787526329321e+00,
1.16210936696872255e-01, 8.60504207627572093e+00, -2.15234831939887172e+00,
1.18164061975360682e-01, 8.46280995492959498e+00, -2.13568126444263484e+00,
1.20117187499996322e-01, 8.32520325203277523e+00, -2.11928745022706622e+00,
1.22070312499895098e-01, 8.19200000000703987e+00, -2.10315806829801133e+00,
1.24023436774175100e-01, 8.06299217317146599e+00, -2.08728472499318229e+00,
1.26953123746900931e-01, 7.87692315467275872e+00, -2.06393736501443570e+00,
1.30859374098123454e-01, 7.64179109744297769e+00, -2.03363201254049386e+00,
1.34765623780674720e-01, 7.42028992220936967e+00, -2.00421812948999545e+00,
```



```
1.38671874242985771e-01, 7.21126764500034501e+00, -1.97564475345722457e+00,
1.42578124148616536e-01, 7.01369867201821506e+00, -1.94786518986246371e+00,
1.46484374166731490e-01, 6.82666670549979404e+00, -1.92083651719164372e+00,
1.50390624434435488e-01, 6.64935067435644189e+00, -1.89451920694646070e+00,
1.54296874339723084e-01, 6.48101268596180624e+00, -1.86887677685174936e+00,
1.58203124999987427e-01, 6.32098765432149001e+00, -1.84387547036714849e+00,
1.62109374999815342e-01, 6.16867469880220742e+00, -1.81948401724404896e+00,
1.66015624243955634e-01, 6.02352943919619310e+00, -1.79567337310324682e+00,
1.69921874302298687e-01, 5.88505749542848644e+00, -1.77241651049093640e+00,
1.73828124315277527e-01, 5.75280901142480605e+00, -1.74968825924644555e+00,
1.77734374286237506e-01, 5.62637364896854919e+00, -1.72746512253855222e+00,
1.81640624146994889e-01, 5.50537636993989743e+00, -1.70572513658236602e+00,
1.85546874316304788e-01, 5.38947370406942916e+00, -1.68444773712372431e+00,
1.89453124405085355e-01, 5.27835053203882509e+00, -1.66361364967629299e+00,
1.93359374570531595e-01, 5.17171718320401652e+00, -1.64320477712600699e+00,
1.97265624263334577e-01, 5.06930694962380368e+00, -1.62320411193263148e+00,
2.01171874086291030e-01, 4.97087380898513764e+00, -1.60359564135180399e+00,
2.05078123979995308e-01, 4.87619050044336610e+00, -1.58436427985572159e+00,
2.08984373896073439e-01, 4.78504675424820736e+00, -1.56549579585994181e+00,
2.12890623963011144e-01, 4.69724772930228163e+00, -1.54697674768135762e+00,
2.16796874723889421e-01, 4.61261261848719517e+00, -1.52879442500076479e+00,
2.20703124198150608e-01, 4.53097346778917753e+00, -1.51093680996032553e+00,
2.24609374375627030e-01, 4.45217392541970725e+00, -1.49339249945607477e+00,
2.28515625000094036e-01, 4.37606837606657528e+00, -1.47615069024134016e+00,
2.32421873924349737e-01, 4.30252102831546246e+00, -1.45920113655598627e+00,
2.36328123935216378e-01, 4.23140497774241098e+00, -1.44253408394829741e+00,
2.40234375000066919e-01, 4.16260162601510064e+00, -1.42614026966681173e+00,
2.44140623863132178e-01, 4.09600001907347711e+00, -1.41001089239381727e+00,
2.48046874999894917e-01, 4.03149606299383390e+00, -1.39413753858134015e+00,
2.53906248590769879e-01, 3.93846156032078243e+00, -1.37079018013412401e+00,
2.61718748558906533e-01, 3.82089554342693294e+00, -1.34048483059486401e+00,
2.69531249159214337e-01, 3.71014493910979404e+00, -1.31107094300173976e+00,
2.77343749428383191e-01, 3.60563381024826013e+00, -1.28249756949928795e+00,
2.85156249289339359e-01, 3.50684932380819214e+00, -1.25471800582335113e+00,
2.92968749999700462e-01, 3.41333333333682321e+00, -1.22768933094427446e+00,
3.00781248554318814e-01, 3.32467534065511261e+00, -1.20137202743229921e+00,
3.08593748521894806e-01, 3.24050634463533127e+00, -1.17572959680235023e+00,
3.16406249999639899e-01, 3.16049382716409077e+00, -1.15072828980826181e+00,
3.24218749999785061e-01, 3.08433734939963511e+00, -1.12633683668362750e+00,
3.32031248841858584e-01, 3.01176471638753718e+00, -1.10252619147729547e+00,
3.39843749265406558e-01, 2.94252874199264314e+00, -1.07926932798654107e+00,
3.47656249999834799e-01, 2.87640449438338930e+00, -1.05654107474789782e+00,
3.55468749999899247e-01, 2.81318681318761055e+00, -1.03431793796299587e+00,
3.63281249999864997e-01, 2.75268817204403371e+00, -1.01257795132667816e+00,
3.71093749064121570e-01, 2.69473684890124421e+00, -9.91300555400967731e-01,
3.78906249999751032e-01, 2.63917525773369288e+00, -9.70466465976836723e-01,
3.86718748879039009e-01, 2.58585859335407608e+00, -9.50057597243619156e-01,
3.94531249999987899e-01, 2.53465346534661240e+00, -9.30056927638333697e-01,
4.02343749999485523e-01, 2.48543689320706163e+00, -9.10448456251205407e-01,
4.10156249578856991e-01, 2.43809524059864202e+00, -8.91217095348825872e-01,
4.17968749447214571e-01, 2.39252336765021800e+00, -8.72348611340208357e-01,
4.25781248601723117e-01, 2.34862386092395203e+00, -8.53829565534445223e-01,
4.33593749393073047e-01, 2.30630630953458038e+00, -8.35647244566987801e-01,
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new/usr/src/lib/libm/common/C/_TBL_log2.c
patch01 - 693 import Sun Devpro Math Library
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 * Common Development and Distribution License (the "License").
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#include "libm_protos.h"

const double _TBL_log2_hi[] = {
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 6.60891532897949219e-02, 7.68155455589294434e-02, 8.74627828598022461e-02,
 9.80320572853088379e-02, 1.08524441719055176e-01, 1.18941068649291992e-01,
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 1.59871220588684082e-01, 1.69924974441528320e-01, 1.79908990859985352e-01,
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 9.54195976257324219e-01, 9.60001468658447266e-01, 9.65784072875976562e-01,
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 2.41878018084726962e-07, 2.60413978970349421e-07, 4.48778782784743522e-07,
 3.25363260095300664e-08, 1.42486299343828112e-07,
};
```

```
**********************************************************
   44765 Sat May 10 12:08:48 2014
new/usr/src/lib/libm/common/C/_TBL_sin.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include "libm_protos.h"

/*
 * Table of constants for x[i],sin(x[i]),cos(x[i]), where
 * x[i] ~ (i+10.5)/64 chosen to make the value of sine and
 * cosine nearly representable in double (with error less
 * than 2**-8 ulp)
 * By K.C. Ng, May 5, 1995
 *
 * For each i, _TBL_sincosx[i] := x[i], _TBL_sincos[2*i] :=
 * sin(x[i]), and _TBL_sincos[2*i+1] := cos(x[i]).
 */

const double _TBL_sincos[] = {
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        1.94073102892906523831e-01, 9.80987069605669836925e-01,
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        2.24629204957583178404e-01, 9.74444313586017130113e-01,
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        3.58991834544317267586e-01, 9.33340700243220688925e-01,
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        3.87978709726743087316e-01, 9.21668335573470609567e-01,
        4.02331831777567594521e-01, 9.15493908848391546584e-01,
        4.16586730281922223984e-01, 9.09095977415485534401e-01,
        4.30739925110786514573e-01, 9.02476103237949467406e-01,
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131         9.99496524372108563483e-01, 3.17285008797294557081e-02,
132         9.99870255655346151791e-01, 1.61081301122361006395e-02,
133         9.99999882955821872699e-01, 4.83826769160181427432e-04,
134         9.99885374626887313276e-01, -1.51405946795101862407e-02,
135         9.99526758624139421983e-01, -3.07613197753498594789e-02,
136         9.98924122498464628350e-01, -4.63745349375326090802e-02,
137         9.98077613374894423437e-01, -6.19764284214149308028e-02,
138         9.96987437916807328619e-01, -7.75631912448182664344e-02,
139         9.95653862273598311283e-01, -9.31310181393209396417e-02,
140         9.94077212020575529117e-01, -1.08676108420387079745e-01,
141         9.92257872072439317535e-01, -1.24194666996109981394e-01,
142         9.90196286596708996619e-01, -1.39682905217811598186e-01,
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144         9.85348451302295424981e-01, -1.70553304031812708041e-01,
145         9.82563385014030843401e-01, -1.85927928052160545969e-01,
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147         9.76274354660002341433e-01, -2.16537258764389006771e-01,
148         9.72771925969731610095e-01, -2.31764492632368090952e-01,
149         9.69032008956924317822e-01, -2.46935144556029828600e-01,
150         9.65055516693764658953e-01, -2.62045510739892129060e-01,
151         9.60843419958733790942e-01, -2.77091902303196746526e-01,
152         9.56396747083171572257e-01, -2.92070645852553878452e-01,
153         9.51716583658057113659e-01, -3.06978084543891138747e-01,
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156         9.36286859366077139910e-01, -3.51236269451786098372e-01,
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634         2.851562499998553157 35e+00, 2.867187500002356781 44e+00,
635         2.882812499999026112 36e+00, 2.898437499993285194 9e+00,
636         2.914062500003651301 48e+00, 2.929687499999948929 74e+00,
637         2.945312499998473221 30e+00, 2.960937499970135000 6e+00,
638         2.976562500004682920 72e+00, 2.992187500003089727 2e+00,
639         3.007812499998198774 16e+00, 3.023437499970929920 3e+00,
640         3.039062499999486188 78e+00, 3.054687500007525979 84e+00,
641         3.070312500004330757 97e+00, 3.085937499995112798 25e+00,
642         3.101562499999575894 80e+00, 3.117187499996118660 3e+00,
643         3.132812499998364419 44e+00, 3.148437500002620570 43e+00,
644         3.164062499996578736 73e+00, 3.179687500005401901 15e+00,
645         3.195312500003257394 35e+00, 3.210937500027058355 6e+00,
646         3.226562500003588240 8e+00, 3.242187499961830532 4e+00,
647         3.257812500000119904 1e+00, 3.273437500004312550 32e+00,
648         3.289062499996349142 61e+00, 3.304687499977338127 6e+00,
649         3.320312500010880185 6e+00, 3.335937500004285460 9e+00,
650         3.351562499991960978 1e+00, 3.367187499995106136 9e+00,
651         3.382812500007278178 06e+00, 3.398437500038555825 2e+00,
652         3.414062500018429702 2e+00, 3.429687500001838085 24e+00,
653         3.445312499983035887 7e+00, 3.460937499835438302 4e+00,
654         3.476562499999841016 06e+00, 3.492187500008193445 9e+00,
655         3.507812499995777599 79e+00, 3.523437499998666400 10e+00,
```

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656         3.539062499996838 52e+00, 3.554687500004989 78636e+00,
657         3.570312499998260 05848e+00, 3.585937500010926 37092e+00,
658         3.601562500007820 85507e+00, 3.617187499998729 9049e+00,
659         3.632812500005441 86918e+00, 3.648437499992263 52188e+00,
660         3.664062500000624 38943e+00, 3.679687499997576 16109e+00,
661         3.695312500018722 35700e+00, 3.710937500005747 84664e+00,
662         3.726562499995630 16218e+00, 3.742187499995811 79466e+00,
663         3.757812500000335 28735e+00, 3.773437499994150 45693e+00,
664         3.789062499952839 94636e+00, 3.804687500005921 04143e+00,
665         3.820312499989200 63859e+00, 3.835937500001649 34733e+00,
666         3.851562500000577 31597e+00, 3.867187500004050 53768e+00,
667         3.882812499971921 57153e+00, 3.898437499983717 02503e+00,
668         3.914062499999862 77643e+00, 3.929687499995970 33451e+00,
669         3.945312499995192 29021e+00, 3.960937499975631 04870e+00,
670         3.976562500002235 10099e+00, 3.992187500002287 0594e+00,
671         4.007812500044543 92410e+00, 4.023437499935509 3649e+00,
672         4.039062499969819 6973e+00, 4.054687499992500 22142e+00,
673         4.070312499949908 51349e+00, 4.085937499959037 2113e+00,
674         4.101562499990662 58027e+00, 4.117187499993034 90483e+00,
675         4.132812499998531 84107e+00, 4.148437499980883 73587e+00,
676         4.164062499998341 77089e+00, 4.179687499996627 58654e+00,
677         4.195312499998911 09326e+00, 4.210937499998721 02308e+00,
678         4.226562499991208 81000e+00, 4.242187500003381 29524e+00,
679         4.257812500004945 37744e+00, 4.273437499976980 19172e+00,
680         4.289062500003306 68826e+00, 4.304687499995923 2611e+00,
681         4.320312500005620 39304e+00, 4.335937499995506 70537e+00,
682         4.351562500009482 19281e+00, 4.367187500007639 22259e+00,
683         4.382812499999874 76684e+00, 4.398437500031423 7525e+00,
684         4.414062500004084 73255e+00, 4.429687500000793 14333e+00,
685         4.445312499988683 71875e+00, 4.460937500003223 19949e+00,
686         4.476562499994807 70896e+00, 4.492187499979640 28609e+00,
687         4.507812500003208 10045e+00, 4.523437499997247 53508e+00,
688         4.539062499991817 21222e+00, 4.554687500002581 93467e+00,
689         4.570312499999761 96818e+00, 4.585937500008219 20310e+00,
690         4.601562500046013 85939e+00, 4.617187500004449 77388e+00,
691         4.632812499996951 77166e+00, 4.648437499996386 00201e+00,
692         4.664062500005448 97460e+00, 4.679687499996634 69197e+00,
693         4.695312499983810 28377e+00, 4.710937499997963 40688e+00,
694         4.726562500001199 92905e+00, 4.742187500012589 92910e+00,
695         4.757812500004920 50845e+00, 4.773437500003409 71695e+00,
696         4.789062500007474 02140e+00, 4.804687499989907 62862e+00,
697         4.820312500012565 94826e+00, 4.835937500000315 30334e+00,
698         4.851562500002602 3628e+00, 4.867187500009467 9820e+00,
699         4.882812500001853 62836e+00, 4.898437499976001 41910e+00,
700         4.914062499994718 89112e+00, 4.929687499988608 22359e+00,
701         4.945312500004753 53090e+00, 4.960937499965920 5940e+00,
702         4.976562500008568 25721e+00, 4.992187500026371 79364e+00,
703         5.007812499997600 14191e+00, 5.023437499986910 91463e+00,
704         5.039062499996996 18058e+00, 5.054687500005375 25580e+00,
705         5.070312500003534 06193e+00, 5.085937499992868 81547e+00,
706         5.101562499988316 01289e+00, 5.117187500004791 72257e+00,
707         5.132812500010850 87575e+00, 5.148437500003467 44855e+00,
708         5.164062500005818 45683e+00, 5.179687500003501 19933e+00,
709         5.195312499994826 36071e+00, 5.210937500004324 54073e+00,
710         5.226562500004345 85701e+00, 5.242187500010770 93970e+00,
711         5.257812499988698 81779e+00, 5.273437500021399 77084e+00,
712         5.289062499997021 04958e+00, 5.304687499989459 09851e+00,
713         5.320312499993859 13441e+00, 5.335937499954685 1370e+00,
714         5.351562500019081 62517e+00, 5.367187499997244 87054e+00,
715         5.382812499996796 34044e+00, 5.398437500017701 39590e+00,
716         5.414062499996782 12959e+00, 5.429687499990656 3630e+00,
717         5.445312500005170 97476e+00, 5.460937499998117 94993e+00,
718         5.476562500010825 11858e+00, 5.492187499994575 00621e+00,
719         5.507812500012144 06353e+00, 5.523437500014150 45858e+00,
720         5.539062500004983 56911e+00, 5.554687500004988 98818e+00,
721         5.570312500003160 13882e+00, 5.585937500009084 28888e+00,
```



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722         5.601562500027634 78335e+00, 5.617187499950386 3535e+00,
723         5.632812500001294 96414e+00, 5.648437500010818 90133e+00,
724         5.664062500007386 09174e+00, 5.679687500000232 70275e+00,
725         5.695312499983359 97731e+00, 5.710937499991604 04940e+00,
726         5.726562500002179 58984e+00, 5.742187500004749 97819e+00,
727         5.757812500001636 86918e+00, 5.773437499997506 88318e+00,
728         5.789062499999253 04195e+00, 5.804687499999886 31316e+00,
729         5.820312499994872 54598e+00, 5.835937499995510 25809e+00,
730         5.851562499995134 55862e+00, 5.867187499998031 79662e+00,
731         5.882812500002951 41689e+00, 5.898437500009854 33957e+00,
732         5.914062499998456 34591e+00, 5.929687500004559 90801e+00,
733         5.945312500002439 82612e+00, 5.960937500007339 01828e+00,
734         5.976562499992342 12567e+00, 5.992187499991417 53193e+00,
735         6.007812500008435 91863e+00, 6.023437499998800 84092e+00,
736         6.039062499997453 59247e+00, 6.054687500003705 48037e+00,
737         6.070312500012204 45967e+00, 6.085937500011889 15633e+00,
738         6.101562499992907 00714e+00, 6.117187499895745 6171e+00,
739         6.132812499997566 3911e+00, 6.148437499990150 98950e+00,
740         6.164062500003586 46446e+00, 6.179687500002646 7717e+00,
741         6.195312499984142 46249e+00, 6.210937499893729 4521e+00,
742         6.226562499992811 97205e+00, 6.242187500007079 67018e+00,
743         6.257812500002348 34374e+00, 6.273437499946282 9692e+00,
744         6.289062500010521 36156e+00, 6.304687500001718 62524e+00,
745         6.320312500005940 13727e+00, 6.335937500000453 85917e+00,
746         6.351562500004996 89179e+00, 6.367187499992301 5764e+00,
747         6.382812499998681 05505e+00, 6.398437499985362 8196e+00,
748         6.414062499993775 64563e+00, 6.429687500008760 10375e+00,
749         6.445312500023968 38283e+00, 6.460937500006252 7761e+00,
750         6.476562499999292 12180e+00, 6.492187500006420 64180e+00,
751         6.507812499900399 6720e+00, 6.523437500009122 48055e+00,
752         6.539062499987208 45440e+00, 6.554687499998683 71958e+00,
753         6.570312499986380 67211e+00, 6.585937500005464 07364e+00,
754         6.601562499947292 82804e+00, 6.617187499973192 11076e+00,
755         6.632812499978792 96387e+00, 6.648437499992446 26618e+00,
756         6.664062499999005 24017e+00, 6.679687499988409 2716e+00,
757         6.695312499992273 73593e+00, 6.710937499990635 04674e+00,
758         6.726562499994901 36775e+00, 6.742187499995631 93853e+00,
759         6.757812499994638 95506e+00, 6.773437500014275 69174e+00,
760         6.789062499997048 58311e+00, 6.804687500002157 38538e+00,
761         6.820312500003418 59874e+00, 6.835937499984403 2323e+00,
762         6.851562500015989 87609e+00, 6.867187500020392 5765e+00,
763         6.882812500009894 30760e+00, 6.898437500006046 71868e+00,
764         6.914062499975077 7135e+00, 6.929687499996012 0789e+00,
765         6.945312499952440 71016e+00, 6.960937500027398 52789e+00,
766         6.976562499994302 33544e+00, 6.992187499999118 92701e+00,
767         7.007812500008042 45559e+00, 7.023437500008038 0147e+00,
768         7.039062499996657 78461e+00, 7.054687499957553 9533e+00,
769         7.070312500017003 28767e+00, 7.085937500006472 15614e+00,
770         7.101562499970343 72257e+00, 7.117187499969864 1062e+00,
771         7.132812500001889 15550e+00, 7.148437500019273 4717e+00,
772         7.164062500009963 58551e+00, 7.179687500056670 22407e+00,
773         7.195312500009508 83816e+00, 7.210937499958272 48966e+00,
774         7.226562500006385 11466e+00, 7.242187500025781 15499e+00,
775         7.257812499991163 51290e+00, 7.273437499961461 9384e+00,
776         7.289062499986263 43256e+00, 7.304687499983970 15588e+00,
777         7.320312499984883 20330e+00, 7.335937499995500 48813e+00,
778         7.351562499986635 57932e+00, 7.367187500001836 75297e+00,
779         7.382812499996527 22238e+00, 7.398437500078291 15134e+00,
780         7.414062500000484 94542e+00, 7.429687500000897 94838e+00,
781         7.445312499991654 67557e+00, 7.460937499993334 22096e+00,
782         7.476562500021955 77705e+00, 7.492187500010436 0964e+00,
783         7.507812499998539 83468e+00, 7.523437499957358 5541e+00,
784         7.539062499997528 19946e+00, 7.554687499998685 49594e+00,
785         7.570312500246927 81153e+00, 7.585937500069073 6357e+00,
786         7.601562499993656 62973e+00, 7.617187499945128 3372e+00,
787         7.632812499958069 98498e+00, 7.648437499972764 00876e+00,
```

```
788         7.664062499980223819 31e+00, 7.679687500001314504 1e+00,
789         7.695312499980859755 1e+00, 7.710937500011585399 31e+00,
790         7.726562499999790389 89e+00, 7.742187500006200373 55e+00,
791         7.757812499993182342 45e+00, 7.773437500017154278 00e+00,
792         7.789062500001427302 72e+00, 7.804687499975014652 88e+00,
793         7.820312499993003818 59e+00, 7.835937500033149483 16e+00,
794         7.851562499999275246 41e+00, 7.867187499997760014 03e+00,
795         7.882812499994499511 05e+00, 7.898437499993515409 36e+00,
796         7.914062500000508038 06e+00, 7.929687500040686565 23e+00,
797         7.945312499999521271 83e+00, 7.960937500012305712 00e+00,
798         7.976562499999473310 20e+00, 7.992187500039343639 46e+00
799 };
```

```
**********************************************************
    4891 Sat May 10 12:08:49 2014
new/usr/src/lib/libm/common/C/_TBL_tan.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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#include "libm_protos.h"

const double _TBL_tan_hi[] = {
 1.57534107325271622e-01, 1.61539784049521462e-01, 1.65550519273933966e-01,
 1.69566445219766521e-01, 1.73587694767981526e-01, 1.77614401477446726e-01,
 1.81646699603321415e-01, 1.85684724115634414e-01, 1.89728610718059132e-01,
 1.93778495866891859e-01, 1.97834516790238668e-01, 2.01896811507417145e-01,
 2.05965518848578860e-01, 2.10040778474558987e-01, 2.14122730896958657e-01,
 2.18211517498467428e-01, 2.22307280553431325e-01, 2.26410163248673829e-01,
 2.30520309704576154e-01, 2.34637864996423667e-01, 2.38762975176025932e-01,
 2.42895787293616550e-01, 2.47036449420041271e-01, 2.51185110669240763e-01,
 2.55341921221036272e-01, 2.63680596419996804e-01, 2.72053698658770882e-01,
 2.80462470145251386e-01, 2.88908172440514699e-01, 2.97392087269024608e-01,
 3.05915517353059274e-01, 3.14479787272571532e-01, 3.23086244351745544e-01,
 3.31736259573572778e-01, 3.40431228523830398e-01, 3.49172572365910372e-01,
 3.57961738848017019e-01, 3.66800203344323394e-01, 3.75689469931754838e-01,
 3.84631072504149241e-01, 3.93626575925632771e-01, 4.02677577225140193e-01,
 4.11785706834108478e-01, 4.20952629869475847e-01, 4.30180047464230053e-01,
 4.39469698147866239e-01, 4.48823359279239720e-01, 4.58242848534432368e-01,
 4.67730025452391784e-01, 4.77286793041252266e-01, 4.86915099448406330e-01,
 4.96616939697565651e-01, 5.06394357496229852e-01, 5.16249447117175131e-01,
 5.26184355357779188e-01, 5.36201283581215993e-01, 5.46302489843790484e-01,
 5.56767065580586427e-01, 5.67597367591443209e-01, 6.08813740324380737e-01,
 6.30437673835884782e-01, 6.52491897928808018e-01, 6.75000485144242934e-01,
 6.97988963623599301e-01, 7.21484440990904474e-01, 7.45515740559391960e-01,
 7.70113551344208669e-01, 7.95310593568674173e-01, 8.21141801589894138e-01,
 8.47644526446552637e-01, 8.74858760554482306e-01, 9.02827387452673547e-01,
 9.31596459944072475e-01, 9.61215510494370373e-01, 9.91737898363268644e-01,
};
const double _TBL_tan_lo[] = {
-1.10615392752930551e-17, 1.42255435911932711e-17, 1.02781342487141920e-17,
-1.04735896510580927e-17,-5.46679990560150911e-18, 1.50201543247778489e-18,
```



```
 1.22522327805930836e-17,-2.52772423968968903e-18, 9.78955701743985001e-19,
 4.61515122717816178e-18, 7.14813042382104539e-19,-1.25529909642919992e-17,
 1.19416304006222131e-17,-5.91325462642753544e-18, 7.53213214053688138e-18,
 4.77223821731568090e-18, 6.32882137760769522e-18, 8.33823681661647871e-18,
-1.25419320906151988e-17, 1.16585041935775587e-17,-1.19653634178542542e-17,
-7.22806346068389604e-18,-6.16674472236513534e-18, 4.26199277415660669e-18,
-5.58935834356478328e-18,-4.56998635843850688e-18, 1.78004627511465564e-18,
 1.74249040881549088e-17, 2.70817328270223006e-17,-1.80870634839170844e-17,
-1.00676145758650168e-17,-1.53577462986065684e-17,-2.38939880909534397e-17,
-1.08193046058071237e-17,-1.06856311222117164e-17,-1.96951245902998606e-17,
-2.08660034657941102e-17, 2.82596474303348100e-17, 2.34797942068937341e-18,
-1.76131026613802985e-17,-1.29729310968305823e-17, 1.87495311063417555e-17,
-2.29163073231136327e-18,-2.51936954463539765e-17,-4.11327516430776285e-18,
 1.50393242431203736e-18,-1.09029595007501330e-17,-6.87284752683418342e-19,
 1.55195027932634982e-17,-4.62284921534513474e-18,-5.45294879014110259e-18,
-2.56576334605328725e-17,-4.00960685506800741e-17, 1.35860113023765056e-17,
-4.34857062258506890e-17, 3.85791583096984630e-17, 2.90965762168371759e-17,
 1.90815918857458480e-17, 1.21159907937263400e-17,-1.52112721227855650e-17,
-1.51838757657007437e-17,-2.51352280752587451e-17,-2.66690480643161193e-17,
-4.59728584599455591e-17,-5.42439848134543255e-17, 3.56284233494755594e-17,
 3.61475127591663133e-17, 1.22197541073075113e-17,-1.61356193051149559e-17,
 1.66243632690603545e-17, 4.30578558405427098e-17,-4.43234026650131250e-17,
-1.35473813965930355e-17, 4.30118334112910435e-17, 3.62593428168003066e-17,
};
```

```
**********************************************************
    3649 Sat May 10 12:08:49 2014
new/usr/src/lib/libm/common/C/__cos.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/* INDENT OFF */
/*
 * __k_cos(double x; double y)
 * kernel cos function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 *
 * Accurate Table look-up algorithm by K.C. Ng, May, 1995.
 *
 * Algorithm: see __sincos.c
 */

#include "libm.h"

static const double sc[] = {
/* ONE  = */  1.0,
/* NONE = */ -1.0,
/*
 * |sin(x) - (x+pp1*x^3+pp2*x^5)| <= 2^-58.79 for |x| < 0.008
 */
/* PP1  = */ -0.16666666666631655886725205237888952148062785868305556 7,
/* PP2  = */   .00833331565299747232356489424846675824847537497797 4017927,
/*
 * |(sin(x) - (x+p1*x^3+...+p4*x^9)|
 * |---------------------------- | <= 2^-57.63 for |x| < 0.1953125
 * |                x            |
 */
/* P1   = */ -1.66666666666629669805215138920301589656e-0001,
/* P2   = */  8.33333332390951295683993455280336376663e-0003,
/* P3   = */ -1.98412623799797669279155177823009840396 0e-0004,
/* P4   = */  2.75340362485427723764998762284833035111 0e-0006,
/*
 * |cos(x) - (1+qq1*x^2+qq2*x^4)| <= 2^-55.99 for |x| <= 0.008 (0x3f80624d)
 */
```



```
 */
/* QQ1  = */ -0.49999999999754923818429119819484185427429,
/* QQ2  = */  0.04166654290435205929454520915835764039877 1740,
/*
 * |cos(x) - (1+q1*x^2+...+q4*x^8)| <= 2^-55.86 for |x| <= 0.1640625 (10.5/64)
 */
/* Q1   = */ -0.5,
/* Q2   = */  4.16666666650035070368094552086074861744 5e-0002,
/* Q3   = */ -1.38888596436972210694266290577848696006e-0003,
/* Q4   = */  2.47856307885858947367951951789295349219 2e-0005,
};
/* INDENT ON */

#define ONE     sc[0]
#define NONE    sc[1]
#define PP1     sc[2]
#define PP2     sc[3]
#define P1      sc[4]
#define P2      sc[5]
#define P3      sc[6]
#define P4      sc[7]
#define QQ1     sc[8]
#define QQ2     sc[9]
#define Q1      sc[10]
#define Q2      sc[11]
#define Q3      sc[12]
#define Q4      sc[13]

extern const double _TBL_sincos[], _TBL_sincosx[];

double
__k_cos(double x, double y) {
        double  z, w, s, v, p, q;
        int     i, j, n, hx, ix;

        hx = ((int *)&x)[HIWORD];
        ix = hx & ~0x80000000;

        if (ix <= 0x3fc50000) { /* |x| < 10.5/64 = 0.164062500 */
                if (ix < 0x3e400000)    /* |x| < 2**-27 */
                        if ((int)x == 0)
                                return (ONE);
                z = x * x;
                if (ix < 0x3f800000)    /* |x| < 0.008 */
                        q = z * (QQ1 + z * QQ2);
                else
                        q = z * ((Q1 + z * Q2) + (z * z) * (Q3 + z * Q4));
                return (ONE + q);
        } else {                        /* 0.164062500 < |x| < ~pi/4 */
                n = ix >> 20;
                i = (((ix >> 12) & 0xff) | 0x100) >> (0x401 - n);
                j = i - 10;
                if (hx < 0)
                        v = -y - (_TBL_sincosx[j] + x);
                else
                        v = y - (_TBL_sincosx[j] - x);
                s = v * v;
                j <<= 1;
                w = _TBL_sincos[j];
                z = _TBL_sincos[j+1];
                p = s * (PP1 + s * PP2);
                q = s * (QQ1 + s * QQ2);
                p = v + v * p;
                return (z - (w * p - z * q));
        }
}
```

```
**********************************************************
    7028 Sat May 10 12:08:49 2014
new/usr/src/lib/libm/common/C/__lgamma.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
 * double __k_lgamma(double x, int *signgamp);
 *
 * K.C. Ng, March, 1989.
 *
 * Part of the algorithm is based on W. Cody's lgamma function.
 */

#include "libm.h"

static const double
one     = 1.0,
zero    = 0.0,
hln2pi  = 0.91893853320467274178032973,  /* log(2*pi)/2 */
pi      = 3.14159265358979323846264338,
two52   = 4503599627370496.0,            /* 43300000,00000000 (used by sin_pi) */
/*
 * Numerator and denominator coefficients for rational minimax Approximation
 * P/Q over (0.5,1.5).
 */
D1 =    -5.77215664901532860519517 4e-1,
p7 =     4.94523535929672704673488 8e0,
p6 =     2.01811262085677508391556 5e2,
p5 =     2.29083837383134639302673 9e3,
p4 =     1.13196720590338082868504 5e4,
p3 =     2.85572463567163533573638 9e4,
p2 =     3.84849622844379335999026 9e4,
p1 =     2.63774878762419543796353 4e4,
p0 =     7.22581397970028819769896 1e3,
q7 =     6.74821255030377719607303 6e1,
q6 =     1.11333239385719932351300 8e3,
q5 =     7.73875705693539873323383 4e3,
q4 =     2.76398707440334070889858 5e4,
```



```
q3 =     5.49931020622615732979441 4e4,
q2 =     6.16112218006600212783335 2e4,
q1 =     3.63512759150194050727628 7e4,
q0 =     8.78553630243101317087083 5e3,
/*
 * Numerator and denominator coefficients for rational minimax Approximation
 * G/H over (1.5,4.0).
 */
D2 =     4.22784335098467139399377 7e-1,
g7 =     4.97460784556893203501206 4e0,
g6 =     5.42413859989107049410198 6e2,
g5 =     1.55069386497836494766507 7e4,
g4 =     1.84793290444563242541722 3e5,
g3 =     1.08820476946882876749847 0e6,
g2 =     3.33815296798702973591722 3e6,
g1 =     5.10666167892735245627525 5e6,
g0 =     3.07410905485053955625092 7e6,
h7 =     1.83032839937059260405594 2e2,
h6 =     7.76504932144500587132304 7e3,
h5 =     1.33190382796607419440244 8e5,
h4 =     1.13670582132196960893875 5e6,
h3 =     5.26796411743794691757538 6e6,
h2 =     1.34670145431110169229005 2e7,
h1 =     1.78273653035327421397593 2e7,
h0 =     9.53309559184435361339574 7e6,
/*
 * Numerator and denominator coefficients for rational minimax Approximation
 * U/V over (4.0,12.0).
 */
D4 =     1.79175946922805500009402 3e0,
u7 =     1.47450216605993994890506 2e4,
u6 =     2.42681336948670450283631 2e6,
u5 =     1.21475557404509322793959 2e8,
u4 =     2.66343244963097694989080 78e9,
u3 =     2.94037895663455389990687 6e10,
u2 =     1.70266573776539886839299 8e11,
u1 =     4.92612579337743088758812 0e11,
u0 =     5.60625185622395146507824 2e11,
v7 =     2.69053017587089933337984 3e3,
v6 =     6.39388565430009239898423 8e5,
v5 =     4.13559993024138805204284 2e7,
v4 =     1.12087210961614794137657 0e9,
v3 =     1.48861372867881381154239 8e10,
v2 =     1.01680358627243822807730 4e11,
v1 =     3.41747634550737713279859 7e11,
v0 =     4.46315818741971328646208 1e11,
/*
 * Coefficients for minimax approximation over (12, INF).
 */
c5 =    -1.910444077728e-03,
c4 =     8.4171387781295e-04,
c3 =    -5.952379913043012e-04,
c2 =     7.9365079350035024 8e-04,
c1 =    -2.77777777777681622553e-03,
c0 =     8.33333333333333331554247e-02,
c6 =     5.7083835261e-03;

/*
 * Return sin(pi*x).  We assume x is finite and negative, and if it
 * is an integer, then the sign of the zero returned doesn't matter.
 */
static double
sin_pi(double x) {
        double  y, z;
        int     n;
```

```
128         y = -x;
129         if (y <= 0.25)
130                 return (__k_sin(pi * x, 0.0));
131         if (y >= two52)
132                 return (zero);
133         z = floor(y);
134         if (y == z)
135                 return (zero);

137         /* argument reduction: set y = |x| mod 2 */
138         y *= 0.5;
139         y = 2.0 * (y - floor(y));

141         /* now floor(y * 4) tells which octant y is in */
142         n = (int)(y * 4.0);
143         switch (n) {
144         case 0:
145                 y = __k_sin(pi * y, 0.0);
146                 break;
147         case 1:
148         case 2:
149                 y = __k_cos(pi * (0.5 - y), 0.0);
150                 break;
151         case 3:
152         case 4:
153                 y = __k_sin(pi * (1.0 - y), 0.0);
154                 break;
155         case 5:
156         case 6:
157                 y = -__k_cos(pi * (y - 1.5), 0.0);
158                 break;
159         default:
160                 y = __k_sin(pi * (y - 2.0), 0.0);
161                 break;
162         }
163         return (-y);
164 }

166 static double
167 neg(double z, int *signgamp) {
168         double  t, p;

170         /*
171          * written by K.C. Ng,  Feb 2, 1989.
172          *
173          * Since
174          *              -z*G(-z)*G(z) = pi/sin(pi*z),
175          * we have
176          *      G(-z) = -pi/(sin(pi*z)*G(z)*z)
177          *            =  pi/(sin(pi*(-z))*G(z)*z)
178          * Algorithm
179          *              z = |z|
180          *              t = sin_pi(z); ...note that when z>2**52, z is an int
181          *              and hence t=0.
182          *
183          *              if(t==0.0) return 1.0/0.0;
184          *              if(t< 0.0) *signgamp = -1; else t= -t;
185          *              if(z+1.0==1.0)  ...tiny z
186          *                  return -log(z);
187          *              else
188          *                  return log(pi/(t*z))-__k_lgamma(z, signgamp);
189          */

191         t = sin_pi(z);                  /* t := sin(pi*z) */
192         if (t == zero)                  /* return 1.0/0.0 = +INF */
193                 return (one / fabs(t));
```



```
194         z = -z;
195         p = z + one;
196         if (p == one)
197                 p = -log(z);
198         else
199                 p = log(pi / (fabs(t) * z)) - __k_lgamma(z, signgamp);
200         if (t < zero)
201                 *signgamp = -1;
202         return (p);
203 }

205 double
206 __k_lgamma(double x, int *signgamp) {
207         double  t, p, q, cr, y;

209         /* purge off +-inf, NaN and negative arguments */
210         if (!finite(x))
211                 return (x * x);
212         *signgamp = 1;
213         if (signbit(x))
214                 return (neg(x, signgamp));

216         /* lgamma(x) ~ log(1/x) for really tiny x */
217         t = one + x;
218         if (t == one) {
219                 if (x == zero)
220                         return (one / x);
221                 return (-log(x));
222         }

224         /* for tiny < x < inf */
225         if (x <= 1.5) {
226                 if (x < 0.6796875) {
227                         cr = -log(x);
228                         y = x;
229                 } else {
230                         cr = zero;
231                         y = x - one;
232                 }

234                 if (x <= 0.5 || x >= 0.6796875) {
235                         if (x == one)
236                                 return (zero);
237                         p = p0+y*(p1+y*(p2+y*(p3+y*(p4+y*(p5+y*(p6+y*p7))))));
238                         q = q0+y*(q1+y*(q2+y*(q3+y*(q4+y*(q5+y*(q6+y*
239                             (q7+y)))))));
240                         return (cr+y*(D1+y*(p/q)));
241                 } else {
242                         y = x - one;
243                         p = g0+y*(g1+y*(g2+y*(g3+y*(g4+y*(g5+y*(g6+y*g7))))));
244                         q = h0+y*(h1+y*(h2+y*(h3+y*(h4+y*(h5+y*(h6+y*
245                             (h7+y)))))));
246                         return (cr+y*(D2+y*(p/q)));
247                 }
248         } else if (x <= 4.0) {
249                 if (x == 2.0)
250                         return (zero);
251                 y = x - 2.0;
252                 p = g0+y*(g1+y*(g2+y*(g3+y*(g4+y*(g5+y*(g6+y*g7))))));
253                 q = h0+y*(h1+y*(h2+y*(h3+y*(h4+y*(h5+y*(h6+y*(h7+y)))))));
254                 return (y*(D2+y*(p/q)));
255         } else if (x <= 12.0) {
256                 y = x - 4.0;
257                 p = u0+y*(u1+y*(u2+y*(u3+y*(u4+y*(u5+y*(u6+y*u7))))));
258                 q = v0+y*(v1+y*(v2+y*(v3+y*(v4+y*(v5+y*(v6+y*(v7-y)))))));
259                 return (D4+y*(p/q));
```

```
260         } else if (x <= 1.0e17) {               /* x ~< 2**(prec+3) */
261                 t = one / x;
262                 y = t * t;
263                 p = hln2pi+t*(c0+y*(c1+y*(c2+y*(c3+y*(c4+y*(c5+y*c6))))));
264                 q = log(x);
265                 return (x*(q-one)-(0.5*q-p));
266         } else {                                /* may overflow */
267                 return (x * (log(x) - 1.0));
268         }
269 }
```

```
**********************************************************
    1076 Sat May 10 12:08:49 2014
new/usr/src/lib/libm/common/C/__libx_errno.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

extern int *___errno(void);

int *
__libm_errno(void) {
        return (___errno());
}
```

```
**********************************************************
    4337 Sat May 10 12:08:49 2014
new/usr/src/lib/libm/common/C/__rem_pio2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * __rem_pio2(x, y) passes back a better-than-double-precision
 * approximation to x mod pi/2 in y[0]+y[1] and returns an integer
 * congruent mod 8 to the integer part of x/(pi/2).
 *
 * This implementation tacitly assumes that x is finite and at
 * least about pi/4 in magnitude.
 */

#include "libm.h"

extern const int _TBL_ipio2_inf[];

/* INDENT OFF */
/*
 * invpio2:  53 bits of 2/pi
 * pio2_1:   first  33 bit of pi/2
 * pio2_1t:  pi/2 - pio2_1
 * pio2_2:   second 33 bit of pi/2
 * pio2_2t:  pi/2 - pio2_2
 * pio2_3:   third  33 bit of pi/2
 * pio2_3t:  pi/2 - pio2_3
 */
static const double
        half    = 0.5,
        invpio2 = 0.63661977236758134307553505,   /* 2^ -1  * 1.45F306DC9C883 */
        pio2_1  = 1.57079632673412561417e+00,     /* 2^  0  * 1.921FB54400000 */
        pio2_1t = 6.07710050650619260147e-11,     /* 2^-34  * 1.0B4611A626331 */
        pio2_2  = 6.07710050630396597660e-11,     /* 2^-34  * 1.0B4611A600000 */
        pio2_2t = 2.02226624879595073240e-21,     /* 2^-69  * 1.3198A2E037073 */
        pio2_3  = 2.02226624871116645580e-21,     /* 2^-69  * 1.3198A2E000000 */
        pio2_3t = 8.47842766036889964396e-32;     /* 2^-104 * 1.B839A252049C1 */
/* INDENT ON */
```



```
int
__rem_pio2(double x, double *y) {
        double  w, t, r, fn;
        double  tx[3];
        int     e0, i, j, nx, n, ix, hx, lx;

        hx = ((int *)&x)[HIWORD];
        ix = hx & 0x7fffffff;

        if (ix < 0x4002d97c) {
                /* |x| < 3pi/4, special case with n=1 */
                t = fabs(x) - pio2_1;
                if (ix != 0x3ff921fb) { /* 33+53 bit pi is good enough */
                        y[0] = t - pio2_1t;
                        y[1] = (t - y[0]) - pio2_1t;
                } else {                /* near pi/2, use 33+33+53 bit pi */
                        t -= pio2_2;
                        y[0] = t - pio2_2t;
                        y[1] = (t - y[0]) - pio2_2t;
                }
                if (hx < 0) {
                        y[0] = -y[0];
                        y[1] = -y[1];
                        return (-1);
                }
                return (1);
        }

        if (ix <= 0x413921fb) {
                /* |x| <= 2^19 pi */
                t = fabs(x);
                n = (int)(t * invpio2 + half);
                fn = (double)n;
                r = t - fn * pio2_1;
                j = ix >> 20;
                w = fn * pio2_1t;       /* 1st round good to 85 bit */
                y[0] = r - w;
                i = j - ((((int *)y)[HIWORD] >> 20) & 0x7ff);
                if (i > 16) {   /* 2nd iteration (rare) */
                        /* 2nd round good to 118 bit */
                        if (i < 35) {
                                t = r;  /* r-fn*pio2_2 may not be exact */
                                w = fn * pio2_2;
                                r = t - w;
                                w = fn * pio2_2t - ((t - r) - w);
                                y[0] = r - w;
                        } else {
                                r -= fn * pio2_2;
                                w = fn * pio2_2t;
                                y[0] = r - w;
                                i = j - ((((int *)y)[HIWORD] >> 20) & 0x7ff);
                                if (i > 49) {
                                        /* 3rd iteration (extremely rare) */
                                        if (i < 68) {
                                                t = r;
                                                w = fn * pio2_3;
                                                r = t - w;
                                                w = fn * pio2_3t -
                                                    ((t - r) - w);
                                                y[0] = r - w;
                                        } else {
                                                /*
                                                 * 3rd round good to 151 bits;
                                                 * covered all possible cases
                                                 */
```

```
128                                             r -= fn * pio2_3;
129                                             w = fn * pio2_3t;
130                                             y[0] = r - w;
131                                     }
132                             }
133                     }
134             }
135             y[1] = (r - y[0]) - w;
136             if (hx < 0) {
137                     y[0] = -y[0];
138                     y[1] = -y[1];
139                     return (-n);
140             }
141             return (n);
142     }

144     e0 = (ix >> 20) - 1046; /* e0 = ilogb(x)-23; */

146     /* break x into three 24 bit pieces */
147     lx = ((int *)&x)[LOWORD];
148     i = (lx & 0x1f) << 19;
149     tx[2] = (double)i;
150     j = (lx >> 5) & 0xffffff;
151     tx[1] = (double)j;
152     tx[0] = (double)((((ix & 0xfffff) | 0x100000) << 3) |
153         ((unsigned)lx >> 29));
154     nx = 3;
155     if (i == 0) {
156             /* skip zero term */
157             nx--;
158             if (j == 0)
159                     nx--;
160     }
161     n = __rem_pio2m(tx, y, e0, nx, 2, _TBL_ipio2_inf);
162     if (hx < 0) {
163             y[0] = -y[0];
164             y[1] = -y[1];
165             return (-n);
166     }
167     return (n);
168 }
```

```
**********************************************************
    8682 Sat May 10 12:08:49 2014
new/usr/src/lib/libm/common/C/__rem_pio2m.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * int __rem_pio2m(x,y,e0,nx,prec,ipio2)
 * double x[],y[]; int e0,nx,prec; const int ipio2[];
 *
 * __rem_pio2m return the last three digits of N with
 *              y = x - N*pi/2
 * so that |y| < pi/4.
 *
 * The method is to compute the integer (mod 8) and fraction parts of
 * (2/pi)*x without doing the full multiplication. In general we
 * skip the part of the product that are known to be a huge integer (
 * more accurately, = 0 mod 8 ). Thus the number of operations are
 * independent of the exponent of the input.
 *
 * (2/PI) is represented by an array of 24-bit integers in ipio2[].
 * Here PI could as well be a machine value pi.
 *
 * Input parameters:
 *      x[]     The input value (must be positive) is broken into nx
 *              pieces of 24-bit integers in double precision format.
 *              x[i] will be the i-th 24 bit of x. The scaled exponent
 *              of x[0] is given in input parameter e0 (i.e., x[0]*2^e0
 *              match x's up to 24 bits.
 *
 *              Example of breaking a double z into x[0]+x[1]+x[2]:
 *                      e0 = ilogb(z)-23
 *                      z  = scalbn(z,-e0)
 *              for i = 0,1,2
 *                      x[i] =  floor(z)
 *                      z    = (z-x[i])*2**24
 *
 *
 *      y[]     ouput result in an array of double precision numbers.
```



```
 *              The dimension of y[] is:
 *                      24-bit  precision       1
 *                      53-bit  precision       2
 *                      64-bit  precision       2
 *                      113-bit precision       3
 *              The actual value is the sum of them. Thus for 113-bit
 *              precsion, one may have to do something like:
 *
 *              long double t,w,r_head, r_tail;
 *              t = (long double)y[2] + (long double)y[1];
 *              w = (long double)y[0];
 *              r_head = t+w;
 *              r_tail = w - (r_head - t);
 *
 *      e0      The exponent of x[0]
 *
 *      nx      dimension of x[]
 *
 *      prec    an interger indicating the precision:
 *                      0       24  bits (single)
 *                      1       53  bits (double)
 *                      2       64  bits (extended)
 *                      3       113 bits (quad)
 *
 *      ipio2[]
 *              integer array, contains the (24*i)-th to (24*i+23)-th
 *              bit of 2/pi or 2/PI after binary point. The corresponding
 *              floating value is
 *
 *                      ipio2[i] * 2^(-24(i+1)).
 *
 * External function:
 *      double scalbn( ), floor( );
 *
 *
 * Here is the description of some local variables:
 *
 *      jk      jk+1 is the initial number of terms of ipio2[] needed
 *              in the computation. The recommended value is 3,4,4,
 *              6 for single, double, extended,and quad.
 *
 *      jz      local integer variable indicating the number of
 *              terms of ipio2[] used.
 *
 *      jx      nx - 1
 *
 *      jv      index for pointing to the suitable ipio2[] for the
 *              computation. In general, we want
 *                      ( 2^e0*x[0] * ipio2[jv-1]*2^(-24jv) )/8
 *              is an integer. Thus
 *                      e0-3-24*jv >= 0 or (e0-3)/24 >= jv
 *              Hence jv = max(0,(e0-3)/24).
 *
 *      jp      jp+1 is the number of terms in pio2[] needed, jp = jk.
 *
 *      q[]     double array with integral value, representing the
 *              24-bits chunk of the product of x and 2/pi.
 *
 *      q0      the corresponding exponent of q[0]. Note that the
 *              exponent for q[i] would be q0-24*i.
 *
 *      pio2[]  double precision array, obtained by cutting pi/2
 *              into 24 bits chunks.
 *
 *      f[]     ipio2[] in floating point
 *
```

```
 *      iq[]    integer array by breaking up q[] in 24-bits chunk.
 *
 *      fq[]    final product of x*(2/pi) in fq[0],..,fq[jk]
 *
 *      ih      integer. If >0 it indicats q[] is >= 0.5, hence
 *              it also indicates the *sign* of the result.
 *
 */

#include "libm.h"

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const int init_jk[] = { 3, 4, 4, 6 }; /* initial value for jk */

static const double pio2[] = {
        1.57079625129699707031e+00,
        7.54978941586159635335e-08,
        5.39030252995776476554e-15,
        3.28200341580791294123e-22,
        1.27065575308067607349e-29,
        1.22933308981111328932e-36,
        2.73370053816464559624e-44,
        2.16741683877804819444e-51,
};

static const double
        zero    = 0.0,
        one     = 1.0,
        half    = 0.5,
        eight   = 8.0,
        eighth  = 0.125,
        two24   = 16777216.0,
        twon24  = 5.96046447753906250OE-8;

int
__rem_pio2m(double *x, double *y, int e0, int nx, int prec, const int *ipio2)
{
        int     jz, jx, jv, jp, jk, carry, n, iq[20];
        int     i, j, k, m, q0, ih;
        double  z, fw, f[20], fq[20], q[20];
#if defined(__i386) && !defined(__amd64)
        int     rp;

        rp = __swapRP(fp_extended);
#endif

        /* initialize jk */
        jp = jk = init_jk[prec];

        /* determine jx,jv,q0, note that 3>q0 */
        jx = nx - 1;
        jv = (e0 - 3) / 24;
        if (jv < 0)
                jv = 0;
        q0 = e0 - 24 * (jv + 1);

        /* set up f[0] to f[jx+jk] where f[jx+jk] = ipio2[jv+jk] */
        j = jv - jx;
        m = jx + jk;
        for (i = 0; i <= m; i++, j++)
                f[i] = (j < 0)? zero : (double)ipio2[j];

        /* compute q[0],q[1],...q[jk] */
```



```
        for (i = 0; i <= jk; i++) {
                for (j = 0, fw = zero; j <= jx; j++)
                        fw += x[j] * f[jx+i-j];
                q[i] = fw;
        }

        jz = jk;
recompute:
        /* distill q[] into iq[] reversingly */
        for (i = 0, j = jz, z = q[jz]; j > 0; i++, j--) {
                fw = (double)((int)(twon24 * z));
                iq[i] = (int)(z - two24 * fw);
                z = q[j-1] + fw;
        }

        /* compute n */
        z = scalbn(z, q0);              /* actual value of z */
        z -= eight * floor(z * eighth); /* trim off integer >= 8 */
        n = (int)z;
        z -= (double)n;
        ih = 0;
        if (q0 > 0) {                   /* need iq[jz-1] to determine n */
                i = (iq[jz-1] >> (24 - q0));
                n += i;
                iq[jz-1] -= i << (24 - q0);
                ih = iq[jz-1] >> (23 - q0);
        } else if (q0 == 0) {
                ih = iq[jz-1] >> 23;
        } else if (z >= half) {
                ih = 2;
        }

        if (ih > 0) {   /* q > 0.5 */
                n += 1;
                carry = 0;
                for (i = 0; i < jz; i++) {      /* compute 1-q */
                        j = iq[i];
                        if (carry == 0) {
                                if (j != 0) {
                                        carry = 1;
                                        iq[i] = 0x1000000 - j;
                                }
                        } else {
                                iq[i] = 0xffffff - j;
                        }
                }
                if (q0 > 0) {           /* rare case: chance is 1 in 12 */
                        switch (q0) {
                        case 1:
                                iq[jz-1] &= 0x7fffff;
                                break;
                        case 2:
                                iq[jz-1] &= 0x3fffff;
                                break;
                        }
                }
                if (ih == 2) {
                        z = one - z;
                        if (carry != 0)
                                z -= scalbn(one, q0);
                }
        }

        /* check if recomputation is needed */
        if (z == zero) {
                j = 0;
```

```
260                 for (i = jz - 1; i >= jk; i--)
261                         j |= iq[i];
262                 if (j == 0) {   /* need recomputation */
263                         /* set k to no. of terms needed */
264                         for (k = 1; iq[jk-k] == 0; k++)
265                                 ;

267                         /* add q[jz+1] to q[jz+k] */
268                         for (i = jz + 1; i <= jz + k; i++) {
269                                 f[jx+i] = (double)ipio2[jv+i];
270                                 for (j = 0, fw = zero; j <= jx; j++)
271                                         fw += x[j] * f[jx+i-j];
272                                 q[i] = fw;
273                         }
274                         jz += k;
275                         goto recompute;
276                 }
277         }

279         /* cut out zero terms */
280         if (z == zero) {
281                 jz -= 1;
282                 q0 -= 24;
283                 while (iq[jz] == 0) {
284                         jz--;
285                         q0 -= 24;
286                 }
287         } else {                /* break z into 24-bit if neccessary */
288                 z = scalbn(z, -q0);
289                 if (z >= two24) {
290                         fw = (double)((int)(twon24 * z));
291                         iq[jz] = (int)(z - two24 * fw);
292                         jz += 1;
293                         q0 += 24;
294                         iq[jz] = (int)fw;
295                 } else {
296                         iq[jz] = (int)z;
297                 }
298         }

300         /* convert integer "bit" chunk to floating-point value */
301         fw = scalbn(one, q0);
302         for (i = jz; i >= 0; i--) {
303                 q[i] = fw * (double)iq[i];
304                 fw *= twon24;
305         }

307         /* compute pio2[0,...,jp]*q[jz,...,0] */
308         for (i = jz; i >= 0; i--) {
309                 for (fw = zero, k = 0; k <= jp && k <= jz - i; k++)
310                         fw += pio2[k] * q[i+k];
311                 fq[jz-i] = fw;
312         }

314         /* compress fq[] into y[] */
315         switch (prec) {
316         case 0:
317                 fw = zero;
318                 for (i = jz; i >= 0; i--)
319                         fw += fq[i];
320                 y[0] = (ih == 0)? fw : -fw;
321                 break;

323         case 1:
324         case 2:
325                 fw = zero;
```



```
326                 for (i = jz; i >= 0; i--)
327                         fw += fq[i];
328                 y[0] = (ih == 0)? fw : -fw;
329                 fw = fq[0] - fw;
330                 for (i = 1; i <= jz; i++)
331                         fw += fq[i];
332                 y[1] = (ih == 0)? fw : -fw;
333                 break;

335         default:
336                 for (i = jz; i > 0; i--) {
337                         fw = fq[i-1] + fq[i];
338                         fq[i] += fq[i-1] - fw;
339                         fq[i-1] = fw;
340                 }
341                 for (i = jz; i > 1; i--) {
342                         fw = fq[i-1] + fq[i];
343                         fq[i] += fq[i-1] - fw;
344                         fq[i-1] = fw;
345                 }
346                 for (fw = zero, i = jz; i >= 2; i--)
347                         fw += fq[i];
348                 if (ih == 0) {
349                         y[0] = fq[0];
350                         y[1] = fq[1];
351                         y[2] = fw;
352                 } else {
353                         y[0] = -fq[0];
354                         y[1] = -fq[1];
355                         y[2] = -fw;
356                 }
357         }

359 #if defined(__i386) && !defined(__amd64)
360         (void) __swapRP(rp);
361 #endif
362         return (n & 7);
363 }
```

```
**********************************************************
    3709 Sat May 10 12:08:49 2014
new/usr/src/lib/libm/common/C/__sin.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/* INDENT OFF */
/*
 * __k_sin( double x;  double y )
 * kernel sin function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 *
 * Accurate Table look-up algorithm by K.C. Ng, May, 1995.
 *
 * Algorithm: see __sincos.c
 */

#include "libm.h"

static const double sc[] = {
/* ONE  = */  1.0,
/* NONE = */ -1.0,
/*
 * |sin(x) - (x+pp1*x^3+pp2*x^5)| <= 2^-58.79 for |x| < 0.008
 */
/* PP1  = */ -0.16666666666631655886725205237888952148062785868305556 7,
/* PP2  = */   .00833331565299747232356489424846675824847537497797 4017927,
/*
 * |(sin(x) - (x+p1*x^3+...+p4*x^9)|
 * |---------------------------- | <= 2^-57.63 for |x| < 0.1953125
 * |                x             |
 */
/* P1   = */ -1.66666666666662966980521513892030158965 6e-0001,
/* P2   = */  8.33333332390951295683993455280336376663e-0003,
/* P3   = */ -1.98412623799797669279155177823009840396 0e-0004,
/* P4   = */  2.75340362485427723764998762284833035111 0e-0006,
/*
 * |cos(x) - (1+qq1*x^2+qq2*x^4)| <= 2^-55.99 for |x| <= 0.008 (0x3f80624d)
```



```
 */
/* QQ1  = */ -0.49999999999754923818429119819484185427429,
/* QQ2  = */  0.04166654290435205929454520915835764039877 1740,
/*
 * |cos(x) - (1+q1*x^2+...+q4*x^8)| <= 2^-55.86 for |x| <= 0.1640625 (10.5/64)
 */
/* Q1   = */ -0.5,
/* Q2   = */  4.16666666650035070368094552086074861744 5e-0002,
/* Q3   = */ -1.38888859643697221069426629057784869600 6e-0003,
/* Q4   = */  2.47856307885858947367951951789295349219 2e-0005,
};
/* INDENT ON */

#define ONE     sc[0]
#define NONE    sc[1]
#define PP1     sc[2]
#define PP2     sc[3]
#define P1      sc[4]
#define P2      sc[5]
#define P3      sc[6]
#define P4      sc[7]
#define QQ1     sc[8]
#define QQ2     sc[9]
#define Q1      sc[10]
#define Q2      sc[11]
#define Q3      sc[12]
#define Q4      sc[13]

extern const double _TBL_sincos[], _TBL_sincosx[];

double
__k_sin(double x, double y) {
        double  z, w, s, v, p, q;
        int     i, j, n, hx, ix;

        hx = ((int *)&x)[HIWORD];
        ix = hx & ~0x80000000;

        if (ix <= 0x3fc50000) { /* |x| < 10.5/64 = 0.164062500 */
                if (ix < 0x3e400000)    /* |x| < 2**-27 */
                        if ((int)x == 0)
                                return (x + y);
                z = x * x;
                if (ix < 0x3f800000)    /* |x| < 0.008  */
                        p = (x * z) * (PP1 + z * PP2) + y;
                else
                        p = (x * z) * ((P1 + z * P2) + (z * z) * (P3 +
                            z * P4)) + y;
                return (x + p);
        } else {                /* 0.164062500 < |x| < ~pi/4 */
                n = ix >> 20;
                i = (((ix >> 12) & 0xff) | 0x100) >> (0x401 - n);
                j = i - 10;
                if (hx < 0)
                        v = -y - (_TBL_sincosx[j] + x);
                else
                        v = y - (_TBL_sincosx[j] - x);
                s = v * v;
                j <<= 1;
                w = _TBL_sincos[j];
                z = _TBL_sincos[j+1];
                p = s * (PP1 + s * PP2);
                q = s * (QQ1 + s * QQ2);
                p = v + v * p;
                s = w * q + z * p;
                return ((hx >= 0)? w + s : -(w + s));
```

```
128         }
129 }
```

```
**********************************************************
    5054 Sat May 10 12:08:49 2014
new/usr/src/lib/libm/common/C/__sincos.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */
/*
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 */

/* INDENT OFF */
/*
 * double __k_sincos(double x, double y, double *c);
 * kernel sincos function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 * return sin(x) with *c = cos(x)
 *
 * Accurate Table look-up algorithm by K.C. Ng, May, 1995.
 *
 * 1. Reduce x to x>0 by sin(-x)=-sin(x),cos(-x)=cos(x).
 * 2. For 0<= x < pi/4, let i = (64*x chopped)-10. Let d = x - a[i], where
 *    a[i] is a double that is close to (i+10.5)/64 and such that
 *    sin(a[i]) and cos(a[i]) is close to a double (with error less
 *    than 2**-8 ulp). Then
 *      cos(x) = cos(a[i]+d) = cos(a[i])cos(d) - sin(a[i])*sin(d)
 *             = TBL_cos_a[i]*(1+QQ1*d^2+QQ2*d^4) -
 *                       TBL_sin_a[i]*(d+PP1*d^3+PP2*d^5)
 *             = TBL_cos_a[i] + (TBL_cos_a[i]*d^2*(QQ1+QQ2*d^2) -
 *                       TBL_sin_a[i]*(d+PP1*d^3+PP2*d^5))
 *      sin(x) = sin(a[i]+d) = sin(a[i])cos(d) + cos(a[i])*sin(d)
 *             = TBL_sin_a[i]*(1+QQ1*d^2+QQ2*d^4) +
 *                       TBL_cos_a[i]*(d+PP1*d^3+PP2*d^5)
 *             = TBL_sin_a[i] + (TBL_sin_a[i]*d^2*(QQ1+QQ2*d^2) +
 *                       TBL_cos_a[i]*(d+PP1*d^3+PP2*d^5))
 *
 *    For |y| less than 10.5/64 = 0.1640625, use
 *      sin(y) = y + y^3*(p1+y^2*(p2+y^2*(p3+y^2*p4)))
 *      cos(y) = 1 + y^2*(q1+y^2*(q2+y^2*(q3+y^2*q4)))
 *
 *    For |y| less than 0.008, use
 *      sin(y) = y + y^3*(pp1+y^2*pp2)
 *      cos(y) = 1 + y^2*(qq1+y^2*qq2)
```



```
 *
 * Accuracy:
 *      TRIG(x) returns trig(x) nearly rounded (less than 1 ulp)
 */

#include "libm.h"

static const double sc[] = {
/* ONE  = */  1.0,
/* NONE = */ -1.0,
/*
 * |sin(x) - (x+pp1*x^3+pp2*x^5)| <= 2^-58.79 for |x| < 0.008
 */
/* PP1  = */ -0.16666666666631655886725205237888952148062785868305556 7,
/* PP2  = */   .00833331565299747232356489424846675824847537497797401 7927,
/*
 * |(sin(x) - (x+p1*x^3+...+p4*x^9)|
 * |------------------------------| <= 2^-57.63 for |x| < 0.1953125
 * |                 x            |
 */
/* P1   = */ -1.66666666666629669805215138920301589656e-0001,
/* P2   = */  8.33333332390951295683993455280336376663e-0003,
/* P3   = */ -1.98412623799797669279155177823009840396 0e-0004,
/* P4   = */  2.75340362485427723764998762284833035111 0e-0006,
/*
 * |cos(x) - (1+qq1*x^2+qq2*x^4)| <= 2^-55.99 for |x| <= 0.008 (0x3f80624d)
 */
/* QQ1  = */ -0.49999999999754923818429119819484841854 2742729,
/* QQ2  = */  0.04166654290435205929454520915835764039 8771740,
/*
 * |cos(x) - (1+q1*x^2+...+q4*x^8)| <= 2^-55.86 for |x| <= 0.1640625 (10.5/64)
 */
/* Q1   = */ -0.5,
/* Q2   = */  4.16666666650035070368094552086074861744 5e-0002,
/* Q3   = */ -1.38888859643697221069426629057784869600 6e-0003,
/* Q4   = */  2.47856307885858947367951951789295349219 2e-0005,
};
/* INDENT ON */

#define ONE     sc[0]
#define NONE    sc[1]
#define PP1     sc[2]
#define PP2     sc[3]
#define P1      sc[4]
#define P2      sc[5]
#define P3      sc[6]
#define P4      sc[7]
#define QQ1     sc[8]
#define QQ2     sc[9]
#define Q1      sc[10]
#define Q2      sc[11]
#define Q3      sc[12]
#define Q4      sc[13]

extern const double _TBL_sincos[], _TBL_sincosx[];

double
__k_sincos(double x, double y, double *c) {
        double  z, w, s, v, p, q;
        int     i, j, n, hx, ix;

        hx = ((int *)&x)[HIWORD];
        ix = hx & ~0x80000000;

        if (ix <= 0x3fc50000) { /* |x| < 10.5/64 = 0.164062500 */
                if (ix < 0x3e400000) {  /* |x| < 2**-27 */
```

```
128                         if ((int)x == 0)
129                                 *c = ONE;
130                         return (x + y);
131                 } else {
132                         z = x * x;
133                         if (ix < 0x3f800000) {  /* |x| < 0.008 */
134                                 q = z * (QQ1 + z * QQ2);
135                                 p = (x * z) * (PP1 + z * PP2) + y;
136                         } else {
137                                 q = z * ((Q1 + z * Q2) + (z * z) * (Q3 +
138                                     z * Q4));
139                                 p = (x * z) * ((P1 + z * P2) + (z * z) * (P3 +
140                                     z * P4)) + y;
141                         }
142                         *c = ONE + q;
143                         return (x + p);
144                 }
145         } else {                        /* 0.164062500 < |x| < ~pi/4 */
146                 n = ix >> 20;
147                 i = (((ix >> 12) & 0xff) | 0x100) >> (0x401 - n);
148                 j = i - 10;
149                 if (hx < 0)
150                         v = -y - (_TBL_sincosx[j] + x);
151                 else
152                         v = y - (_TBL_sincosx[j] - x);
153                 s = v * v;
154                 j <<= 1;
155                 w = _TBL_sincos[j];
156                 z = _TBL_sincos[j+1];
157                 p = s * (PP1 + s * PP2);
158                 q = s * (QQ1 + s * QQ2);
159                 p = v + v * p;
160                 *c = z - (w * p - z * q);
161                 s = w * q + z * p;
162                 return ((hx >= 0)? w + s : -(w + s));
163         }
164 }
```

```
**********************************************************
    5678 Sat May 10 12:08:50 2014
new/usr/src/lib/libm/common/C/__tan.c
__tan.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/* INDENT OFF */
/*
 * __k_tan( double x;  double y; int k )
 * kernel tan/cotan function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 * Input k indicate -- tan if k=0; else -1/tan
 *
 * Table look up algorithm
 *      1. by tan(-x) = -tan(x), need only to consider positive x
 *      2. if x < 5/32 = [0x3fc40000, 0] = 0.15625 , then
 *           if x < 2^-27 (hx < 0x3e400000 0), set w=x with inexact if x!= 0
 *           else
 *              z = x*x;
 *              w = x + (y+(x*z)*(t1+z*(t2+z*(t3+z*(t4+z*(t5+z*t6))))))
 *         return (k==0)? w: 1/w;
 *      3. else
 *              ht = (hx + 0x4000)&0x7fff8000   (round x to a break point t)
 *              lt = 0
 *              i  = (hy-0x3fc40000)>>15;       (i<=64)
 *              x' = (x - t)+y                  (|x'| ~<= 2^-7)
 *         By
 *              tan(t+x')
 *                = (tan(t)+tan(x'))/(1-tan(x')tan(t))
 *         We have
 *                              sin(x')+tan(t)*(tan(t)*sin(x'))
 *                = tan(t) + ------------------------------    for k=0
 *                                 cos(x') - tan(t)*sin(x')
 *
 *                              cos(x') - tan(t)*sin(x')
```



```
 *                = - ------------------------------------    for k=1
 *                          tan(t) + tan(t)*(cos(x')-1) + sin(x')
 *
 *
 *         where        tan(t) is from the table,
 *                      sin(x') = x + pp1*x^3 + pp2*x^5
 *                      cos(x') = 1 + qq1*x^2 + qq2*x^4
 */

#include "libm.h"

extern const double _TBL_tan_hi[], _TBL_tan_lo[];
static const double q[] = {
/* one  = */  1.0,
/*
 *                        2       2       -59.56
 * |sin(x) - pp1*x*(pp2+x *(pp3+x )| <= 2        for |x|<1/64
 */
/* pp1  = */  8.33326120969096230395312119298978359438478946686e-0003,
/* pp2  = */  1.20001038589438965215025680596868692381425944526e+0002,
/* pp3  = */ -2.00001730975089451192161504877731204032897949219e+0001,

/*
 *                    2      2        -56.19
 * |cos(x) - (1+qq1*x (qq2+x ))| <= 2        for |x|<=1/128
 */
/* qq1  = */  4.16665486385721928197511942926212213933467864990e-0002,
/* qq2  = */ -1.20000339921340035687080671777948737144470214844e+0001,

/*
 * |tan(x) - PF(x)|
 * |--------------| <= 2^-58.57 for |x|<0.15625
 * |      x       |
 *
 * where (let z = x*x)
 *      PF(x) = x + (t1*x*z)(t2 + z(t3 + z))(t4 + z)(t5 + z(t6 + z))
 */
/* t1 = */  3.71923358986516816929168705030406272271648049355e-0003,
/* t2 = */  6.02645120354857866118436504621058702468872070312e+0000,
/* t3 = */  2.42627327587398156083509093150496482849121093750e+0000,
/* t4 = */  2.44968983934252770851003333518747240304946899414e+0000,
/* t5 = */  6.07089252571767978849948121933266520500183105469e+0000,
/* t6 = */ -2.49403756995593761658369658107403665781021118164e+0000,
};


#define one q[0]
#define pp1 q[1]
#define pp2 q[2]
#define pp3 q[3]
#define qq1 q[4]
#define qq2 q[5]
#define t1  q[6]
#define t2  q[7]
#define t3  q[8]
#define t4  q[9]
#define t5  q[10]
#define t6  q[11]

/* INDENT ON */


double
__k_tan(double x, double y, int k) {
        double a, t, z, w = 0.0L, s, c, r, rh, xh, xl;
        int i, j, hx, ix;
```

```
127         t = one;
128         hx = ((int *) &x)[HIWORD];
129         ix = hx & 0x7fffffff;
130         if (ix < 0x3fc40000) {          /* 0.15625 */
131                 if (ix < 0x3e400000) {  /* 2^-27 */
132                         if ((i = (int) x) == 0)         /* generate inexact */
133                                 w = x;
134                         t = y;
135                 } else {
136                         z = x * x;
137                         t = y + (((t1 * x) * z) * (t2 + z * (t3 + z))) *
138                                 ((t4 + z) * (t5 + z * (t6 + z)));
139                         w = x + t;
140                 }
141                 if (k == 0)
142                         return (w);
143                 /*
144                 * Compute -1/(x+T) with great care
145                 * Let r = -1/(x+T), rh = r chopped to 20 bits.
146                 * Also let xh   = x+T chopped to 20 bits, xl = (x-xh)+T. Then
147                 *   -1/(x+T)    = rh + (-1/(x+T)-rh) = rh + r*(1+rh*(x+T))
148                 *               = rh + r*((1+rh*xh)+rh*xl).
149                 */
150                 rh = r = -one / w;
151                 ((int *) &rh)[LOWORD] = 0;
152                 xh = w;
153                 ((int *) &xh)[LOWORD] = 0;
154                 xl = (x - xh) + t;
155                 return (rh + r * ((one + rh * xh) + rh * xl));
156         }
157         j = (ix + 0x4000) & 0x7fff8000;
158         i = (j - 0x3fc40000) >> 15;
159         ((int *) &t)[HIWORD] = j;
160         if (hx > 0)
161                 x = y - (t - x);
162         else
163                 x = -y - (t + x);
164         a = _TBL_tan_hi[i];
165         z = x * x;
166         s = (pp1 * x) * (pp2 + z * (pp3 + z));  /* sin(x) */
167         t = (qq1 * z) * (qq2 + z);              /* cos(x) - 1 */
168         if (k == 0) {
169                 w = a * s;
170                 t = _TBL_tan_lo[i] + (s + a * w) / (one - (w - t));
171                 return (hx < 0 ? -a - t : a + t);
172         } else {
173                 w = s + a * t;
174                 c = w + _TBL_tan_lo[i];
175                 t = a * s - t;
176                 /*
177                 * Now try to compute [(1-T)/(a+c)] accurately
178                 *
179                 * Let r = 1/(a+c), rh = (1-T)*r chopped to 20 bits.
180                 * Also let xh = a+c chopped to 20 bits, xl = (a-xh)+c. Then
181                 *       (1-T)/(a+c) = rh + ((1-T)/(a+c)-rh)
182                 *                   = rh + r*(1-T-rh*(a+c))
183                 *                   = rh + r*((1-T-rh*xh)-rh*xl)
184                 *                   = rh + r*(((1-rh*xh)-T)-rh*xl)
185                 */
186                 r = one / (a + c);
187                 rh = (one - t) * r;
188                 ((int *) &rh)[LOWORD] = 0;
189                 xh = a + c;
190                 ((int *) &xh)[LOWORD] = 0;
191                 xl = (a - xh) + c;
```



```
192                 z = rh + r * (((one - rh * xh) - t) - rh * xl);
193                 return (hx >= 0 ? -z : z);
194         }
195 }
```

****
2119 Sat May 10 12:08:50 2014
new/usr/src/lib/libm/common/C/__xpg6.c
patch01 - 693 import Sun Devpro Math Library
****

```
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/*LINTLIBRARY*/

/*
 * See /ws/unix200x-gate/usr/src/lib/libc/port/gen/xpg6.c for libc default.
 * __xpg6 (C99/SUSv3) is first included in Solaris 10 libc and libm
 * as well as the K2 (S1S8) libsunmath and libmopt.
 *
 * The default setting, _C99SUSv3_mode_OFF, means to retain current Solaris
 * behavior which is NOT C99/SUSv3 compliant.  This is normal.  These libraries
 * determine which standard to use based on how applications are built.  These
 * libraries at runtime determine which behavior to choose based on the value
 * of __xpg6.  By default they retain their original Solaris behavior.
 *
 * __xpg6 is used to control certain behaviors between the C99 standard, the
 * SUSv3 standard, and Solaris.  More explanation in lib/libc/inc/xpg6.h.
 * The XPG6 C compiler utility (c99) will add an object file that contains
 * an alternate definition for __xpg6.  The symbol interposition provided
 * by the linker will allow these libraries to find that symbol instead.
 *
 * Possible settings are available and documented in lib/libc/inc/xpg6.h.
 */

#include "xpg6.h"

unsigned int __xpg6 = _C99SUSv3_mode_OFF;
```

```
**********************************************************
    1202 Sat May 10 12:08:50 2014
new/usr/src/lib/libm/common/C/_lib_version.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * values-{X,x}?.o should define + initialize an *actual* symbol _lib_version.
 */

#include <math.h>

#pragma weak _lib_version = __libm_lib_version

const enum version __libm_lib_version = libm_ieee;
```

```
**********************************************************
    4659 Sat May 10 12:08:50 2014
new/usr/src/lib/libm/common/C/acos.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak acos = __acos

/* INDENT OFF */
/* acos(x)
 * Method :
 *      acos(x)  = pi/2 - asin(x)
 *      acos(-x) = pi/2 + asin(x)
 * For |x|<=0.5
 *      acos(x) = pi/2 - (x + x*x^2*R(x^2))     (see asin.c)
 * For x>0.5
 *      acos(x) = pi/2 - (pi/2 - 2asin(sqrt((1-x)/2)))
 *              = 2asin(sqrt((1-x)/2))
 *              = 2s + 2s*z*R(z)        ...z=(1-x)/2, s=sqrt(z)
 *              = 2f + (2c + 2s*z*R(z))
 *     where f=hi part of s, and c = (z-f*f)/(s+f) is the correction term
 *     for f so that f+c ~ sqrt(z).
 * For x<-0.5
 *      acos(x) = pi - 2asin(sqrt((1-|x|)/2))
 *              = pi - 0.5*(s+s*z*R(z)), where z=(1-|x|)/2,s=sqrt(z)
 *
 * Special cases:
 *      if x is NaN, return x itself;
 *      if |x|>1, return NaN with invalid signal.
 *
 * Function needed: sqrt
 */
/* INDENT ON */

#include "libm_synonyms.h"      /* __acos, __sqrt, __isnan */
#include "libm_protos.h"        /* _SVID_libm_error */
#include "libm_macros.h"
#include <math.h>
```



```
/* INDENT OFF */
static const double xxx[] = {
/* one */        1.00000000000000000000e+00,    /* 3FF00000, 00000000 */
/* pi */         3.14159265358979311600e+00,    /* 400921FB, 54442D18 */
/* pio2_hi */    1.57079632679489655800e+00,    /* 3FF921FB, 54442D18 */
/* pio2_lo */    6.12323399573676603587e-17,    /* 3C91A626, 33145C07 */
/* pS0 */        1.66666666666666657415e-01,    /* 3FC55555, 55555555 */
/* pS1 */       -3.25565818622400915405e-01,    /* BFD4D612, 03EB6F7D */
/* pS2 */        2.01212532134862925881e-01,    /* 3FC9C155, 0E884455 */
/* pS3 */       -4.00555345006794114027e-02,    /* BFA48228, B5688F3B */
/* pS4 */        7.91534994289814532176e-04,    /* 3F49EFE0, 7501B288 */
/* pS5 */        3.47933107596021167570e-05,    /* 3F023DE1, 0DFDF709 */
/* qS1 */       -2.40339491173441421878e+00,    /* C0033A27, 1C8A2D4B */
/* qS2 */        2.02094576023350569471e+00,    /* 40002AE5, 9C598AC8 */
/* qS3 */       -6.88283971605453293030e-01,    /* BFE6066C, 1B8D0159 */
/* qS4 */        7.70381505559019352791e-02     /* 3FB3B8C5, B12E9282 */
};
#define one     xxx[0]
#define pi      xxx[1]
#define pio2_hi xxx[2]
#define pio2_lo xxx[3]
#define pS0     xxx[4]
#define pS1     xxx[5]
#define pS2     xxx[6]
#define pS3     xxx[7]
#define pS4     xxx[8]
#define pS5     xxx[9]
#define qS1     xxx[10]
#define qS2     xxx[11]
#define qS3     xxx[12]
#define qS4     xxx[13]
/* INDENT ON */

double
acos(double x) {
        double z, p, q, r, w, s, c, df;
        int hx, ix;

        hx = ((int *) &x)[HIWORD];
        ix = hx & 0x7fffffff;
        if (ix >= 0x3ff00000) { /* |x| >= 1 */
                if (((ix - 0x3ff00000) | ((int *) &x)[LOWORD]) == 0) {
                        /* |x| == 1 */
                        if (hx > 0)     /* acos(1) = 0 */
                                return 0.0;
                        else            /* acos(-1) = pi */
                                return pi + 2.0 * pio2_lo;
                }
                else if (isnan(x))
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                        return ix >= 0x7ff80000 ? x : (x - x) / (x - x);
                        /* assumes sparc-like QNaN */
#else
                        return (x - x) / (x - x);       /* acos(|x|>1) is NaN */
#endif
                else
                        return _SVID_libm_err(x, x, 1);
        }
        if (ix < 0x3fe00000) {  /* |x| < 0.5 */
                if (ix <= 0x3c600000)
                        return pio2_hi + pio2_lo;       /* if |x| < 2**-57 */
                z = x * x;
                p = z * (pS0 + z * (pS1 + z * (pS2 + z * (pS3 +
                        z * (pS4 + z * pS5)))));
                q = one + z * (qS1 + z * (qS2 + z * (qS3 + z * qS4)));
```

```
128                 r = p / q;
129                 return pio2_hi - (x - (pio2_lo - x * r));
130         }
131         else if (hx < 0) {      /* x < -0.5 */
132                 z = (one + x) * 0.5;
133                 p = z * (pS0 + z * (pS1 + z * (pS2 + z * (pS3 +
134                         z * (pS4 + z * pS5)))));
135                 q = one + z * (qS1 + z * (qS2 + z * (qS3 + z * qS4)));
136                 s = sqrt(z);
137                 r = p / q;
138                 w = r * s - pio2_lo;
139                 return pi - 2.0 * (s + w);
140         }
141         else {                  /* x > 0.5 */
142                 z = (one - x) * 0.5;
143                 s = sqrt(z);
144                 df = s;
145                 ((int *) &df)[LOWORD] = 0;
146                 c = (z - df * df) / (s + df);
147                 p = z * (pS0 + z * (pS1 + z * (pS2 + z * (pS3 +
148                         z * (pS4 + z * pS5)))));
149                 q = one + z * (qS1 + z * (qS2 + z * (qS3 + z * qS4)));
150                 r = p / q;
151                 w = r * s + c;
152                 return 2.0 * (df + w);
153         }
154 }
```

```
**********************************************************
    2602 Sat May 10 12:08:50 2014
new/usr/src/lib/libm/common/C/acosh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak acosh = __acosh

/* INDENT OFF */
/* acosh(x)
 * Method :
 *      Based on
 *              acosh(x) = log [ x + sqrt(x*x-1) ]
 *      we have
 *              acosh(x) := log(x)+ln2, if x is large; else
 *              acosh(x) := log(2x-1/(sqrt(x*x-1)+x)) if x > 2; else
 *              acosh(x) := log1p(t+sqrt(2.0*t+t*t)); where t = x-1.
 *
 * Special cases:
 *      acosh(x) is NaN with signal if x < 1.
 *      acosh(NaN) is NaN without signal.
 */
/* INDENT ON */

#include "libm_synonyms.h"      /* __acosh, __log, __log1p */
#include "libm_protos.h"        /* _SVID_libm_error */
#include "libm_macros.h"
#include <math.h>

static const double
        one = 1.0,
        ln2 = 6.93147180559945286227e-01;       /* 3FE62E42, FEFA39EF */

double
acosh(double x) {
        double t;
        int hx;
```



```
        hx = ((int *) &x)[HIWORD];
        if (hx < 0x3ff00000) {  /* x < 1 */
                if (isnan(x))
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                        return hx >= 0xfff80000 ? x : (x - x) / (x - x);
                        /* assumes sparc-like QNaN */
#else
                        return (x - x) / (x - x);
#endif
                else
                        return _SVID_libm_err(x, x, 29);
        }
        else if (hx >= 0x41b00000) {    /* x > 2**28 */
                if (hx >= 0x7ff00000) { /* x is inf of NaN */
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                        return hx >= 0x7ff80000 ? x : x + x;
                        /* assumes sparc-like QNaN */
#else
                        return x + x;
#endif
                }
                else    /* acosh(huge)=log(2x) */
                        return log(x) + ln2;
        }
        else if (((hx - 0x3ff00000) | ((int *) &x)[LOWORD]) == 0) {
                return 0.0;     /* acosh(1) = 0 */
        }
        else if (hx > 0x40000000) {     /* 2**28 > x > 2 */
                t = x * x;
                return log(2.0 * x - one / (x + sqrt(t - one)));
        }
        else {                  /* 1 < x < 2 */
                t = x - one;
                return log1p(t + sqrt(2.0 * t + t * t));
        }
}
```

```
**********************************************************
    4870 Sat May 10 12:08:50 2014
new/usr/src/lib/libm/common/C/asin.c
In case of |x| < 2**-27 we are talking about x being almost 0.
The graph of arcsine curve shows that arcsin(0) is 0 so we will return 0 if x ==
or return x and generate inexact if x is close to 0.
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
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 */

#pragma weak asin = __asin

/* INDENT OFF */
/* asin(x)
 * Method :
 *      Since  asin(x) = x + x^3/6 + x^5*3/40 + x^7*15/336 + ...
 *      we approximate asin(x) on [0,0.5] by
 *              asin(x) = x + x*x^2*R(x^2)
 *      where
 *              R(x^2) is a rational approximation of (asin(x)-x)/x^3
 *      and its remez error is bounded by
 *              |(asin(x)-x)/x^3 - R(x^2)| < 2^(-58.75)
 *
 *      For x in [0.5,1]
 *              asin(x) = pi/2-2*asin(sqrt((1-x)/2))
 *      Let y = (1-x), z = y/2, s := sqrt(z), and pio2_hi+pio2_lo=pi/2;
 *      then for x>0.98
 *              asin(x) = pi/2 - 2*(s+s*z*R(z))
 *                      = pio2_hi - (2*(s+s*z*R(z)) - pio2_lo)
 *      For x<=0.98, let pio4_hi = pio2_hi/2, then
 *              f = hi part of s;
 *              c = sqrt(z) - f = (z-f*f)/(s+f)         ...f+c=sqrt(z)
 *      and
 *              asin(x) = pi/2 - 2*(s+s*z*R(z))
 *                      = pio4_hi+(pio4-2s)-(2s*z*R(z)-pio2_lo)
 *                      = pio4_hi+(pio4-2f)-(2s*z*R(z)-(pio2_lo+2c))
 *
 * Special cases:
```



```
 *      if x is NaN, return x itself;
 *      if |x|>1, return NaN with invalid signal.
 *
 */
/* INDENT ON */

#include "libm_synonyms.h"      /* __asin, __sqrt, __isnan */
#include "libm_protos.h"        /* _SVID_libm_error */
#include "libm_macros.h"
#include <math.h>

/* INDENT OFF */
static const double xxx[] = {
/* one */        1.00000000000000000000e+00,    /* 3FF00000, 00000000 */
/* huge */       1.000e+300,
/* pio2_hi */    1.57079632679489655800e+00,    /* 3FF921FB, 54442D18 */
/* pio2_lo */    6.12323399573676603587e-17,    /* 3C91A626, 33145C07 */
/* pio4_hi */    7.85398163397448278999e-01,    /* 3FE921FB, 54442D18 */
/* coefficient for R(x^2) */
/* pS0 */        1.66666666666666657415e-01,    /* 3FC55555, 55555555 */
/* pS1 */       -3.25565818622400915405e-01,    /* BFD4D612, 03EB6F7D */
/* pS2 */        2.01212532134862925881e-01,    /* 3FC9C155, 0E884455 */
/* pS3 */       -4.00555345006794114027e-02,    /* BFA48228, B5688F3B */
/* pS4 */        7.91534994289814532176e-04,    /* 3F49EFE0, 7501B288 */
/* pS5 */        3.47933107596021167570e-05,    /* 3F023DE1, 0DFDF709 */
/* qS1 */       -2.40339491173441421878e+00,    /* C0033A27, 1C8A2D4B */
/* qS2 */        2.02094576023350569471e+00,    /* 40002AE5, 9C598AC8 */
/* qS3 */       -6.88283971605453293030e-01,    /* BFE6066C, 1B8D0159 */
/* qS4 */        7.70381505559019352791e-02     /* 3FB3B8C5, B12E9282 */
};
#define one     xxx[0]
#define huge    xxx[1]
#define pio2_hi xxx[2]
#define pio2_lo xxx[3]
#define pio4_hi xxx[4]
#define pS0     xxx[5]
#define pS1     xxx[6]
#define pS2     xxx[7]
#define pS3     xxx[8]
#define pS4     xxx[9]
#define pS5     xxx[10]
#define qS1     xxx[11]
#define qS2     xxx[12]
#define qS3     xxx[13]
#define qS4     xxx[14]
/* INDENT ON */

double
asin(double x) {
        double t, w, p, q, c, r, s;
        int hx, ix, i;

        hx = ((int *) &x)[HIWORD];
        ix = hx & 0x7fffffff;
        if (ix >= 0x3ff00000) { /* |x| >= 1 */
                if (((ix - 0x3ff00000) | ((int *) &x)[LOWORD]) == 0)
                        /* asin(1)=+-pi/2 with inexact */
                        return x * pio2_hi + x * pio2_lo;
                else if (isnan(x))
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                        return ix >= 0x7ff80000 ? x : (x - x) / (x - x);
                        /* assumes sparc-like QNaN */
#else
                        return (x - x) / (x - x);       /* asin(|x|>1) is NaN */
#endif
                else
```

```
124                         return _SVID_libm_err(x, x, 2);
125         }
126         else if (ix < 0x3fe00000) {     /* |x| < 0.5 */
127                 if (ix < 0x3e400000) {  /* if |x| < 2**-27 */
128                         if ((i = (int) x) == 0)
129                                 return x;       /* return x with inexact if
130                                                  * x != 0 */
131                 }
132                 t = x * x;
133                 p = t * (pS0 + t * (pS1 + t * (pS2 + t * (pS3 +
134                         t * (pS4 + t * pS5)))));
135                 q = one + t * (qS1 + t * (qS2 + t * (qS3 + t * qS4)));
136                 w = p / q;
137                 return x + x * w;
138         }
139         /* 1 > |x| >= 0.5 */
140         w = one - fabs(x);
141         t = w * 0.5;
142         p = t * (pS0 + t * (pS1 + t * (pS2 + t * (pS3 + t * (pS4 + t * pS5)))));
143         q = one + t * (qS1 + t * (qS2 + t * (qS3 + t * qS4)));
144         s = sqrt(t);
145         if (ix >= 0x3FEF3333) { /* if |x| > 0.975 */
146                 w = p / q;
147                 t = pio2_hi - (2.0 * (s + s * w) - pio2_lo);
148         }
149         else {
150                 w = s;
151                 ((int *) &w)[LOWORD] = 0;
152                 c = (t - w * w) / (s + w);
153                 r = p / q;
154                 p = 2.0 * s * r - (pio2_lo - 2.0 * c);
155                 q = pio4_hi - 2.0 * w;
156                 t = pio4_hi - (p - q);
157         }
158         return hx > 0 ? t : -t;
159 }
```

```
**********************************************************
    2423 Sat May 10 12:08:50 2014
new/usr/src/lib/libm/common/C/asinh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak asinh = __asinh

/* INDENT OFF */
/* asinh(x)
 * Method :
 *      Based on
 *              asinh(x) = sign(x) * log [ |x| + sqrt(x*x+1) ]
 *      we have
 *      asinh(x) := x  if  1+x*x == 1,
 *               := sign(x)*(log(x)+ln2)) for large |x|, else
 *               := sign(x)*log(2|x|+1/(|x|+sqrt(x*x+1))) if|x| > 2, else
 *               := sign(x)*log1p(|x|+x^2/(1+sqrt(1+x^2)))
 */
/* INDENT ON */

#include "libm_synonyms.h"      /* __asinh */
#include "libm_macros.h"
#include <math.h>

static const double xxx[] = {
/* one */       1.00000000000000000000e+00,     /* 3FF00000, 00000000 */
/* ln2 */       6.93147180559945286227e-01,     /* 3FE62E42, FEFA39EF */
/* huge */      1.00000000000000000000e+300
};
#define one     xxx[0]
#define ln2     xxx[1]
#define huge    xxx[2]

double
asinh(double x) {
        double t, w;
        int hx, ix;
```



```
        hx = ((int *) &x)[HIWORD];
        ix = hx & 0x7fffffff;
        if (ix >= 0x7ff00000)
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return ix >= 0x7ff80000 ? x : x + x;
                /* assumes sparc-like QNaN */
#else
                return x + x;   /* x is inf or NaN */
#endif
        if (ix < 0x3e300000) {  /* |x|<2**-28 */
                if (huge + x > one)
                        return x;       /* return x inexact except 0 */
        }
        if (ix > 0x41b00000) {  /* |x| > 2**28 */
                w = log(fabs(x)) + ln2;
        }
        else if (ix > 0x40000000) {     /* 2**28 > |x| > 2.0 */
                t = fabs(x);
                w = log(2.0 * t + one / (sqrt(x * x + one) + t));
        }
        else {                  /* 2.0 > |x| > 2**-28 */
                t = x * x;
                w = log1p(fabs(x) + t / (one + sqrt(one + t)));
        }
        return hx > 0 ? w : -w;
}
```

```
**********************************************************
    6017 Sat May 10 12:08:50 2014
new/usr/src/lib/libm/common/C/atan.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atan = __atan

/* INDENT OFF */
/*
 * atan(x)
 * Accurate Table look-up algorithm with polynomial approximation in
 * partially product form.
 *
 * -- K.C. Ng, October 17, 2004
 *
 * Algorithm
 *
 * (1). Purge off Inf and NaN and 0
 * (2). Reduce x to positive by atan(x) = -atan(-x).
 * (3). For x <= 1/8 and let z = x*x, return
 *      (2.1) if x < 2^(-prec/2), atan(x) = x  with inexact flag raised
 *      (2.2) if x < 2^(-prec/4-1), atan(x) = x+(x/3)(x*x)
 *      (2.3) if x < 2^(-prec/6-2), atan(x) = x+(z-5/3)(z*x/5)
 *      (2.4) Otherwise
 *              atan(x) = poly1(x) = x + A * B,
 *      where
 *              A = (p1*x*z) * (p2+z(p3+z))
 *              B = (p4+z)+z*z) * (p5+z(p6+z))
 *      Note: (i) domain of poly1 is [0, 1/8], (ii) remez relative
 *      approximation error of poly1 is bounded by
 *               |(atan(x)-poly1(x))/x| <= 2^-57.61
 * (4). For x >= 8 then
 *      (3.1) if x >= 2^prec,     atan(x) = atan(inf) - pio2lo
 *      (3.2) if x >= 2^(prec/3), atan(x) = atan(inf) - 1/x
 *      (3.3) if x <= 65,         atan(x) = atan(inf) - poly1(1/x)
 *      (3.4) otherwise           atan(x) = atan(inf) - poly2(1/x)
 *      where
```



```
 *              poly2(r) = (q1*r) * (q2+z(q3+z)) * (q4+z),
 *      its domain is [0, 0.0154]; and its remez absolute
 *      approximation error is bounded by
 *              |atan(x)-poly2(x)|<= 2^-59.45
 *
 * (5). Now x is in (0.125, 8).
 *      Recall identity
 *              atan(x) = atan(y) + atan((x-y)/(1+x*y)).
 *      Let j = (ix - 0x3fc00000) >> 16, 0 <= j < 96, where ix is the high
 *      part of x in IEEE double format. Then
 *              atan(x) = atan(y[j]) + poly2((x-y[j])/(1+x*y[j]))
 *      where y[j] are carefully chosen so that it matches x to around 4.5
 *      bits and at the same time atan(y[j]) is very close to an IEEE double
 *      floating point number. Calculation indicates that
 *              max|(x-y[j])/(1+x*y[j])| < 0.0154
 *              j,x
 *
 * Accuracy: Maximum error observed is bounded by 0.6 ulp after testing
 * more than 10 million random arguments
 */
/* INDENT ON */

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"

extern const double _TBL_atan[];
static const double g[] = {
/* one  = */  1.0,
/* p1   = */  8.02176624254765935351230154992663301527500152588e-0002,
/* p2   = */  1.27223421700559402580665846471674740314483642578e+0000,
/* p3   = */ -1.20606901800503640842521235754247754812240600586e+0000,
/* p4   = */ -2.36088967922325565496066701598465442657470703125e+0000,
/* p5   = */  1.38345799501389166152875986881554126739501953125e+0000,
/* p6   = */  1.06742368078953453469637224770849570631980895996e+0000,
/* q1   = */ -1.42796626333911796935538518482644576579332351685e-0001,
/* q2   = */  3.51427110447873227059810477159863497078605962912e+0000,
/* q3   = */  5.92129112708164262457444237952586263418197631836e-0001,
/* q4   = */ -1.99272234785683144409063061175402253866195678711e+0000,
/* pio2hi */  1.57079632794896558e+00,
/* pio2lo */  6.12323399573676588 6e-17,
/* t1   = */ -0.33333333333333333333333333333333,
/* t2   = */  0.2,
/* t3   = */ -1.66666666666666666666666666666666,
};

#define one g[0]
#define p1 g[1]
#define p2 g[2]
#define p3 g[3]
#define p4 g[4]
#define p5 g[5]
#define p6 g[6]
#define q1 g[7]
#define q2 g[8]
#define q3 g[9]
#define q4 g[10]
#define pio2hi g[11]
#define pio2lo g[12]
#define t1 g[13]
#define t2 g[14]
#define t3 g[15]


double
atan(double x) {
```

```
128         double y, z, r, p, s;
129         int ix, lx, hx, j;
130
131         hx = ((int *) &x)[HIWORD];
132         lx = ((int *) &x)[LOWORD];
133         ix = hx & ~0x80000000;
134         j = ix >> 20;
135
136         /* for |x| < 1/8 */
137         if (j < 0x3fc) {
138                 if (j < 0x3f5) {        /* when |x| < 2**(-prec/6-2) */
139                         if (j < 0x3e3) {        /* if |x| < 2**(-prec/2-2) */
140                                 return ((int) x == 0 ? x : one);
141                         }
142                         if (j < 0x3f1) {        /* if |x| < 2**(-prec/4-1) */
143                                 return (x + (x * t1) * (x * x));
144                         } else {        /* if |x| < 2**(-prec/6-2) */
145                                 z = x * x;
146                                 s = t2 * x;
147                                 return (x + (t3 + z) * (s * z));
148                         }
149                 }
150                 z = x * x; s = p1 * x;
151                 return (x + ((s * z) * (p2 + z * (p3 + z))) *
152                                 (((p4 + z) + z * z) * (p5 + z * (p6 + z))));
153         }
154
155         /* for |x| >= 8.0 */
156         if (j >= 0x402) {
157                 if (j < 0x436) {
158                         r = one / x;
159                         if (hx >= 0) {
160                                 y =  pio2hi; p =  pio2lo;
161                         } else {
162                                 y = -pio2hi; p = -pio2lo;
163                         }
164                         if (ix < 0x40504000) {  /* x <  65 */
165                                 z = r * r;
166                                 s = p1 * r;
167                                 return (y + ((p - r) - ((s * z) *
168                                         (p2 + z * (p3 + z))) *
169                                         (((p4 + z) + z * z) *
170                                         (p5 + z * (p6 + z)))));
171                         } else if (j < 0x412) {
172                                 z = r * r;
173                                 return (y + (p - ((q1 * r) * (q4 + z)) *
174                                         (q2 + z * (q3 + z))));
175                         } else
176                                 return (y + (p - r));
177                 } else {
178                         if (j >= 0x7ff) /* x is inf or NaN */
179                                 if (((ix - 0x7ff00000) | lx) != 0)
180 #if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
181                                         return (ix >= 0x7ff80000 ? x : x - x);
182                                         /* assumes sparc-like QNaN */
183 #else
184                                         return (x - x);
185 #endif
186                         y = -pio2lo;
187                         return (hx >= 0 ? pio2hi - y : y - pio2hi);
188                 }
189         } else {        /* now x is between 1/8 and 8 */
190                 double *w, w0, w1, s, z;
191                 w = (double *) _TBL_atan + (((ix - 0x3fc00000) >> 16) << 1);
192                 w0 = (hx >= 0)? w[0] : -w[0];
193                 s = (x - w0) / (one + x * w0);
```



```
194                 w1 = (hx >= 0)? w[1] : -w[1];
195                 z = s * s;
196                 return (((q1 * s) * (q4 + z)) * (q2 + z * (q3 + z)) + w1);
197         }
198 }
```

```
**********************************************************
   18614 Sat May 10 12:08:50 2014
new/usr/src/lib/libm/common/C/atan2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak atan2 = __atan2

#include "libm.h"

/*
 * Let t(0) = 1 and for i = 1, ..., 160, let t(i) be the slope of
 * the line bisecting the conical hull of the set of points (x,y)
 * where x and y are positive normal floating point numbers and
 * the high order words hx and hy of their binary representations
 * satisfy |hx - hy - i * 0x8000| <= 0x4000.  Then:
 *
 * TBL[4*i+2] is t(i) rounded to 21 significant bits (i.e., the
 *   low order word is zero), and
 *
 * TBL[4*i] + TBL[4*i+1] form a doubled-double approximation to
 *   atan(TBL[4*i+2]).
 *
 * Finally, TBL[4*161] = TBL[4*161+1] = TBL[4*161+2] = 0.
 *
 * Now for any (x,y) with 0 < y <= x and any 0 < t <= 1,  we have
 * atan(y/x) = atan(t) + atan((y-t*x)/(x+t*y)).  By choosing t =
 * TBL[4*i+2], where i is the multiple of 0x8000 nearest hx - hy,
 * if this multiple is less than 161, and i = 161 otherwise, we
 * find that |(y-t*x)/(x+t*y)| <~ 2^-5.
 */
static const double TBL[] = {
        7.8539816339744827900e-01, +3.0616169978683830179e-17,
        1.0000000000000000000e+00, +0,
        7.7198905126506112140e-01, +2.6989956960083153652e-16,
        9.7353506088256835938e-01, +0,
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359         3.7456806948784837630e-02, +1.5213508760679563439e-16,
360         3.7474334239959716797e-02, +0,
361         3.6661849947035918262e-02, +7.3335516005184616486e-17,
362         3.6678284406661987305e-02, +0,
363         3.5877353272533163420e-02, -1.3007348019891714540e-16,
364         3.5892754793167114258e-02, +0,
365         3.5102754135096780885e-02, -2.9903662298950558656e-16,
366         3.5117179155349731445e-02, +0,
367         3.4337638360670830195e-02, +2.9656295131966114331e-16,
368         3.4351140260696411133e-02, +0,
369         3.3581472523789734907e-02, +3.4810947205572817820e-16,
370         3.3594101667404174805e-02, +0,
371         3.2833871859357266487e-02, -3.8885440174405159838e-16,
372         3.2845675945281982422e-02, +0,
373         3.2094421679560447558e-02, +5.8805134853032009978e-17,
374         3.2105445861816406250e-02, +0,
375         3.1243584858944295490e-02, +2.8737383773884313066e-17,
376         3.1253755092620849609e-02, +0,
377         0, 0, 0, 0
378 };

380 static const double C[] = {
381         0.0,
382         0.125,
383         1.2980742146337069071e+33,
384         7.8539816339744827900e-01,
385         1.5707963267948965580e+00,
386         6.1232339957367658860e-17,
387         -3.1415926535897931160e+00,
388         -1.2246467991473531772e-16,
389         -3.3333333333332757189333178635417910107486063300 9e-0001,
390         +1.9999999994267162423008649761039472181743863137 9e-0001,
391         -1.4285696556542863689618301332472720598048415835 6e-0001,
```

```
392         +1.10894981496317081405107718475040168084164825641e-0001,
393 };

395 #define zero    C[0]
396 #define twom3   C[1]
397 #define two110  C[2]
398 #define pio4    C[3]
399 #define pio2    C[4]
400 #define pio2_lo C[5]
401 #define mpi     C[6]
402 #define mpi_lo  C[7]
403 #define p1      C[8]
404 #define p2      C[9]
405 #define p3      C[10]
406 #define p4      C[11]

408 double
409 atan2(double oy, double ox) {
410         double  ah, al, t, xh, x, y, z;
411         int     i, k, hx, hy, sx, sy;
412 #ifndef lint
413         volatile int    inexact;
414 #endif

416         hy = ((int *)&oy)[HIWORD];
417         sy = hy & 0x80000000;
418         hy &= ~0x80000000;

420         hx = ((int *)&ox)[HIWORD];
421         sx = hx & 0x80000000;
422         hx &= ~0x80000000;

424         if (hy > hx || (hy == hx && ((unsigned *)&oy)[LOWORD] >
425             ((unsigned *)&ox)[LOWORD])) {
426                 i = hx;
427                 hx = hy;
428                 hy = i;
429                 x = fabs(oy);
430                 y = fabs(ox);
431                 if (sx) {
432                         ah = pio2;
433                         al = pio2_lo;
434                 } else {
435                         ah = -pio2;
436                         al = -pio2_lo;
437                         sy ^= 0x80000000;
438                 }
439         } else {
440                 x = fabs(ox);
441                 y = fabs(oy);
442                 if (sx) {
443                         ah = mpi;
444                         al = mpi_lo;
445                         sy ^= 0x80000000;
446                 } else {
447                         ah = al = zero;
448                 }
449         }

451         if (hx >= 0x7fe00000 || hx - hy >= 0x03600000) {
452                 if (hx >= 0x7ff00000) {
453                         if (((hx ^ 0x7ff00000) | ((int *)&x)[LOWORD]) != 0)
454                                 return (ox * oy);
455                         if (hy >= 0x7ff00000)
456                                 ah += pio4;
457 #ifndef lint
```



```
458                         inexact = (int)ah;      /* inexact if ah != 0 */
459 #endif
460                         return ((sy)? -ah : ah);
461                 }
462                 if (hx - hy >= 0x03600000) {
463                         if ((int)ah == 0)
464                                 ah = y / x;
465                         return ((sy)? -ah : ah);
466                 }
467                 y *= twom3;
468                 x *= twom3;
469                 hy -= 0x00300000;
470                 hx -= 0x00300000;
471         } else if (hy < 0x00100000) {
472                 if ((hy | ((int *)&y)[LOWORD]) == 0) {
473                         if ((hx | ((int *)&x)[LOWORD]) == 0)
474                                 return (_SVID_libm_err(ox, oy, 3));
475 #ifndef lint
476                         inexact = (int)ah;      /* inexact if ah != 0 */
477 #endif
478                         return ((sy)? -ah : ah);
479                 }
480                 y *= two110;
481                 x *= two110;
482                 hy = ((int *)&y)[HIWORD];
483                 hx = ((int *)&x)[HIWORD];
484         }

486         k = (((hx - hy) + 0x00004000) >> 13) & ~0x3;
487         if (k > 644)
488                 k = 644;
489         ah += TBL[k];
490         al += TBL[k+1];
491         t = TBL[k+2];

493         xh = x;
494         ((int *)&xh)[LOWORD] = 0;
495         z = ((y - t * xh) - t * (x - xh)) / (x + y * t);
496         x = z * z;
497         t = ah + (z + (al + (z * x) * (p1 + x * (p2 + x * (p3 + x * p4)))));
498         return ((sy)? -t : t);
499 }
```

```
**********************************************************
    1379 Sat May 10 12:08:51 2014
new/usr/src/lib/libm/common/C/atan2pi.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atan2pi = __atan2pi

/*
 * atan2pi(x) = atan2(x)/pi
 */

#include "libm.h"

static const double invpi = 0.31830988618379067153776752;

double
atan2pi(double y, double x) {
        int     ix, iy;

        if (x == 0.0 && y == 0.0) {
                ix = ((int *)&x)[HIWORD];
                iy = ((int *)&y)[HIWORD];
                if (ix >= 0)
                        return (y);
                return ((iy >= 0)? 1.0 : -1.0);
        }
        return (atan2(y, x) * invpi);
}
```

```
**********************************************************
    2077 Sat May 10 12:08:51 2014
new/usr/src/lib/libm/common/C/atanh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak atanh = __atanh

/* INDENT OFF */
/* atanh(x)
 * Code originated from 4.3bsd.
 * Modified by K.C. Ng for SUN 4.0 libm.
 * Method :
 *                  1             2x                          x
 *      atanh(x) = --- * log(1 + -------) = 0.5 * log1p(2 * --------)
 *                  2            1 - x                      1 - x
 * Note: to guarantee atanh(-x) = -atanh(x), we use
 *                 sign(x)             |x|
 *      atanh(x) = ------- * log1p(2*-------).
 *                    2              1 - |x|
 *
 * Special cases:
 *      atanh(x) is NaN if |x| > 1 with signal;
 *      atanh(NaN) is that NaN with no signal;
 *      atanh(+-1) is +-INF with signal.
 */
/* INDENT ON */

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"
#include <math.h>

double
atanh(double x) {
        double t;

        if (isnan(x))
```



```
                return x * x;           /* switched from x + x for Cheetah */
        t = fabs(x);
        if (t > 1.0)
                return _SVID_libm_err(x, x, 30);        /* sNaN */
        if (t == 1.0)
                return _SVID_libm_err(x, x, 31);        /* x/0; */
        t = t / (1.0 - t);
        return copysign(0.5, x) * log1p(t + t);
}
```

```
**********************************************************
   13648 Sat May 10 12:08:51 2014
new/usr/src/lib/libm/common/C/cbrt.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include "libm_macros.h"

/* INDENT OFF */

/*
 *  cbrt: double precision cube root
 *
 *  Algorithm: bit hacking, table lookup, and polynomial approximation
 *
 *  For normal x, write x = s*2^(3j)*z where s = +/-1, j is an integer,
 *  and 1 <= z < 8.  Let y := s*2^j.  From a table, find u such that
 *  u^3 is computable exactly and |(z-u^3)/u^3| <~ 2^-8.  We construct
 *  y, z, and the table index from x by a few integer operations.
 *
 *  Now cbrt(x) = y*u*(1+t)^(1/3) where t = (z-u^3)/u^3.  We approximate
 *  (1+t)^(1/3) by a polynomial 1+p(t), where p(t) := t*(p1+t*(p2+...+
 *  (p5+t*p6))).  By computing the result as y*(u+u*p(t)), we can bound
 *  the worst case error by .51 ulp.
 *
 *  Notes:
 *
 *  1. For subnormal x, we scale x by 2^54, compute the cube root, and
 *     scale the result by 2^-18.
 *
 *  2. cbrt(+/-inf) = +/-inf and cbrt(NaN) is NaN.
 */

/*
 * for i = 0, ..., 385
 *   form x(i) with high word 0x3ff00000 + (i << 13) and low word 0;
 *   then TBL[i] = cbrt(x(i)) rounded to 17 significant bits
 */
```



```
static const double __libm_TBL_cbrt[] = {
 1.0000000000000000e+00, 1.0025939941062500e+00, 1.0051879882812500e+00,
 1.0077514648437500e+00, 1.0103149414062500e+00, 1.0128479003906250e+00,
 1.0153808593750000e+00, 1.0179138183593750e+00, 1.0204162597656250e+00,
 1.0229034423828125e+00, 1.0253906250000000e+00, 1.0278625488281250e+00,
 1.0303192138671875e+00, 1.0327758789062500e+00, 1.0352020263671875e+00,
 1.0376281738281250e+00, 1.0400390625000000e+00, 1.0424499511718750e+00,
 1.0448303222656250e+00, 1.0472106933593750e+00, 1.0495910644531250e+00,
 1.0519409179687500e+00, 1.0542907714843750e+00, 1.0566253662109375e+00,
 1.0589599609375000e+00, 1.0612792968750000e+00, 1.0635833740234375e+00,
 1.0658721923828125e+00, 1.0681610107421875e+00, 1.0704498291015625e+00,
 1.0727081298828125e+00, 1.0749664306640625e+00, 1.0772247314453125e+00,
 1.0794525146484375e+00, 1.0816802978515625e+00, 1.0839080810546875e+00,
 1.0861206054687500e+00, 1.0883178710937500e+00, 1.0905151367187500e+00,
 1.0926971435546875e+00, 1.0948791503906250e+00, 1.0970458984375000e+00,
 1.0992126464843750e+00, 1.1013641357421875e+00, 1.1035036621093750e+00,
 1.1056365966796875e+00, 1.1077575683593750e+00, 1.1098785400390625e+00,
 1.1119842529296875e+00, 1.1140899658203125e+00, 1.1161804199218750e+00,
 1.1182708740234375e+00, 1.1203460693359375e+00, 1.1224212646484375e+00,
 1.1244812011718750e+00, 1.1265411376953125e+00, 1.1285858154296875e+00,
 1.1306304931640625e+00, 1.1326599121093750e+00, 1.1346893310546875e+00,
 1.1367034912109375e+00, 1.1387176513671875e+00, 1.1407318115234375e+00,
 1.1427307128906250e+00, 1.1447143554687500e+00, 1.1466979980468750e+00,
 1.1486816406250000e+00, 1.1506500244140625e+00, 1.1526031494140625e+00,
 1.1545715332031250e+00, 1.1565039394140625e+00, 1.1584625244140625e+00,
 1.1604003906250000e+00, 1.1623229980468750e+00, 1.1642456054687500e+00,
 1.1661682128906250e+00, 1.1680755615234375e+00, 1.1699829101562500e+00,
 1.1718902587890625e+00, 1.1737823486328125e+00, 1.1756744384765625e+00,
 1.1775512695312500e+00, 1.1794281005859375e+00, 1.1812896728515625e+00,
 1.1831512451171875e+00, 1.1850128173828125e+00, 1.1868591308593750e+00,
 1.1887054443359375e+00, 1.1905517578125000e+00, 1.1923828125000000e+00,
 1.1942138671875000e+00, 1.1960296630859375e+00, 1.1978607177734375e+00,
 1.1996612548828125e+00, 1.2014770507812500e+00, 1.2032775878906250e+00,
 1.2050781250000000e+00, 1.2068634033203125e+00, 1.2086486816406250e+00,
 1.2104339599609375e+00, 1.2122039794921875e+00, 1.2139739990234375e+00,
 1.2157287597656250e+00, 1.2174987792968750e+00, 1.2192535400390625e+00,
 1.2209930419921875e+00, 1.2227478027343750e+00, 1.2244873046875000e+00,
 1.2262115478515625e+00, 1.2279510498046875e+00, 1.2296752929687500e+00,
 1.2313842773437500e+00, 1.2331085205078125e+00, 1.2348175048828125e+00,
 1.2365264892578125e+00, 1.2382201484375000e+00, 1.2399139404296875e+00,
 1.2416076660156250e+00, 1.2433013916015625e+00, 1.2449798583984375e+00,
 1.2466583251953125e+00, 1.2483367919921875e+00, 1.2500000000000000e+00,
 1.2516632080078125e+00, 1.2533264160156250e+00, 1.2549743652343750e+00,
 1.2566375732421875e+00, 1.2582855224609375e+00, 1.2599182128906250e+00,
 1.2631988525390625e+00, 1.2664489746093750e+00, 1.2696838378906250e+00,
 1.2729034423828125e+00, 1.2761230468750000e+00, 1.2793212337890625e+00,
 1.2824859619140625e+00, 1.2856445312500000e+00, 1.2887878417968750e+00,
 1.2919158935546875e+00, 1.2950286865234375e+00, 1.2981262207031250e+00,
 1.3012084960937500e+00, 1.3042755126953125e+00, 1.3073272705078125e+00,
 1.3103637695312500e+00, 1.3134002685546875e+00, 1.3164062500000000e+00,
 1.3194122314453125e+00, 1.3223876953125000e+00, 1.3253631591796875e+00,
 1.3283233642578125e+00, 1.3312683105468750e+00, 1.3341979980468750e+00,
 1.3371276855468750e+00, 1.3400268554687500e+00, 1.3429260253906250e+00,
 1.3458099365234375e+00, 1.3486785888671875e+00, 1.3515319824218750e+00,
 1.3543701171875000e+00, 1.3572082519531250e+00, 1.3600311279296875e+00,
 1.3628387451171875e+00, 1.3656436230468750e+00, 1.3684234619140625e+00,
 1.3712005615234375e+00, 1.3739624023437500e+00, 1.3767242431640625e+00,
 1.3794555664062500e+00, 1.3821868896484375e+00, 1.3849182128906250e+00,
 1.3876190185546875e+00, 1.3903198242187500e+00, 1.3930206298828125e+00,
 1.3956909179687500e+00, 1.3983612060546875e+00, 1.4010162353515625e+00,
 1.4036712646484375e+00, 1.4063110351562500e+00, 1.4089355468750000e+00,
 1.4115600585937500e+00, 1.4141693115234375e+00, 1.4167633056640625e+00,
 1.4193572998046875e+00, 1.4219360351562500e+00, 1.4244995117187500e+00,
 1.4270629882812500e+00, 1.4296264648437500e+00, 1.4321594238281250e+00,
 1.4346923828125000e+00, 1.4372253417968750e+00, 1.4397430419921875e+00,
 1.4422548339843750e+00, 1.4447479248046875e+00, 1.4472351074218750e+00,
```

```
 1.4497222900390625e+00, 1.4521942138671875e+00, 1.4546661376953125e+00,
 1.4571228027343750e+00, 1.4595642089843750e+00, 1.4620056152343750e+00,
 1.4644470214843750e+00, 1.4668731689453125e+00, 1.4692840576171875e+00,
 1.4716949462890625e+00, 1.4740905761718750e+00, 1.4764862060546875e+00,
 1.4788665771484375e+00, 1.4812469482421875e+00, 1.4836120605468750e+00,
 1.4859771728515625e+00, 1.4883422851562500e+00, 1.4906768798828125e+00,
 1.4930267333984375e+00, 1.4953613281250000e+00, 1.4976806640625000e+00,
 1.5000000000000000e+00, 1.5023040771484375e+00, 1.5046081542968750e+00,
 1.5069122314453125e+00, 1.5092010498046875e+00, 1.5114898681640625e+00,
 1.5137634277343750e+00, 1.5160369873046875e+00, 1.5182952880859375e+00,
 1.5205535888671875e+00, 1.5227966308593750e+00, 1.5250396728515625e+00,
 1.5272827148437500e+00, 1.5295104980468750e+00, 1.5317382812500000e+00,
 1.5339508056640625e+00, 1.5361633300781250e+00, 1.5383605957031250e+00,
 1.5405578613281250e+00, 1.5427551269531250e+00, 1.5449371337890625e+00,
 1.5471191406250000e+00, 1.5492858886718750e+00, 1.5514526367187500e+00,
 1.5536193847656250e+00, 1.5557708740234375e+00, 1.5579223632812500e+00,
 1.5600585937500000e+00, 1.5621948242187500e+00, 1.5643310546875000e+00,
 1.5664520263671875e+00, 1.5685729980468750e+00, 1.5706939697265625e+00,
 1.5727996826171875e+00, 1.5749053955078125e+00, 1.5769958496093750e+00,
 1.5790863037109375e+00, 1.5811767578125000e+00, 1.5832519531250000e+00,
 1.5853271484375000e+00, 1.5874023437500000e+00, 1.5915222167968750e+00,
 1.5956268310546875e+00, 1.5997009277343750e+00, 1.6037597656250000e+00,
 1.6078033447265625e+00, 1.6118316650390625e+00, 1.6158294677734375e+00,
 1.6198120117187500e+00, 1.6237640380859375e+00, 1.6277008056640625e+00,
 1.6316223144531250e+00, 1.6355285644531250e+00, 1.6394195556640625e+00,
 1.6432800292968750e+00, 1.6471405029296875e+00, 1.6509704589843750e+00,
 1.6547698974609375e+00, 1.6585693359375000e+00, 1.6623535156250000e+00,
 1.6661071777343750e+00, 1.6698608398437500e+00, 1.6735839843750000e+00,
 1.6772918701171875e+00, 1.6809844970703125e+00, 1.6846618652343750e+00,
 1.6883239746093750e+00, 1.6919708251953125e+00, 1.6956024169921875e+00,
 1.6992187500000000e+00, 1.7028198242187500e+00, 1.7064056396484375e+00,
 1.7099761962890625e+00, 1.7135314941406250e+00, 1.7170715332031250e+00,
 1.7205963134765625e+00, 1.7241058349609375e+00, 1.7276000976562500e+00,
 1.7310943603515625e+00, 1.7345581054687500e+00, 1.7380065917968750e+00,
 1.7414550781250000e+00, 1.7448883056640625e+00, 1.7482910156250000e+00,
 1.7516937255859375e+00, 1.7550811767578125e+00, 1.7584686279296875e+00,
 1.7618255615234375e+00, 1.7651672363281250e+00, 1.7685089111328125e+00,
 1.7718353271484375e+00, 1.7751464843750000e+00, 1.7784423828125000e+00,
 1.7817382812500000e+00, 1.7850036621093750e+00, 1.7882690429687500e+00,
 1.7915191650390625e+00, 1.7947692871093750e+00, 1.7979888916015625e+00,
 1.8012084960937500e+00, 1.8044128417968750e+00, 1.8076019287109375e+00,
 1.8107910156250000e+00, 1.8139648437500000e+00, 1.8171234130859375e+00,
 1.8202667236328125e+00, 1.8234100341796875e+00, 1.8265380859375000e+00,
 1.8296508789062500e+00, 1.8327636718750000e+00, 1.8358612060546875e+00,
 1.8389434814453125e+00, 1.8420104980468750e+00, 1.8450775146484375e+00,
 1.8481292724609375e+00, 1.8511810302734375e+00, 1.8542175292968750e+00,
 1.8572387695312500e+00, 1.8602600097656250e+00, 1.8632659912109375e+00,
 1.8662567138671875e+00, 1.8692474365234375e+00, 1.8722229003906250e+00,
 1.8751831054687500e+00, 1.8781433105468750e+00, 1.8810882568359375e+00,
 1.8840332031250000e+00, 1.8869628906250000e+00, 1.8898773193359375e+00,
 1.8927917480468750e+00, 1.8956909179687500e+00, 1.8985900878906250e+00,
 1.9014739990234375e+00, 1.9043579101562500e+00, 1.9072265625000000e+00,
 1.9100799560546875e+00, 1.9129333496093750e+00, 1.9157714843750000e+00,
 1.9186096191406250e+00, 1.9214324951171875e+00, 1.9242553710937500e+00,
 1.9270629882812500e+00, 1.9298553466796875e+00, 1.9326477050781250e+00,
 1.9354400634765625e+00, 1.9382171630859375e+00, 1.9409790039062500e+00,
 1.9437408447265625e+00, 1.9465026855468750e+00, 1.9492492675781250e+00,
 1.9519805908203125e+00, 1.9547119140625000e+00, 1.9574279785156250e+00,
 1.9601440429687500e+00, 1.9628601074218750e+00, 1.9655609130859375e+00,
 1.9682464599609375e+00, 1.9709320068359375e+00, 1.9736175537109375e+00,
 1.9762784179687500e+00, 1.9789428710937500e+00, 1.9815979003906250e+00,
 1.9842529296875000e+00, 1.9868927001953125e+00, 1.9895324707031250e+00,
 1.9921569824218750e+00, 1.9947814941406250e+00, 1.9973907470703125e+00,
 2.0000000000000000e+00,
};
```



```
/*
 * The polynomial p(x) := p1*x + p2*x^2 + ... + p6*x^6 satisfies
 *
 * |(1+x)^(1/3) - 1 - p(x)| < 2^-63  for |x| < 0.003914
 */
static const double C[] = {
         3.3333333333333334070356231807076644003214131786 00e-0001,
        -1.1111111111111111199279798912906951533479143230 4e-0001,
         6.1728395057850669571030211523472060507208337908 2e-0002,
        -4.1152263373100516413896463866664731151489231901 0e-0002,
         3.0178834310526872815173558659780732485917370484 7e-0002,
        -2.3472334003838697100966507396850726307421509075 1e-0002,
        18014398509481984.0
};

#define p1                      C[0]
#define p2                      C[1]
#define p3                      C[2]
#define p4                      C[3]
#define p5                      C[4]
#define p6                      C[5]
#define two54           C[6]

/* INDENT ON */

#pragma weak cbrt = __cbrt

double __cbrt(double x)
{
        union {
                unsigned int    i[2];
                double                  d;
        } xx, yy;
        double                  t, u, w;
        unsigned int    hx, sx, ex, j, offset;

        xx.d = x;
        hx = xx.i[HIWORD] & ~0x80000000;
        sx = xx.i[HIWORD] & 0x80000000;

        /* handle special cases */
        if (hx >= 0x7ff00000) /* x is inf or nan */
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return hx >= 0x7ff80000 ? x : x + x;
                /* assumes sparc-like QNaN */
#else
                return x + x;
#endif

        if (hx < 0x00100000) { /* x is subnormal or zero */
                if ((hx | xx.i[LOWORD]) == 0)
                        return x;

                /* scale x to normal range */
                xx.d = x * two54;
                hx = xx.i[HIWORD] & ~0x80000000;
                offset = 0x29800000;
        }
        else
                offset = 0x2aa00000;

        ex = hx & 0x7ff00000;
        j = (ex >> 2) + (ex >> 4) + (ex >> 6);
        j = j + (j >> 6);
        j = 0x7ff00000 & (j + 0x2aa00); /* j is ex/3 */
        hx -= (j + j + j);
```

```
260         xx.i[HIWORD] = 0x3ff00000 + hx;

262         u = __libm_TBL_cbrt[(hx + 0x1000) >> 13];
263         w = u * u * u;
264         t = (xx.d - w) / w;

266         yy.i[HIWORD] = sx | (j + offset);
267         yy.i[LOWORD] = 0;

269         w = t * t;
270         return yy.d * (u + u * (t * (p1 + t * p2 + w * p3) +
271                 (w * w) * (p4 + t * p5 + w * p6)));
272 }
```

```
**********************************************************
    1725 Sat May 10 12:08:51 2014
new/usr/src/lib/libm/common/C/ceil.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak ceil = __ceil

/*
 * ceil(x) returns the least integral value bigger than or equal to x.
 * NOTE: ceil(x) returns result with the same sign as x's, including 0.
 *
 * Modified 8/4/04 for performance.
 */

#include "libm.h"

static const double
        zero = 0.0,
        one = 1.0,
        two52 = 4503599627370496.0;

double
ceil(double x) {
        double  t, w;
        int     hx, lx, ix;

        hx = ((int *)&x)[HIWORD];
        lx = ((int *)&x)[LOWORD];
        ix = hx & ~0x80000000;
        if (ix >= 0x43300000)   /* return x if |x| >= 2^52, or x is NaN */
                return (x * one);
        t = (hx >= 0)? two52 : -two52;
        w = x + t;
        t = w - t;
        if (ix < 0x3ff00000) {
                if ((ix | lx) == 0)
                        return (x);
                else
```



```
                        return ((hx < 0)? -zero : one);
        }
        return ((t >= x)? t : t + one);
}
```

```
**********************************************************
    1227 Sat May 10 12:08:51 2014
new/usr/src/lib/libm/common/C/copysign.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak copysign = __copysign
#endif

#include "libm.h"

double
copysign(double x, double y) {
        int hx, hy;

        hx = ((int *) &x)[HIWORD];
        hy = ((int *) &y)[HIWORD];
        return (hx ^ hy) >= 0 ?  (x) : (-x);
}
```

```
**********************************************************
    6131 Sat May 10 12:08:51 2014
new/usr/src/lib/libm/common/C/cos.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

#pragma weak cos = __cos

/* INDENT OFF */
/*
 * cos(x)
 * Accurate Table look-up algorithm by K.C. Ng, May, 1995.
 *
 * Algorithm: see sincos.c
 */

#include "libm.h"

static const double sc[] = {
/* ONE  = */  1.0,
/* NONE = */ -1.0,
/*
 * |sin(x) - (x+pp1*x^3+pp2*x^5)| <= 2^-58.79 for |x| < 0.008
 */
/* PP1  = */ -0.166666666666631655886725205237888952148062785868305 5567,
/* PP2  = */   .008333315652997472323564894248466758248475374977974017927,
/*
 * |(sin(x) - (x+p1*x^3+...+p4*x^9)|
 * |------------------------------ | <= 2^-57.63 for |x| < 0.1953125
 * |               x               |
 */
/* P1   = */ -1.6666666666666296698052151389202301589656e-0001,
/* P2   = */  8.3333333323909512956839934552803363766 63e-0003,
/* P3   = */ -1.9841262379979766927915517782300984039 60e-0004,
/* P4   = */  2.7534036248542772376499876228483303511 10e-0006,
/*
 * |cos(x) - (1+qq1*x^2+qq2*x^4)| <= 2^-55.99 for |x| <= 0.008 (0x3f80624d)
 */
/* QQ1  = */ -0.499999999997549238184291198194841854274272 9,
```



```
/* QQ2  = */  0.041666542904352059294545209158357640398771740,
/* Q1   = */ -0.5,
/* Q2   = */  4.16666666650035070368094552086074861744 5e-0002,
/* Q3   = */ -1.3888885964369722106942662905778486960 06e-0003,
/* Q4   = */  2.4785630788585894736795195178929534921 92e-0005,
/* PIO2_H    = */  1.570796326794896557999,
/* PIO2_L    = */  6.123233995736765886130e-17,
/* PIO2_L0   = */  6.123233995727922165564e-17,
/* PIO2_L1   = */  8.843720566135701120255e-29,
/* PI3O2_H   = */  4.712388980384689673997,
/* PI3O2_L   = */  1.836970198721029765839e-16,
/* PI3O2_L0  = */  1.836970198720396133587e-16,
/* PI3O2_L1  = */  6.336322524749201142226e-29,
/* PI5O2_H   = */  7.853981633974482789995,
/* PI5O2_L   = */  3.061616997868382943065e-16,
/* PI5O2_L0  = */  3.061616997861941598865e-16,
/* PI5O2_L1  = */  6.441344200433640781982e-28,
};
/* INDENT ON */

#define ONE             sc[0]
#define PP1             sc[2]
#define PP2             sc[3]
#define P1              sc[4]
#define P2              sc[5]
#define P3              sc[6]
#define P4              sc[7]
#define QQ1             sc[8]
#define QQ2             sc[9]
#define Q1              sc[10]
#define Q2              sc[11]
#define Q3              sc[12]
#define Q4              sc[13]
#define PIO2_H          sc[14]
#define PIO2_L          sc[15]
#define PIO2_L0         sc[16]
#define PIO2_L1         sc[17]
#define PI3O2_H         sc[18]
#define PI3O2_L         sc[19]
#define PI3O2_L0        sc[20]
#define PI3O2_L1        sc[21]
#define PI5O2_H         sc[22]
#define PI5O2_L         sc[23]
#define PI5O2_L0        sc[24]
#define PI5O2_L1        sc[25]

extern const double _TBL_sincos[], _TBL_sincosx[];

double
cos(double x) {
        double  z, y[2], w, s, v, p, q;
        int     i, j, n, hx, ix, lx;

        hx = ((int *)&x)[HIWORD];
        lx = ((int *)&x)[LOWORD];
        ix = hx & ~0x80000000;

        if (ix <= 0x3fc50000) { /* |x| < 10.5/64 = 0.164062500 */
                if (ix < 0x3e400000) {  /* |x| < 2**-27 */
                        if ((int)x == 0)
                                return (ONE);
                }
                z = x * x;
                if (ix < 0x3f800000)    /* |x| < 0.008 */
                        w = z * (QQ1 + z * QQ2);
                else
```

```
128                         w = z * ((Q1 + z * Q2) + (z * z) * (Q3 + z * Q4));
129                 return (ONE + w);
130         }

132         /* for 0.164062500 < x < M, */
133         n = ix >> 20;
134         if (n < 0x402) {        /* x < 8 */
135                 i = (((ix >> 12) & 0xff) | 0x100) >> (0x401 - n);
136                 j = i - 10;
137                 x = fabs(x);
138                 v = x - _TBL_sincosx[j];
139                 if (((j - 81) ^ (j - 101)) < 0) {
140                         /* near pi/2, cos(pi/2-x)=sin(x) */
141                         p = PIO2_H - x;
142                         i = ix - 0x3ff921fb;
143                         x = p + PIO2_L;
144                         if ((i | ((lx - 0x54442D00) & 0xffffff00)) == 0) {
145                                 /* very close to pi/2 */
146                                 x = p + PIO2_L0;
147                                 return (x + PIO2_L1);
148                         }
149                         z = x * x;
150                         if (((ix - 0x3ff92000) >> 12) == 0) {
151                                 /* |pi/2-x|<2**-8 */
152                                 w = PIO2_L + (z * x) * (PP1 + z * PP2);
153                         } else {
154                                 w = PIO2_L + (z * x) * ((P1 + z * P2) +
155                                     (z * z) * (P3 + z * P4));
156                         }
157                         return (p + w);
158                 }
159                 s = v * v;
160                 if (((j - 282) ^ (j - 302)) < 0) {
161                         /* near 3/2pi, cos(x-3/2pi)=sin(x) */
162                         p = PI3O2_H;
163                         i = ix - 0x4012D97C;
164                         x = p - PI3O2_L;
165                         if ((i | ((lx - 0x7f332100) & 0xffffff00)) == 0) {
166                                 /* very close to 3/2pi */
167                                 x = p - PI3O2_L0;
168                                 return (x - PI3O2_L1);
169                         }
170                         z = x * x;
171                         if (((ix - 0x4012D800) >> 9) == 0) {
172                                 /* |x-3/2pi|<2**-8 */
173                                 w = (z * x) * (PP1 + z * PP2) - PI3O2_L;
174                         } else {
175                                 w = (z * x) * ((P1 + z * P2) + (z * z)
176                                     * (P3 + z * P4)) - PI3O2_L;
177                         }
178                         return (p + w);
179                 }
180                 if (((j - 483) ^ (j - 503)) < 0) {
181                         /* near 5pi/2, cos(5pi/2-x)=sin(x) */
182                         p = PI5O2_H - x;
183                         i = ix - 0x401F6A7A;
184                         x = p + PI5O2_L;
185                         if ((i | ((lx - 0x29553800) & 0xffffff00)) == 0) {
186                                 /* very close to pi/2 */
187                                 x = p + PI5O2_L0;
188                                 return (x + PI5O2_L1);
189                         }
190                         z = x * x;
191                         if (((ix - 0x401F6A7A) >> 7) == 0) {
192                                 /* |pi/2-x|<2**-8 */
193                                 w = PI5O2_L + (z * x) * (PP1 + z * PP2);
```



```
194                         } else {
195                                 w = PI5O2_L + (z * x) * ((P1 + z * P2) +
196                                     (z * z) * (P3 + z * P4));
197                         }
198                         return (p + w);
199                 }
200                 j <<= 1;
201                 w = _TBL_sincos[j];
202                 z = _TBL_sincos[j+1];
203                 p = v + (v * s) * (PP1 + s * PP2);
204                 q = s * (QQ1 + s * QQ2);
205                 return (z - (w * p - z * q));
206         }

208         if (ix >= 0x7ff00000)   /* cos(Inf or NaN) is NaN */
209                 return (x / x);

211         /* argument reduction needed */
212         n = __rem_pio2(x, y);
213         switch (n & 3) {
214         case 0:
215                 return (__k_cos(y[0], y[1]));
216         case 1:
217                 return (-__k_sin(y[0], y[1]));
218         case 2:
219                 return (-__k_cos(y[0], y[1]));
220         default:
221                 return (__k_sin(y[0], y[1]));
222         }
223 }
```

```
**********************************************************
    2482 Sat May 10 12:08:51 2014
new/usr/src/lib/libm/common/C/cosh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak cosh = __cosh

/* INDENT OFF */
/*
 * cosh(x)
 * Code originated from 4.3bsd.
 * Modified by K.C. Ng for SUN 4.0 libm.
 * Method :
 *      1. Replace x by |x| (cosh(x) = cosh(-x)).
 *      2.
 *                                                      [ exp(x) - 1 ]^2
 *          0       <= x <= 0.3465  :  cosh(x) := 1 + -------------------
 *                                                         2*exp(x)
 *
 *                                                 exp(x) +  1/exp(x)
 *          0.3465  <= x <= 22      :  cosh(x) := -------------------
 *                                                         2
 *          22      <= x <= lnovft  :  cosh(x) := exp(x)/2
 *          lnovft  <= x <  INF     :  cosh(x) := scalbn(exp(x-1024*ln2),1023)
 *
 *      Note: .3465 is a number near one half of ln2.
 *
 * Special cases:
 *      cosh(x) is |x| if x is +INF, -INF, or NaN.
 *      only cosh(0)=1 is exact for finite x.
 */
/* INDENT ON */

#include "libm.h"

static const double
        ln2 = 6.93147180559945286227e-01,
        ln2hi = 6.93147180369123816490e-01,
```



```
        ln2lo = 1.90821492927058770002e-10,
        lnovft = 7.09782712893383973096e+02;

double
cosh(double x) {
        double t, w;

        w = fabs(x);
        if (!finite(w))
                return (w * w);
        if (w < 0.3465) {
                t = expm1(w);
                w = 1.0 + t;
                if (w != 1.0)
                        w = 1.0 + (t * t) / (w + w);
                return (w);
        } else if (w < 22.0) {
                t = exp(w);
                return (0.5 * (t + 1.0 / t));
        } else if (w <= lnovft) {
                return (0.5 * exp(w));
        } else {
                w = (w - 1024 * ln2hi) - 1024 * ln2lo;
                if (w >= ln2)
                        return (_SVID_libm_err(x, x, 5));
                else
                        return (scalbn(exp(w), 1023));
        }
}
```

```
**********************************************************
   13829 Sat May 10 12:08:51 2014
new/usr/src/lib/libm/common/C/erf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak erf = __erf
#pragma weak erfc = __erfc

/* INDENT OFF */
/* double erf(double x)
 * double erfc(double x)
 *                           x
 *                    2      |\
 *     erf(x)  =  ---------  | exp(-t*t)dt
 *                 sqrt(pi) \|
 *                           0
 *
 *     erfc(x) =  1-erf(x)
 *   Note that
 *              erf(-x) = -erf(x)
 *              erfc(-x) = 2 - erfc(x)
 *
 * Method:
 *      1. For |x| in [0, 0.84375]
 *          erf(x)  = x + x*R(x^2)
 *          erfc(x) = 1 - erf(x)           if x in [-.84375,0.25]
 *                  = 0.5 + ((0.5-x)-x*R)  if x in [0.25,0.84375]
 *         where R = P/Q where P is an odd poly of degree 8 and
 *         Q is an odd poly of degree 10.
 *                                               -57.90
 *                      | R - (erf(x)-x)/x | <= 2
 *
 *
 *         Remark. The formula is derived by noting
 *          erf(x) = (2/sqrt(pi))*(x - x^3/3 + x^5/10 - x^7/42 + ....)
 *         and that
 *          2/sqrt(pi) = 1.128379167095512573896158903121545171688
```



```
 *          is close to one. The interval is chosen because the fix
 *          point of erf(x) is near 0.6174 (i.e., erf(x)=x when x is
 *          near 0.6174), and by some experiment, 0.84375 is chosen to
 *          guarantee the error is less than one ulp for erf.
 *
 *      2. For |x| in [0.84375,1.25], let s = |x| - 1, and
 *         c = 0.84506291151 rounded to single (24 bits)
 *              erf(x)  = sign(x) * (c  + P1(s)/Q1(s))
 *              erfc(x) = (1-c)  - P1(s)/Q1(s) if x > 0
 *                        1+(c+P1(s)/Q1(s))    if x < 0
 *              |P1/Q1 - (erf(|x|)-c)| <= 2**-59.06
 *         Remark: here we use the taylor series expansion at x=1.
 *              erf(1+s) = erf(1) + s*Poly(s)
 *                       = 0.845.. + P1(s)/Q1(s)
 *         That is, we use rational approximation to approximate
 *                      erf(1+s) - (c = (single)0.84506291151)
 *         Note that |P1/Q1|< 0.078 for x in [0.84375,1.25]
 *         where
 *              P1(s) = degree 6 poly in s
 *              Q1(s) = degree 6 poly in s
 *
 *      3. For x in [1.25,1/0.35(~2.857143)],
 *              erfc(x) = (1/x)*exp(-x*x-0.5625+R1/S1)
 *              erf(x)  = 1 - erfc(x)
 *         where
 *              R1(z) = degree 7 poly in z, (z=1/x^2)
 *              S1(z) = degree 8 poly in z
 *
 *      4. For x in [1/0.35,28]
 *              erfc(x) = (1/x)*exp(-x*x-0.5625+R2/S2) if x > 0
 *                      = 2.0 - (1/x)*exp(-x*x-0.5625+R2/S2) if -6<x<0
 *                      = 2.0 - tiny            (if x <= -6)
 *              erf(x)  = sign(x)*(1.0 - erfc(x)) if x < 6, else
 *              erf(x)  = sign(x)*(1.0 - tiny)
 *         where
 *              R2(z) = degree 6 poly in z, (z=1/x^2)
 *              S2(z) = degree 7 poly in z
 *
 *      Note1:
 *         To compute exp(-x*x-0.5625+R/S), let s be a single
 *         precision number and s := x; then
 *              -x*x = -s*s + (s-x)*(s+x)
 *              exp(-x*x-0.5626+R/S) =
 *                      exp(-s*s-0.5625)*exp((s-x)*(s+x)+R/S);
 *      Note2:
 *         Here 4 and 5 make use of the asymptotic series
 *                        exp(-x*x)
 *              erfc(x) ~ ---------- * ( 1 + Poly(1/x^2) )
 *                        x*sqrt(pi)
 *         We use rational approximation to approximate
 *              g(s)=f(1/x^2) = log(erfc(x)*x) - x*x + 0.5625
 *         Here is the error bound for R1/S1 and R2/S2
 *              |R1/S1 - f(x)|  < 2**(-62.57)
 *              |R2/S2 - f(x)|  < 2**(-61.52)
 *
 *      5. For inf > x >= 28
 *              erf(x)  = sign(x) *(1 - tiny)  (raise inexact)
 *              erfc(x) = tiny*tiny (raise underflow) if x > 0
 *                      = 2 - tiny if x<0
 *
 *      7. Special case:
 *              erf(0)  = 0, erf(inf)  = 1, erf(-inf) = -1,
 *              erfc(0) = 1, erfc(inf) = 0, erfc(-inf) = 2,
 *              erfc/erf(NaN) is NaN
 */
/* INDENT ON */
```

```
#include "libm_synonyms.h"      /* __erf, __erfc, __exp */
#include "libm_macros.h"
#include <math.h>

static const double xxx[] = {
/* tiny */      1e-300,
/* half */      5.00000000000000000000e-01,     /* 3FE00000, 00000000 */
/* one */       1.00000000000000000000e+00,     /* 3FF00000, 00000000 */
/* two */       2.00000000000000000000e+00,     /* 40000000, 00000000 */
/* erx */       8.45062911510467529297e-01,     /* 3FEB0AC1, 60000000 */
/*
 * Coefficients for approximation to  erf on [0,0.84375]
 */
/* efx */        1.28379167095512586316e-01,    /* 3FC06EBA, 8214DB69 */
/* efx8 */       1.02703333676410069053e+00,    /* 3FF06EBA, 8214DB69 */
/* pp0 */        1.28379167095512558561e-01,    /* 3FC06EBA, 8214DB68 */
/* pp1 */       -3.25042107247001499370e-01,    /* BFD4CD7D, 691CB913 */
/* pp2 */       -2.84817495755985104766e-02,    /* BF9D2A51, DBD7194F */
/* pp3 */       -5.77027029648944159157e-03,    /* BF77A291, 236668E4 */
/* pp4 */       -2.37630166566501626084e-05,    /* BEF8EAD6, 120016AC */
/* qq1 */        3.97917223959155352819e-01,    /* 3FD97779, CDDADC09 */
/* qq2 */        6.50222499887672944485e-02,    /* 3FB0A54C, 5536CEBA */
/* qq3 */        5.08130628187576562776e-03,    /* 3F74D022, C4D36B0F */
/* qq4 */        1.32494738004321644526e-04,    /* 3F215DC9, 221C1A10 */
/* qq5 */       -3.96022827877536812320e-06,    /* BED09C43, 42A26120 */
/*
 * Coefficients for approximation to  erf  in [0.84375,1.25]
 */
/* pa0 */       -2.36211856075265944077e-03,    /* BF6359B8, BEF77538 */
/* pa1 */        4.14856118683748331666e-01,    /* 3FDA8D00, AD92B34D */
/* pa2 */       -3.72207876035701323847e-01,    /* BFD7D240, FBB8C3F1 */
/* pa3 */        3.18346619901161753674e-01,    /* 3FD45FCA, 805120E4 */
/* pa4 */       -1.10894694282396677476e-01,    /* BFBC6398, 3D3E28EC */
/* pa5 */        3.54783043256182359371e-02,    /* 3FA22A36, 599795EB */
/* pa6 */       -2.16637559486879084300e-03,    /* BF61BF38, 0A96073F */
/* qa1 */        1.06420880400844228286e-01,    /* 3FBB3E66, 18EEE323 */
/* qa2 */        5.40397917702171048937e-01,    /* 3FE14AF0, 92EB6F33 */
/* qa3 */        7.18286544141962662868e-02,    /* 3FB2635C, D99FE9A7 */
/* qa4 */        1.26171219808761642112e-01,    /* 3FC02660, E763351F */
/* qa5 */        1.36370839120290507362e-02,    /* 3F8BEDC2, 6B51DD1C */
/* qa6 */        1.19844998467991074170e-02,    /* 3F888B54, 5735151D */
/*
 * Coefficients for approximation to  erfc in [1.25,1/0.35]
 */
/* ra0 */       -9.86494403484714822705e-03,    /* BF843412, 600D6435 */
/* ra1 */       -6.93858572707181764372e-01,    /* BFE63416, E4BA7360 */
/* ra2 */       -1.05586262253232909814e+01,    /* C0251E04, 41B0E726 */
/* ra3 */       -6.23753324503260060396e+01,    /* C04F300A, E4CBA38D */
/* ra4 */       -1.62396669462573470355e+02,    /* C0644CB1, 84282266 */
/* ra5 */       -1.84605092906711035994e+02,    /* C067135C, EBCCABB2 */
/* ra6 */       -8.12874355063065934246e+01,    /* C0545265, 57E4D2F2 */
/* ra7 */       -9.81432934416914548592e+00,    /* C023A0EF, C69AC25C */
/* sa1 */        1.96512716674392571292e+01,    /* 4033A6B9, BD707687 */
/* sa2 */        1.37657754143519042600e+02,    /* 4061350C, 526AE721 */
/* sa3 */        4.34565877475229228821e+02,    /* 407B290D, D58A1A71 */
/* sa4 */        6.45387271733267880336e+02,    /* 40842B19, 21EC2868 */
/* sa5 */        4.29008140027567833386e+02,    /* 407AD021, 57700314 */
/* sa6 */        1.08635005541779435134e+02,    /* 405B28A3, EE48AE2C */
/* sa7 */        6.57024977031928170135e+00,    /* 401A47EF, 8E484A93 */
/* sa8 */       -6.04244152148580987438e-02,    /* BFAEEFF2, EE749A62 */
/*
 * Coefficients for approximation to  erfc in [1/.35,28]
 */
/* rb0 */       -9.86494292470009928597e-03,    /* BF843412, 39E86F4A */
/* rb1 */       -7.99283237680523006574e-01,    /* BFE993BA, 70C285DE */
```



```
/* rb2 */       -1.77579549177547519889e+01,    /* C031C209, 555F995A */
/* rb3 */       -1.60636384855821916062e+02,    /* C064145D, 43C5ED98 */
/* rb4 */       -6.37566443368389627722e+02,    /* C083EC88, 1375F228 */
/* rb5 */       -1.02509513161107724954e+03,    /* C0900461, 6A2E5992 */
/* rb6 */       -4.83519191608651397019e+02,    /* C07E384E, 9BDC383F */
/* sb1 */        3.03380607434824582924e+01,    /* 403E568B, 261D5190 */
/* sb2 */        3.25792512996573918826e+02,    /* 40745CAE, 221B9F0A */
/* sb3 */        1.53672958608443695994e+03,    /* 409802EB, 189D5118 */
/* sb4 */        3.19985821950859553908e+03,    /* 40A8FFB7, 688C246A */
/* sb5 */        2.55305040643316442583e+03,    /* 40A3F219, CEDF3BE6 */
/* sb6 */        4.74528541206955367215e+02,    /* 407DA874, E79FE763 */
/* sb7 */       -2.24409524465858183362e+01     /* C03670E2, 42712D62 */
};

#define tiny    xxx[0]
#define half    xxx[1]
#define one     xxx[2]
#define two     xxx[3]
#define erx     xxx[4]
/*
 * Coefficients for approximation to  erf on [0,0.84375]
 */
#define efx     xxx[5]
#define efx8    xxx[6]
#define pp0     xxx[7]
#define pp1     xxx[8]
#define pp2     xxx[9]
#define pp3     xxx[10]
#define pp4     xxx[11]
#define qq1     xxx[12]
#define qq2     xxx[13]
#define qq3     xxx[14]
#define qq4     xxx[15]
#define qq5     xxx[16]
/*
 * Coefficients for approximation to  erf  in [0.84375,1.25]
 */
#define pa0     xxx[17]
#define pa1     xxx[18]
#define pa2     xxx[19]
#define pa3     xxx[20]
#define pa4     xxx[21]
#define pa5     xxx[22]
#define pa6     xxx[23]
#define qa1     xxx[24]
#define qa2     xxx[25]
#define qa3     xxx[26]
#define qa4     xxx[27]
#define qa5     xxx[28]
#define qa6     xxx[29]
/*
 * Coefficients for approximation to  erfc in [1.25,1/0.35]
 */
#define ra0     xxx[30]
#define ra1     xxx[31]
#define ra2     xxx[32]
#define ra3     xxx[33]
#define ra4     xxx[34]
#define ra5     xxx[35]
#define ra6     xxx[36]
#define ra7     xxx[37]
#define sa1     xxx[38]
#define sa2     xxx[39]
#define sa3     xxx[40]
#define sa4     xxx[41]
#define sa5     xxx[42]
```

```
260 #define sa6     xxx[43]
261 #define sa7     xxx[44]
262 #define sa8     xxx[45]
263 /*
264  * Coefficients for approximation to  erfc in [1/.35,28]
265  */
266 #define rb0     xxx[46]
267 #define rb1     xxx[47]
268 #define rb2     xxx[48]
269 #define rb3     xxx[49]
270 #define rb4     xxx[50]
271 #define rb5     xxx[51]
272 #define rb6     xxx[52]
273 #define sb1     xxx[53]
274 #define sb2     xxx[54]
275 #define sb3     xxx[55]
276 #define sb4     xxx[56]
277 #define sb5     xxx[57]
278 #define sb6     xxx[58]
279 #define sb7     xxx[59]

281 double
282 erf(double x) {
283         int hx, ix, i;
284         double R, S, P, Q, s, y, z, r;

286         hx = ((int *) &x)[HIWORD];
287         ix = hx & 0x7fffffff;
288         if (ix >= 0x7ff00000) { /* erf(nan)=nan */
289 #if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
290                 if (ix >= 0x7ff80000)           /* assumes sparc-like QNaN */
291                         return x;
292 #endif
293                 i = ((unsigned) hx >> 31) << 1;
294                 return (double) (1 - i) + one / x;      /* erf(+-inf)=+-1 */
295         }

297         if (ix < 0x3feb0000) {  /* |x|<0.84375 */
298                 if (ix < 0x3e300000) {  /* |x|<2**-28 */
299                         if (ix < 0x00800000)    /* avoid underflow */
300                                 return 0.125 * (8.0 * x + efx8 * x);
301                         return x + efx * x;
302                 }
303                 z = x * x;
304                 r = pp0 + z * (pp1 + z * (pp2 + z * (pp3 + z * pp4)));
305                 s = one + z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5)))
306                 y = r / s;
307                 return x + x * y;
308         }
309         if (ix < 0x3ff40000) {  /* 0.84375 <= |x| < 1.25 */
310                 s = fabs(x) - one;
311                 P = pa0 + s * (pa1 + s * (pa2 + s * (pa3 + s * (pa4 +
312                         s * (pa5 + s * pa6)))));
313                 Q = one + s * (qa1 + s * (qa2 + s * (qa3 + s * (qa4 +
314                         s * (qa5 + s * qa6)))));
315                 if (hx >= 0)
316                         return erx + P / Q;
317                 else
318                         return -erx - P / Q;
319         }
320         if (ix >= 0x40180000) { /* inf > |x| >= 6 */
321                 if (hx >= 0)
322                         return one - tiny;
323                 else
324                         return tiny - one;
325         }
```



```
326         x = fabs(x);
327         s = one / (x * x);
328         if (ix < 0x4006DB6E) {  /* |x| < 1/0.35 */
329                 R = ra0 + s * (ra1 + s * (ra2 + s * (ra3 + s * (ra4 +
330                         s * (ra5 + s * (ra6 + s * ra7))))));
331                 S = one + s * (sa1 + s * (sa2 + s * (sa3 + s * (sa4 +
332                         s * (sa5 + s * (sa6 + s * (sa7 + s * sa8)))))));
333         }
334         else {                  /* |x| >= 1/0.35 */
335                 R = rb0 + s * (rb1 + s * (rb2 + s * (rb3 + s * (rb4 +
336                         s * (rb5 + s * rb6)))));
337                 S = one + s * (sb1 + s * (sb2 + s * (sb3 + s * (sb4 +
338                         s * (sb5 + s * (sb6 + s * sb7))))));
339         }
340         z = x;
341         ((int *) &z)[LOWORD] = 0;
342         r = exp(-z * z - 0.5625) * exp((z - x) * (z + x) + R / S);
343         if (hx >= 0)
344                 return one - r / x;
345         else
346                 return r / x - one;
347 }

349 double
350 erfc(double x) {
351         int hx, ix;
352         double R, S, P, Q, s, y, z, r;

354         hx = ((int *) &x)[HIWORD];
355         ix = hx & 0x7fffffff;
356         if (ix >= 0x7ff00000) { /* erfc(nan)=nan */
357 #if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
358                 if (ix >= 0x7ff80000)           /* assumes sparc-like QNaN */
359                         return x;
360 #endif
361                 /* erfc(+-inf)=0,2 */
362                 return (double) (((unsigned) hx >> 31) << 1) + one / x;
363         }

365         if (ix < 0x3feb0000) {  /* |x| < 0.84375 */
366                 if (ix < 0x3c700000)    /* |x| < 2**-56 */
367                         return one - x;
368                 z = x * x;
369                 r = pp0 + z * (pp1 + z * (pp2 + z * (pp3 + z * pp4)));
370                 s = one + z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5)))
371                 y = r / s;
372                 if (hx < 0x3fd00000) {  /* x < 1/4 */
373                         return one - (x + x * y);
374                 }
375                 else {
376                         r = x * y;
377                         r += (x - half);
378                         return half - r;
379                 }
380         }
381         if (ix < 0x3ff40000) {  /* 0.84375 <= |x| < 1.25 */
382                 s = fabs(x) - one;
383                 P = pa0 + s * (pa1 + s * (pa2 + s * (pa3 + s * (pa4 +
384                         s * (pa5 + s * pa6)))));
385                 Q = one + s * (qa1 + s * (qa2 + s * (qa3 + s * (qa4 +
386                         s * (qa5 + s * qa6)))));
387                 if (hx >= 0) {
388                         z = one - erx;
389                         return z - P / Q;
390                 }
391                 else {
```

```
392                         z = erx + P / Q;
393                         return one + z;
394                 }
395         }
396         if (ix < 0x403c0000) {  /* |x|<28 */
397                 x = fabs(x);
398                 s = one / (x * x);
399                 if (ix < 0x4006DB6D) {  /* |x| < 1/.35 ~ 2.857143 */
400                         R = ra0 + s * (ra1 + s * (ra2 + s * (ra3 + s * (ra4 +
401                                 s * (ra5 + s * (ra6 + s * ra7))))));
402                         S = one + s * (sa1 + s * (sa2 + s * (sa3 + s * (sa4 +
403                                 s * (sa5 + s * (sa6 + s * (sa7 + s * sa8)))))));
404                 }
405                 else {          /* |x| >= 1/.35 ~ 2.857143 */
406                         if (hx < 0 && ix >= 0x40180000)
407                                 return two - tiny;      /* x < -6 */
408                         R = rb0 + s * (rb1 + s * (rb2 + s * (rb3 + s * (rb4 +
409                                 s * (rb5 + s * rb6)))));
410                         S = one + s * (sb1 + s * (sb2 + s * (sb3 + s * (sb4 +
411                                 s * (sb5 + s * (sb6 + s * sb7))))));
412                 }
413                 z = x;
414                 ((int *) &z)[LOWORD] = 0;
415                 r = exp(-z * z - 0.5625) * exp((z - x) * (z + x) + R / S);
416                 if (hx > 0)
417                         return r / x;
418                 else
419                         return two - r / x;
420         }
421         else {
422                 if (hx > 0)
423                         return tiny * tiny;
424                 else
425                         return two - tiny;
426         }
427 }
```

```
**********************************************************
   14865 Sat May 10 12:08:51 2014
new/usr/src/lib/libm/common/C/exp.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

#pragma weak exp = __exp

/*
 * exp(x)
 * Hybrid algorithm of Peter Tang's Table driven method (for large
 * arguments) and an accurate table (for small arguments).
 * Written by K.C. Ng, November 1988.
 * Method (large arguments):
 *      1. Argument Reduction: given the input x, find r and integer k
 *         and j such that
 *                    x = (k+j/32)*(ln2) + r,  |r| <= (1/64)*ln2
 *
 *      2. exp(x) = 2^k * (2^(j/32) + 2^(j/32)*expm1(r))
 *         a. expm1(r) is approximated by a polynomial:
 *            expm1(r) ~ r + t1*r^2 + t2*r^3 + ... + t5*r^6
 *            Here t1 = 1/2 exactly.
 *         b. 2^(j/32) is represented to twice double precision
 *            as TBL[2j]+TBL[2j+1].
 *
 * Note: If divide were fast enough, we could use another approximation
 *       in 2.a:
 *            expm1(r) ~ (2r)/(2-R), R = r - r^2*(t1 + t2*r^2)
 *            (for the same t1 and t2 as above)
 *
 * Special cases:
 *      exp(INF) is INF, exp(NaN) is NaN;
 *      exp(-INF)=  0;
 *      for finite argument, only exp(0)=1 is exact.
 *
 * Accuracy:
 *      According to an error analysis, the error is always less than
 *      an ulp (unit in the last place).  The largest errors observed
 *      are less than 0.55 ulp for normal results and less than 0.75 ulp
```



```
 *      for subnormal results.
 *
 * Misc. info.
 *      For IEEE double
 *              if x >  7.09782712893383973096e+02 then exp(x) overflow
 *              if x < -7.45133219101941108420e+02 then exp(x) underflow
 */

#include "libm.h"

static const double TBL[] = {
        1.00000000000000000000e+00,  0.00000000000000000000e+00,
        1.02189714865411662714e+00,  5.10922502897344389359e-17,
        1.04427378242741375480e+00,  8.55188970553796365958e-17,
        1.06714040067682369717e+00, -7.89985396684158212226e-17,
        1.09050773266525768967e+00, -3.04678207981247114697e-17,
        1.11438674259589243221e+00,  1.04102784568455709549e-16,
        1.13878863475669156458e+00,  8.91281267602540777782e-17,
        1.16372485877757747552e+00,  3.82920483692409349872e-17,
        1.18920711500272102690e+00,  3.98201523146564611098e-17,
        1.21524735998046895524e+00, -7.71263069268148813091e-17,
        1.24185781207348400201e+00,  4.65802759183693679123e-17,
        1.26905095719173321989e+00,  2.66793213134218609523e-18,
        1.29683955465100964055e+00,  2.53825027948883149593e-17,
        1.32523664315974132322e+00, -2.85873121003886075697e-17,
        1.35425554693689265129e+00,  7.70094837980298946162e-17,
        1.38390988196383202258e+00, -6.77051165879478628716e-17,
        1.41421356237309514547e+00, -9.66729331345291345105e-17,
        1.44518080697704665027e+00, -3.02375813499398731940e-17,
        1.47682614593949934623e+00, -3.48399455689279579579e-17,
        1.50916442759342284141e+00, -1.01645532775429503911e-16,
        1.54221082540794074411e+00,  7.94983480969762085616e-17,
        1.57598084510788649659e+00, -1.01369164712783039808e-17,
        1.61049033194925428347e+00,  2.47071925697978878522e-17,
        1.64575547815396494578e+00, -1.01256799136747726038e-16,
        1.68179283050742900407e+00,  8.19901002058149652013e-17,
        1.71861929812247793414e+00, -1.85138041826311098821e-17,
        1.75625216037329945351e+00,  2.96014069544887330703e-17,
        1.79470907500310716820e+00,  1.82274584279120867698e-17,
        1.83400808640934243066e+00,  3.28310722424562658722e-17,
        1.87416763411029996256e+00, -6.12276341300414256164e-17,
        1.91520656139714740007e+00, -1.06199460561959626376e-16,
        1.95714412417540017941e+00,  8.96076779103666776760e-17,
};

/*
 * For i = 0, ..., 66,
 *   TBL2[2*i] is a double precision number near (i+1)*2^-6, and
 *   TBL2[2*i+1] = exp(TBL2[2*i]) to within a relative error less
 *   than 2^-60.
 *
 * For i = 67, ..., 133,
 *   TBL2[2*i] is a double precision number near -(i+1)*2^-6, and
 *   TBL2[2*i+1] = exp(TBL2[2*i]) to within a relative error less
 *   than 2^-60.
 */
static const double TBL2[] = {
        1.56249999999984491572e-02, 1.01574770858668417262e+00,
        3.12499999999998716305e-02, 1.03174340749910253834e+00,
        4.68750000000011102230e-02, 1.04799100201663386578e+00,
        6.24999999999990632493e-02, 1.06449445891785843266e+00,
        7.81249999999999444888e-02, 1.08125780744903954300e+00,
        9.37500000000013322676e-02, 1.09828514030782731226e+00,
        1.09375000000001346145e-01, 1.11558061464248226002e+00,
        1.24999999999999417133e-01, 1.13314845306682565607e+00,
        1.40624999999995337063e-01, 1.15099294469117108264e+00,
```

```
128         1.56249999999996141975e-01, 1.16911844616949989195e+00,
129         1.71874999999992894573e-01, 1.18752938276309216725e+00,
130         1.87500000000000888178e+00, 1.20623024942098178158e+00,
131         2.03124999999361649516e-01, 1.22522561187652545556e+00,
132         2.18750000000000416334e-01, 1.24452010776609567344e+00,
133         2.34375000000003524958e-01, 1.26411844775347081971e+00,
134         2.50000000000006328271e-01, 1.28402541668774961003e+00,
135         2.65624999999982791543e-01, 1.30424587476761533189e+00,
136         2.81249999999993727240e-01, 1.32478475872885725906e+00,
137         2.96875000000003275158e-01, 1.34564708304941493822e+00,
138         3.12500000000002886580e-01, 1.36683794117380030819e+00,
139         3.28124999999993394173e-01, 1.38836250675661765364e+00,
140         3.43749999999998612221e-01, 1.41022603492570874906e+00,
141         3.59374999999992450483e-01, 1.43243386356506730017e+00,
142         3.74999999999991395772e-01, 1.45499141461818881638e+00,
143         3.90624999999997613020e-01, 1.47790419541173490003e+00,
144         4.06249999999991895372e-01, 1.50117780000011058483e+00,
145         4.21874999999996613820e-01, 1.52481791053132154090e+00,
146         4.37500000000004607426e-01, 1.54883029863414023453e+00,
147         4.53125000000004274359e-01, 1.57322082682725961078e+00,
148         4.68750000000008326673e-01, 1.59799544995064657371e+00,
149         4.84374999999985456078e-01, 1.62316021661928200359e+00,
150         4.99999999999997335465e-01, 1.64872127070012375327e+00,
151         5.15625000000000222045e-01, 1.67468485281178436352e+00,
152         5.31250000000003441691e-01, 1.70105730184840653330e+00,
153         5.46874999999999111822e-01, 1.72784505652716169344e+00,
154         5.62499999999999333866e-01, 1.75505465696029738787e+00,
155         5.78124999999993338662e-01, 1.78269274625180318417e+00,
156         5.93749999999999666933e-01, 1.81076607211938656050e+00,
157         6.09375000000003441691e-01, 1.83928148854178719063e+00,
158         6.24999999999995559108e-01, 1.86824595743221411048e+00,
159         6.40625000000009103829e-01, 1.89766655033813602671e+00,
160         6.56249999999993782751e-01, 1.92755045016753268072e+00,
161         6.71875000000002109424e-01, 1.95790495294292221651e+00,
162         6.87499999999992450483e-01, 1.98873746958227681780e+00,
163         7.03125000000004996004e-01, 2.02005552770870666635e+00,
164         7.18750000000007105427e-01, 2.05186677348799140219e+00,
165         7.34375000000008770762e-01, 2.08417897349558689513e+00,
166         7.49999999999983901766e-01, 2.11700001661264058939e+00,
167         7.65624999999997002398e-01, 2.15033791595229351046e+00,
168         7.81250000000005884182e-01, 2.18420081081563077774e+00,
169         7.96874999999991451283e-01, 2.21859696867912603579e+00,
170         8.12500000000000000000e-01, 2.25353478721320854561e+00,
171         8.28125000000008215650e-01, 2.28902279633221983346e+00,
172         8.43749999999997890576e-01, 2.32506966027711614586e+00,
173         8.59374999999999444888e-01, 2.36168417973090827289e+00,
174         8.75000000000003219647e-01, 2.39887529396710563745e+00,
175         8.90625000000013433699e-01, 2.43665208303232461162e+00,
176         9.06249999999980571097e-01, 2.47502376996297712708e+00,
177         9.21874999999984456878e-01, 2.51399972303748420188e+00,
178         9.37500000000001887379e-01, 2.55358945806293169412e+00,
179         9.53125000000003330669e-01, 2.59380264069854327147e+00,
180         9.68749999999989119814e-01, 2.63464908881560244680e+00,
181         9.84374999999997890576e-01, 2.67613877489447116176e+00,
182         1.00000000000001154632e+00, 2.71828182845907662113e+00,
183         1.01562499999999333866e+00, 2.76108853855008318234e+00,
184         1.03124999999995980993e+00, 2.80456935623711389738e+00,
185         1.04687499999999333387e+00, 2.84873489717039740654e+00,
186        -1.56249999999999514277e-02, 9.84496437005408453480e-01,
187        -3.12499999999955972718e-02, 9.69233234476348348707e-01,
188        -4.68749999999993824384e-02, 9.54206665969188905230e-01,
189        -6.24999999999976130205e-02, 9.39413062813478028090e-01,
190        -7.81249999999989314103e-02, 9.24848813216205822840e-01,
191        -9.37499999999995975442e-02, 9.10510363180034494161e-01,
192        -1.09374999999998584466e-01, 8.96394206635151680196e-01,
193        -1.24999999999998556710e-01, 8.82496902584596676355e-01,
```



```
194        -1.40624999999999361622e-01, 8.68815056262843721235e-01,
195        -1.56249999999999111822e-01, 8.55345327307423297647e-01,
196        -1.71874999999924144012e-01, 8.42084427143446223596e-01,
197        -1.87499999999996752598e-01, 8.29029118180403035154e-01,
198        -2.03124999999988037347e-01, 8.16176213022349550386e-01,
199        -2.18749999999995947686e-01, 8.03522573689063990265e-01,
200        -2.34374999999996419531e-01, 7.91065110850298847112e-01,
201        -2.49999999999996280753e-01, 7.78800783071407765057e-01,
202        -2.65624999999999888978e-01, 7.66726596070820165529e-01,
203        -2.81249999999989397370e-01, 7.54839601989015340777e-01,
204        -2.96874999999996114219e-01, 7.43136898668761203268e-01,
205        -3.12499999999999555911e-01, 7.31615628946642115871e-01,
206        -3.28124999999993782751e-01, 7.20272979955444259126e-01,
207        -3.43749999999997946087e-01, 7.09106182437399867879e-01,
208        -3.59374999999994337863e-01, 6.98112510068129799023e-01,
209        -3.74999999999994615418e-01, 6.87289278790975899369e-01,
210        -3.90624999999999000799e-01, 6.76633846161729612945e-01,
211        -4.06249999999947264406e-01, 6.66143610703522903727e-01,
212        -4.21874999999988453681e-01, 6.55816011271509125002e-01,
213        -4.37499999999999111822e-01, 6.45648526427892610613e-01,
214        -4.53124999999999278355e-01, 6.35638673826052436056e-01,
215        -4.68749999999999278355e-01, 6.25784009604591573428e-01,
216        -4.84374999999992894573e-01, 6.16082127790682609891e-01,
217        -4.99999999999998168132e-01, 6.06530659712634534486e-01,
218        -5.15625000000000000000e-01, 5.97127734216274613619e-01,
219        -5.31249999999989785948e-01, 5.87869673122352498496e-01,
220        -5.46874999999972688514e-01, 5.78755598612500032907e-01,
221        -5.62500000000000000000e-01, 5.69782847309230009859e-01,
222        -5.78124999999992339461e-01, 5.60949160814475100700e-01,
223        -5.93749999999948707696e-01, 5.52252450163048691500e-01,
224        -6.09374999999552580121e-01, 5.43690569513243682209e-01,
225        -6.24999999999984789945e-01, 5.35261428518998383375e-01,
226        -6.40624999999983457677e-01, 5.26962969243379708573e-01,
227        -6.56249999999998334665e-01, 5.18793165653890220312e-01,
228        -6.71874999999943378626e-01, 5.10750023129039609771e-01,
229        -6.87499999999997002398e-01, 5.02831577970942467104e-01,
230        -7.03124999999991118216e-01, 4.95035896926202978463e-01,
231        -7.18749999999991340260e-01, 4.87361076713623331269e-01,
232        -7.34374999999985678123e-01, 4.79805243559684402310e-01,
233        -7.49999999999973354654e-01, 4.72366552741015965911e-01,
234        -7.65624999999993782751e-01, 4.65043188134059204408e-01,
235        -7.81249999999863220523e-01, 4.57833361771676883301e-01,
236        -7.96874999999998112621e-01, 4.50735134063634247157e-01,
237        -8.12499999999990119015e-01, 4.43747310081084256339e-01,
238        -8.28124999999996003197e-01, 4.36867645705559026759e-01,
239        -8.43749999999988120614e-01, 4.30094640640067360504e-01,
240        -8.59374999999994115818e-01, 4.23426641285265303871e-01,
241        -8.74999999999977129406e-01, 4.16862019678517936594e-01,
242        -8.90624999999983346655e-01, 4.10399173096376801428e-01,
243        -9.06249999999991784350e-01, 4.04036523663345414903e-01,
244        -9.21874999999994004796e-01, 3.97772517966614058693e-01,
245        -9.37499999999994337863e-01, 3.91605626676801210628e-01,
246        -9.53124999999999444888e-01, 3.85534344174578935682e-01,
247        -9.68749999999986677324e-01, 3.79557188183094640355e-01,
248        -9.84374999999992339461e-01, 3.73672699406045860648e-01,
249        -9.99999999999995892175e-01, 3.67879441171443832825e-01,
250        -1.01562499999994315658e+00, 3.62175999080846300338e-01,
251        -1.03124999999991096011e+00, 3.56560980663978732697e-01,
252        -1.04687499999999067413e+00, 3.51033015038813400732e-01,
253 };

255 static const double C[] = {
256         0.5,
257         4.61662413084468283841e+01,     /* 0x40471547, 0x652b82fe */
258         2.16608493865351192653e-02,     /* 0x3f962e42, 0xfee00000 */
259         5.96317165397058656257e-12,     /* 0x3d9a39ef, 0x35793c76 */
```

```
260         1.6666666666526086527e-1,       /* 3fc5555555548f7c */
261         4.1666666666226079285e-2,       /* 3fa5555555545d4e */
262         8.3333679843421958056e-3,       /* 3f811115b7aa905e */
263         1.3888949086377719040e-3,       /* 3f56c1728d739765 */
264         1.0,
265         0.0,
266         7.0978271289338397 3096e+02,    /* 0x40862E42, 0xFEFA39EF */
267         7.4513321910194110 8420e+02,    /* 0x40874910, 0xD52D3051 */
268         5.5511151231257827 0212e-17,    /* 0x3c900000, 0x00000000 */
269 };

271 #define half            C[0]
272 #define invln2_32       C[1]
273 #define ln2_32hi        C[2]
274 #define ln2_32lo        C[3]
275 #define t2              C[4]
276 #define t3              C[5]
277 #define t4              C[6]
278 #define t5              C[7]
279 #define one             C[8]
280 #define zero            C[9]
281 #define threshold1      C[10]
282 #define threshold2      C[11]
283 #define twom54          C[12]

285 double
286 exp(double x) {
287         double  y, z, t;
288         int     hx, ix, k, j, m;

290         ix = ((int *)&x)[HIWORD];
291         hx = ix & ~0x80000000;

293         if (hx < 0x3ff0a2b2) {  /* |x| < 3/2 ln 2 */
294                 if (hx < 0x3f862e42) {  /* |x| < 1/64 ln 2 */
295                         if (hx < 0x3ed00000) {  /* |x| < 2^-18 */
296                                 volatile int    dummy;

298                                 dummy = (int)x; /* raise inexact if x != 0 */
299 #ifdef lint
300                                 dummy = dummy;
301 #endif
302                                 if (hx < 0x3e300000)
303                                         return (one + x);
304                                 return (one + x * (one + half * x));
305                         }
306                         t = x * x;
307                         y = x + (t * (half + x * t2) +
308                             (t * t) * (t3 + x * t4 + t * t5));
309                         return (one + y);
310                 }

312                 /* find the multiple of 2^-6 nearest x */
313                 k = hx >> 20;
314                 j = (0x00100000 | (hx & 0x000fffff)) >> (0x40c - k);
315                 j = (j - 1) & ~1;
316                 if (ix < 0)
317                         j += 134;
318                 z = x - TBL2[j];
319                 t = z * z;
320                 y = z + (t * (half + z * t2) +
321                     (t * t) * (t3 + z * t4 + t * t5));
322                 return (TBL2[j+1] + TBL2[j+1] * y);
323         }

325         if (hx >= 0x40862e42) { /* x is large, infinite, or nan */
```



```
326                 if (hx >= 0x7ff00000) {
327                         if (ix == 0xfff00000 && ((int *)&x)[LOWORD] == 0)
328                                 return (zero);
329                         return (x * x);
330                 }
331                 if (x > threshold1)
332                         return (_SVID_libm_err(x, x, 6));
333                 if (-x > threshold2)
334                         return (_SVID_libm_err(x, x, 7));
335         }

337         t = invln2_32 * x;
338         if (ix < 0)
339                 t -= half;
340         else
341                 t += half;
342         k = (int)t;
343         j = (k & 0x1f) << 1;
344         m = k >> 5;
345         z = (x - k * ln2_32hi) - k * ln2_32lo;

347         /* z is now in primary range */
348         t = z * z;
349         y = z + (t * (half + z * t2) + (t * t) * (t3 + z * t4 + t * t5));
350         y = TBL[j] + (TBL[j+1] + TBL[j] * y);
351         if (m < -1021) {
352                 ((int *)&y)[HIWORD] += (m + 54) << 20;
353                 return (twom54 * y);
354         }
355         ((int *)&y)[HIWORD] += m << 20;
356         return (y);
357 }
```

```
**********************************************************
    2611 Sat May 10 12:08:52 2014
new/usr/src/lib/libm/common/C/exp10.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
 *
 * The contents of this file are subject to the terms of the
 * Common Development and Distribution License (the "License").
 * You may not use this file except in compliance with the License.
 *
 * You can obtain a copy of the license at usr/src/OPENSOLARIS.LICENSE
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 * See the License for the specific language governing permissions
 * and limitations under the License.
 *
 * When distributing Covered Code, include this CDDL HEADER in each
 * file and include the License file at usr/src/OPENSOLARIS.LICENSE.
 * If applicable, add the following below this CDDL HEADER, with the
 * fields enclosed by brackets "[]" replaced with your own identifying
 * information: Portions Copyright [yyyy] [name of copyright owner]
 *
 * CDDL HEADER END
 */
/*
 * Copyright 2011 Nexenta Systems, Inc.  All rights reserved.
 */
/*
 * Copyright 2006 Sun Microsystems, Inc.  All rights reserved.
 * Use is subject to license terms.
 */

#pragma weak exp10 = __exp10

/* INDENT OFF */
/*
 * exp10(x)
 * Code by K.C. Ng for SUN 4.0 libm.
 * Method :
 *      n = nint(x*(log10/log2));
 *      exp10(x) = 10**x = exp(x*ln(10)) = exp(n*ln2+(x*ln10-n*ln2))
 *               = 2**n*exp(ln10*(x-n*log2/log10)))
 *      If x is an integer < 23 then use repeat multiplication. For
 *      10**22 is the largest representable integer.
 */
/* INDENT ON */

#include "libm.h"

static const double C[] = {
        3.3219280948736234787,  /* log(10)/log(2) */
        2.3025850929940456840,  /* log(10) */
        3.0102999565860955045E-1,       /* log(2)/log(10) high */
        5.3716447674669983622E-12,      /* log(2)/log(10) low */
        0.0,
        0.5,
        1.0,
        10.0,
        1.0e300,
        1.0e-300,
};

#define lg10    C[0]
#define ln10    C[1]
#define logt2hi C[2]
```



```
#define logt2lo C[3]
#define zero    C[4]
#define half    C[5]
#define one     C[6]
#define ten     C[7]
#define huge    C[8]
#define tiny    C[9]

double
exp10(double x) {
        double  t, pt;
        int     ix, hx, k;

        ix = ((int *)&x)[HIWORD];
        hx = ix & ~0x80000000;

        if (hx >= 0x4074a000) { /* |x| >= 330 or x is nan */
                if (hx >= 0x7ff00000) { /* x is inf or nan */
                        if (ix == 0xfff00000 && ((int *)&x)[LOWORD] == 0)
                                return (zero);
                        return (x * x);
                }
                t = (ix < 0)? tiny : huge;
                return (t * t);
        }

        if (hx < 0x3c000000)
                return (one + x);

        k = (int)x;
        if (0 <= k && k < 23 && (double)k == x) {
                /* x is a small positive integer */
                t = one;
                pt = ten;
                if (k & 1)
                        t = ten;
                k >>= 1;
                while (k) {
                        pt *= pt;
                        if (k & 1)
                                t *= pt;
                        k >>= 1;
                }
                return (t);
        }
        t = x * lg10;
        k = (int)((ix < 0)? t - half : t + half);
        return (scalbn(exp(ln10 * ((x - k * logt2hi) - k * logt2lo)), k));
}
```

```
**********************************************************
    2067 Sat May 10 12:08:52 2014
new/usr/src/lib/libm/common/C/exp2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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#pragma weak exp2 = __exp2

/* INDENT OFF */
/*
 * exp2(x)
 * Code by K.C. Ng for SUN 4.0 libm.
 * Method :
 *      exp2(x) = 2**x = 2**((x-anint(x))+anint(x))
 *              = 2**anint(x)*2**(x-anint(x))
 *              = 2**anint(x)*exp((x-anint(x))*ln2)
 */
/* INDENT ON */

#include "libm.h"

static const double C[] = {
        0.0,
        1.0,
        0.5,
        6.93147180559945286227e-01,
        1.0e300,
        1.0e-300,
};

#define zero    C[0]
#define one     C[1]
#define half    C[2]
#define ln2     C[3]
#define huge    C[4]
#define tiny    C[5]

double
exp2(double x) {
```



```
        int     ix, hx, k;
        double  t;

        ix = ((int *)&x)[HIWORD];
        hx = ix & ~0x80000000;

        if (hx >= 0x4090e000) { /* |x| >= 1080 or x is nan */
                if (hx >= 0x7ff00000) { /* x is inf or nan */
                        if (ix == 0xfff00000 && ((int *)&x)[LOWORD] == 0)
                                return (zero);
                        return (x * x);
                }
                t = (ix < 0)? tiny : huge;
                return (t * t);
        }

        if (hx < 0x3fe00000) {  /* |x| < 0.5 */
                if (hx < 0x3c000000)
                        return (one + x);
                return (exp(ln2 * x));
        }

        k = (int)x;
        if (x != (double)k)
                k = (int)((ix < 0)? x - half : x + half);
        return (scalbn(exp(ln2 * (x - (double)k)), k));
}
```

```
**********************************************************
    8501 Sat May 10 12:08:52 2014
new/usr/src/lib/libm/common/C/expm1.c
libm/common/C/expm1.c
For |x| <= 0.5 ln2, (k == 0) we don't need to compute correction (c).
We can initialize c manually with 0, to fix compiler warning.
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
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#pragma weak expm1 = __expm1

/* INDENT OFF */
/* expm1(x)
 * Returns exp(x)-1, the exponential of x minus 1.
 *
 * Method
 *   1. Arugment reduction:
 *      Given x, find r and integer k such that
 *
 *                x = k*ln2 + r,  |r| <= 0.5*ln2 ~ 0.34658
 *
 *      Here a correction term c will be computed to compensate
 *      the error in r when rounded to a floating-point number.
 *
 *   2. Approximating expm1(r) by a special rational function on
 *      the interval [0,0.34658]:
 *      Since
 *          r*(exp(r)+1)/(exp(r)-1) = 2+ r^2/6 - r^4/360 + ...
 *      we define R1(r*r) by
 *          r*(exp(r)+1)/(exp(r)-1) = 2+ r^2/6 * R1(r*r)
 *      That is,
 *          R1(r**2) = 6/r *((exp(r)+1)/(exp(r)-1) - 2/r)
 *                   = 6/r * ( 1 + 2.0*(1/(exp(r)-1) - 1/r))
 *                   = 1 - r^2/60 + r^4/2520 - r^6/100800 + ...
 *      We use a special Reme algorithm on [0,0.347] to generate
 *      a polynomial of degree 5 in r*r to approximate R1. The
 *      maximum error of this polynomial approximation is bounded
```



```
 *      by 2**-61. In other words,
 *          R1(z) ~ 1.0 + Q1*z + Q2*z**2 + Q3*z**3 + Q4*z**4 + Q5*z**5
 *      where   Q1  =  -1.66666666666666567384E-2,
 *              Q2  =   3.96825396813703658873E-4,
 *              Q3  =  -9.92063447334359873557E-6,
 *              Q4  =   2.50513614208085170027E-7,
 *              Q5  =  -6.28435056823826171027E-9;
 *      (where z=r*r, and the values of Q1 to Q5 are listed below)
 *      with error bounded by
 *          |                      5           |     -61
 *          | 1.0+Q1*z+...+Q5*z   -  R1(z) | <= 2
 *          |                                  |
 *
 *      expm1(r) = exp(r)-1 is then computed by the following
 *      specific way which minimize the accumulation rounding error:
 *                               2     3
 *                              r     r    [ 3 - (R1 + R1*r/2)  ]
 *            expm1(r) = r + --- + --- * [--------------------]
 *                              2     2    [ 6 - r*(3 - R1*r/2) ]
 *
 *      To compensate the error in the argument reduction, we use
 *              expm1(r+c) = expm1(r) + c + expm1(r)*c
 *                         ~ expm1(r) + c + r*c
 *      Thus c+r*c will be added in as the correction terms for
 *      expm1(r+c). Now rearrange the term to avoid optimization
 *      screw up:
 *                      (     2                                    2 )
 *                      ({  ( r    [ R1 -  (3 - R1*r/2) ]  )  }    r  )
 *       expm1(r+c)~r - ({r*(--- * [--------------------]-c)-c} - --- )
 *                      ({  ( 2    [ 6 - r*(3 - R1*r/2) ]  )  }    2  )
 *                      (                                          )
 *
 *                = r - E
 *   3. Scale back to obtain expm1(x):
 *      From step 1, we have
 *         expm1(x) = either 2^k*[expm1(r)+1] - 1
 *                  = or     2^k*[expm1(r) + (1-2^-k)]
 *   4. Implementation notes:
 *      (A). To save one multiplication, we scale the coefficient Qi
 *           to Qi*2^i, and replace z by (x^2)/2.
 *      (B). To achieve maximum accuracy, we compute expm1(x) by
 *        (i)   if x < -56*ln2, return -1.0, (raise inexact if x!=inf)
 *        (ii)  if k=0, return r-E
 *        (iii) if k=-1, return 0.5*(r-E)-0.5
 *        (iv)  if k=1 if r < -0.25, return 2*((r+0.5)- E)
 *                     else          return  1.0+2.0*(r-E);
 *        (v)   if (k<-2||k>56) return 2^k(1-(E-r)) - 1 (or exp(x)-1)
 *        (vi)  if k <= 20, return 2^k((1-2^-k)-(E-r)), else
 *        (vii) return 2^k(1-((E+2^-k)-r))
 *
 * Special cases:
 *      expm1(INF) is INF, expm1(NaN) is NaN;
 *      expm1(-INF) is -1, and
 *      for finite argument, only expm1(0)=0 is exact.
 *
 * Accuracy:
 *      according to an error analysis, the error is always less than
 *      1 ulp (unit in the last place).
 *
 * Misc. info.
 *      For IEEE double
 *          if x >  7.09782712893383973096e+02 then expm1(x) overflow
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following
 * constants. The decimal values may be used, provided that the
```

```
 * compiler will convert from decimal to binary accurately enough
 * to produce the hexadecimal values shown.
 */
/* INDENT ON */

#include "libm_synonyms.h"      /* __expm1 */
#include "libm_macros.h"
#include <math.h>

static const double xxx[] = {
/* one */               1.0,
/* huge */              1.0e+300,
/* tiny */              1.0e-300,
/* o_threshold */       7.09782712893383973096e+02,    /* 40862E42 FEFA39EF */
/* ln2_hi */            6.93147180369123816490e-01,    /* 3FE62E42 FEE00000 */
/* ln2_lo */            1.90821492927058770002e-10,    /* 3DEA39EF 35793C76 */
/* invln2 */            1.44269504088896338700e+00,    /* 3FF71547 652B82FE */
/* scaled coefficients related to expm1 */
/* Q1 */                -3.33333333333331316428e-02,    /* BFA11111 111110F4 */
/* Q2 */                 1.58730158725481460165e-03,    /* 3F5A01A0 19FE5585 */
/* Q3 */                -7.93650757867487942473e-05,    /* BF14CE19 9EAADBB7 */
/* Q4 */                 4.00821782732936239552e-06,    /* 3ED0CFCA 86E65239 */
/* Q5 */                -2.01099218183624371326e-07     /* BE8AFDB7 6E09C32D */
};
#define one             xxx[0]
#define huge            xxx[1]
#define tiny            xxx[2]
#define o_threshold     xxx[3]
#define ln2_hi          xxx[4]
#define ln2_lo          xxx[5]
#define invln2          xxx[6]
#define Q1              xxx[7]
#define Q2              xxx[8]
#define Q3              xxx[9]
#define Q4              xxx[10]
#define Q5              xxx[11]

double
expm1(double x) {
        double y, hi, lo, c = 0.0L, t, e, hxs, hfx, r1;
        int k, xsb;
        unsigned hx;

        hx = ((unsigned *) &x)[HIWORD];         /* high word of x */
        xsb = hx & 0x80000000;                  /* sign bit of x */
        if (xsb == 0)
                y = x;
        else
                y = -x;                         /* y = |x| */
        hx &= 0x7fffffff;                       /* high word of |x| */

        /* filter out huge and non-finite argument */
        /* for example exp(38)-1 is approximately 3.1855932e+16 */
        if (hx >= 0x4043687A) {                 /* if |x|>=56*ln2  (~38.8162...)
                if (hx >= 0x40862E42) {         /* if |x|>=709.78... -> inf */
                        if (hx >= 0x7ff00000) {
                                if (((hx & 0xfffff) | ((int *) &x)[LOWORD])
                                        != 0)
                                        return x * x;   /* + -> * for Cheetah */
                                else
                                        return xsb == 0 ? x : -1.0;     /* exp(+
                        }
                        if (x > o_threshold)
                                return huge * huge;     /* overflow */
                }
                if (xsb != 0) {         /* x < -56*ln2, return -1.0 w/inexact */
```



```
                        if (x + tiny < 0.0)             /* raise inexact */
                                return tiny - one;      /* return -1 */
                }
        }

        /* argument reduction */
        if (hx > 0x3fd62e42) {                  /* if  |x| > 0.5 ln2 */
                if (hx < 0x3FF0A2B2) {          /* and |x| < 1.5 ln2 */
                        if (xsb == 0) {         /* positive number */
                                hi = x - ln2_hi;
                                lo = ln2_lo;
                                k = 1;
                        }
                        else { /* negative number */
                                hi = x + ln2_hi;
                                lo = -ln2_lo;
                                k = -1;
                        }
                }
                else {  /* |x| > 1.5 ln2 */
                        k = (int) (invln2 * x + (xsb == 0 ? 0.5 : -0.5));
                        t = k;
                        hi = x - t * ln2_hi;    /* t*ln2_hi is exact here */
                        lo = t * ln2_lo;
                }
                x = hi - lo;
                c = (hi - x) - lo; /* still at |x| > 0.5 ln2 */
        }
        else if (hx < 0x3c900000) {             /* when |x|<2**-54, return x */
                t = huge + x;           /* return x w/inexact when x != 0 */
                return x - (t - (huge + x));
        }
        else    /* |x| <= 0.5 ln2 */
                k = 0;

        /* x is now in primary range */
        hfx = 0.5 * x;
        hxs = x * hfx;
        r1 = one + hxs * (Q1 + hxs * (Q2 + hxs * (Q3 + hxs * (Q4 + hxs * Q5))));
        t = 3.0 - r1 * hfx;
        e = hxs * ((r1 - t) / (6.0 - x * t));
        if (k == 0) /* |x| <= 0.5 ln2 */
                return x - (x * e - hxs);
        else {      /* |x| > 0.5 ln2 */
                e = (x * (e - c) - c);
                e -= hxs;
                if (k == -1)
                        return 0.5 * (x - e) - 0.5;
                if (k == 1) {
                        if (x < -0.25)
                                return -2.0 * (e - (x + 0.5));
                        else
                                return one + 2.0 * (x - e);
                }
                if (k <= -2 || k > 56) {        /* suffice to return exp(x)-1 */
                        y = one - (e - x);
                        ((int *) &y)[HIWORD] += k << 20;
                        return y - one;
                }
                t = one;
                if (k < 20) {
                        ((int *) &t)[HIWORD] = 0x3ff00000 - (0x200000 >> k);
                                                        /* t = 1 - 2^-k */
                        y = t - (e - x);
                        ((int *) &y)[HIWORD] += k << 20;
                }
```

```
256                 else {
257                         ((int *) &t)[HIWORD] = (0x3ff - k) << 20; /* 2^-k */
258                         y = x - (e + t);
259                         y += one;
260                         ((int *) &y)[HIWORD] += k << 20;
261                 }
262         }
263         return y;
264 }
```

****
1203 Sat May 10 12:08:52 2014
new/usr/src/lib/libm/common/C/fabs.c
patch01 - 693 import Sun Devpro Math Library
****

```
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#pragma weak fabs = __fabs

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_macros.h"
#include <math.h>

double
fabs(double x) {
        int *px = (int *) &x;

        px[HIWORD] &= ~0x80000000;
        return x;
}
```

```
**********************************************************
    1730 Sat May 10 12:08:52 2014
new/usr/src/lib/libm/common/C/floor.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak floor = __floor

/*
 * floor(x) returns the biggest integral value less than or equal to x.
 * NOTE: floor(x) returns result with the same sign as x's, including 0.
 *
 * Modified 8/4/04 for performance.
 */

#include "libm.h"

static const double
        zero = 0.0,
        one = 1.0,
        two52 = 4503599627370496.0;

double
floor(double x) {
        double  t, w;
        int     hx, lx, ix;

        hx = ((int *)&x)[HIWORD];
        lx = ((int *)&x)[LOWORD];
        ix = hx & ~0x80000000;
        if (ix >= 0x43300000)   /* return x if |x| >= 2^52, or x is NaN */
                return (x * one);
        t = (hx >= 0)? two52 : -two52;
        w = x + t;
        t = w - t;
        if (ix < 0x3ff00000) {
                if ((ix | lx) == 0)
                        return (x);
                else
```



```
                        return ((hx < 0)? -one : zero);
        }
        return ((t <= x)? t : t - one);
}
```

```
**********************************************************
    3207 Sat May 10 12:08:52 2014
new/usr/src/lib/libm/common/C/fmod.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak fmod = __fmod

#include "libm.h"

static const double zero = 0.0;

/*
 * The following implementation assumes fast 64-bit integer arith-
 * metic.  This is fine for sparc because we build libm in v8plus
 * mode.  It's also fine for sparcv9 and amd64, although we have
 * assembly code on amd64.  For x86, it would be better to use
 * 32-bit code, but we have assembly for x86, too.
 */
double
fmod(double x, double y) {
        double          w;
        long long       hx, ix, iy, iz;
        int             nd, k, ny;

        hx = *(long long *)&x;
        ix = hx & ~0x8000000000000000ull;
        iy = *(long long *)&y & ~0x8000000000000000ull;

        /* handle special cases */
        if (iy == 0ll)
                return (_SVID_libm_err(x, y, 27));

        if (ix >= 0x7ff0000000000000ll || iy > 0x7ff0000000000000ll)
                return ((x * y) * zero);

        if (ix <= iy)
                return ((ix < iy)? x : x * zero);
```



```
        /*
         * Set:
         *      ny = true exponent of y
         *      nd = true exponent of x minus true exponent of y
         *      ix = normalized significand of x
         *      iy = normalized significand of y
         */
        ny = iy >> 52;
        k = ix >> 52;
        if (ny == 0) {
                /* y is subnormal, x could be normal or subnormal */
                ny = 1;
                while (iy < 0x0010000000000000ll) {
                        ny -= 1;
                        iy += iy;
                }
                nd = k - ny;
                if (k == 0) {
                        nd += 1;
                        while (ix < 0x0010000000000000ll) {
                                nd -= 1;
                                ix += ix;
                        }
                } else {
                        ix = 0x0010000000000000ll | (ix & 0x000fffffffffffll);
                }
        } else {
                /* both x and y are normal */
                nd = k - ny;
                ix = 0x0010000000000000ll | (ix & 0x000fffffffffffll);
                iy = 0x0010000000000000ll | (iy & 0x000fffffffffffll);
        }

        /* perform fixed point mod */
        while (nd--) {
                iz = ix - iy;
                if (iz >= 0)
                        ix = iz;
                ix += ix;
        }
        iz = ix - iy;
        if (iz >= 0)
                ix = iz;

        /* convert back to floating point and restore the sign */
        if (ix == 0ll)
                return (x * zero);
        while (ix < 0x0010000000000000ll) {
                ix += ix;
                ny -= 1;
        }
        while (ix > 0x0020000000000000ll) {     /* XXX can this ever happen? */
                ny += 1;
                ix >>= 1;
        }
        if (ny <= 0) {
                /* result is subnormal */
                k = -ny + 1;
                ix >>= k;
                *(long long *)&w = (hx & 0x8000000000000000ull) | ix;
                return (w);
        }
        *(long long *)&w = (hx & 0x8000000000000000ull) |
            ((long long)ny << 52) | (ix & 0x000fffffffffffll);
        return (w);
}
```

```
**********************************************************
    1333 Sat May 10 12:08:52 2014
new/usr/src/lib/libm/common/C/gamma.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak gamma = __gamma

#include "libm.h"

extern int signgam;

double
gamma(double x) {
        double  g;

        if (!finite(x))
                return (x * x);

        g = rint(x);
        if (x == g && x <= 0.0) {
                signgam = 1;
                return (_SVID_libm_err(x, x, 41));
        }

        g = __k_lgamma(x, &signgam);
        if (!finite(g))
            g = _SVID_libm_err(x, x, 40);
        return (g);
}
```

****
1126 Sat May 10 12:08:52 2014
new/usr/src/lib/libm/common/C/gamma_r.c
patch01 - 693 import Sun Devpro Math Library
****

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 */

#pragma weak gamma_r = __gamma_r

#include "libm.h"

double
gamma_r(double x, int *signgamp) {
        return (lgamma_r(x, signgamp));
}
```

```
**********************************************************
    5510 Sat May 10 12:08:52 2014
new/usr/src/lib/libm/common/C/hypot.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak hypot = __hypot
#endif

/* INDENT OFF */
/*
 * Hypot(x, y)
 * by K.C. Ng for SUN 4.0 libm, updated 3/11/2003.
 * Method :
 * A. When rounding is rounded-to-nearest:
 *      If z = x * x + y * y has error less than sqrt(2) / 2 ulp than
 *      sqrt(z) has error less than 1 ulp.
 *      So, compute sqrt(x*x+y*y) with some care as follows:
 *      Assume x > y > 0;
 *      1. Check whether save and set rounding to round-to-nearest
 *      2. if x > 2y  use
 *              xh*xh+(y*y+((x-xh)*(x+xh))) for x*x+y*y
 *      where xh = x with lower 32 bits cleared;  else
 *      3. if x <= 2y use
 *              x2h*yh+((x-y)*(x-y)+(x2h*(y-yh)+(x2-x2h)*y))
 *      where x2 = 2*x, x2h = 2x with lower 32 bits cleared, yh = y with
 *      lower 32 bits chopped.
 *
 * B. When rounding is not rounded-to-nearest:
 *      The following (magic) formula will yield an error less than 1 ulp.
 *      z = sqrt(x * x + y * y)
 *              hypot(x, y) = x + (y / ((x + z) / y))
 *
 * NOTE: DO NOT remove parenthsis!
 *
 * Special cases:
 *      hypot(x, y) is INF if x or y is +INF or -INF; else
 *      hypot(x, y) is NAN if x or y is NAN.
 *
 * Accuracy:
 *      hypot(x, y) returns sqrt(x^2+y^2) with error less than 1 ulps
 *      (units in the last place)
 */

#include "libm.h"

static const double
        zero = 0.0,
        onep1u = 1.00000000000000022204e+00,    /* 0x3ff00000 1 = 1+2**-52 */
        twom53 = 1.11022302462515654042e-16,    /* 0x3ca00000 0 = 2**-53 */
        twom768 = 6.44114876959713308e-232,    /* 2^-768 */
        two768  = 1.55251809230070893 5e+231;    /* 2^768 */

/* INDENT ON */

double
hypot(double x, double y) {
        double xh, yh, w, ax, ay;
        int i, j, nx, ny, ix, iy, iscale = 0;
        unsigned lx, ly;

        ix = ((int *) &x)[HIWORD] & ~0x80000000;
        lx = ((int *) &x)[LOWORD];
        iy = ((int *) &y)[HIWORD] & ~0x80000000;
        ly = ((int *) &y)[LOWORD];
/*
 * Force ax = |x| ~>~ ay = |y|
 */
        if (iy > ix) {
                ax = fabs(y);
                ay = fabs(x);
                i = ix;
                ix = iy;
                iy = i;
                i = lx;
                lx = ly;
                ly = i;
        } else {
                ax = fabs(x);
                ay = fabs(y);
        }
        nx = ix >> 20;
        ny = iy >> 20;
        j  = nx - ny;
/*
 * x >= 2^500 (x*x or y*y may overflow)
 */
        if (nx >= 0x5f3) {
                if (nx == 0x7ff) {      /* inf or NaN, signal of sNaN */
                        if (((ix - 0x7ff00000) | lx) == 0)
                                return (ax == ay ? ay : ax);
                        else if (((iy - 0x7ff00000) | ly) == 0)
                                return (ay == ax ? ax : ay);
                        else
                                return (ax * ay);       /* + -> * for Cheetah */
                } else if (j > 32) {    /* x >> y */
                        if (j <= 53)
                                ay *= twom53;
                        ax += ay;
                        if (((int *) &ax)[HIWORD] == 0x7ff00000)
                                ax = _SVID_libm_err(x, y, 4);
                        return (ax);
                }
```

```
128                 ax *= twom768;
129                 ay *= twom768;
130                 iscale = 2;
131                 ix -= 768 << 20;
132                 iy -= 768 << 20;
133         }
134 /*
135  * y < 2^-450 (x*x or y*y may underflow)
136  */
137         else if (ny < 0x23d) {
138                 if ((ix | lx) == 0)
139                         return (ay);
140                 if ((iy | ly) == 0)
141                         return (ax);
142                 if (j > 53)             /* x >> y */
143                         return (ax + ay);
144                 iscale = 1;
145                 ax *= two768;
146                 ay *= two768;
147                 if (nx == 0) {
148                         if (ax == zero) /* guard subnormal flush to zero */
149                                 return (ax);
150                         ix = ((int *) &ax)[HIWORD];
151                 } else
152                         ix += 768 << 20;
153                 if (ny == 0) {
154                         if (ay == zero) /* guard subnormal flush to zero */
155                                 return (ax * twom768);
156                         iy = ((int *) &ay)[HIWORD];
157                 } else
158                         iy += 768 << 20;
159                 j = (ix >> 20) - (iy >> 20);
160                 if (j > 32) {           /* x >> y */
161                         if (j <= 53)
162                                 ay *= twom53;
163                         return ((ax + ay) * twom768);
164                 }
165         } else if (j > 32) {            /* x >> y */
166                 if (j <= 53)
167                         ay *= twom53;
168                 return (ax + ay);
169         }
170 /*
171  * Medium range ax and ay with max{|ax/ay|,|ay/ax|} bounded by 2^32
172  * First check rounding mode by comparing onep1u*onep1u with onep1u+twom53.
173  * Make sure the computation is done at run-time.
174  */
175         if (((lx | ly) << 5) == 0) {
176                 ay = ay * ay;
177                 ax += ay / (ax + sqrt(ax * ax + ay));
178         } else
179         if (onep1u * onep1u != onep1u + twom53) {
180         /* round-to-zero, positive, negative mode */
181         /* magic formula with less than an ulp error */
182                 w = sqrt(ax * ax + ay * ay);
183                 ax += ay / ((ax + w) / ay);
184         } else {
185         /* round-to-nearest mode */
186                 w = ax - ay;
187                 if (w > ay) {
188                         ((int *) &xh)[HIWORD] = ix;
189                         ((int *) &xh)[LOWORD] = 0;
190                         ay = ay * ay + (ax - xh) * (ax + xh);
191                         ax = sqrt(xh * xh + ay);
192                 } else {
193                         ax = ax + ax;
```



```
194                         ((int *) &xh)[HIWORD] = ix + 0x00100000;
195                         ((int *) &xh)[LOWORD] = 0;
196                         ((int *) &yh)[HIWORD] = iy;
197                         ((int *) &yh)[LOWORD] = 0;
198                         ay = w * w + ((ax - xh) * yh + (ay - yh) * ax);
199                         ax = sqrt(xh * yh + ay);
200                 }
201         }
202         if (iscale > 0) {
203                 if (iscale == 1)
204                         ax *= twom768;
205                 else {
206                         ax *= two768;   /* must generate side effect here */
207                         if (((int *) &ax)[HIWORD] == 0x7ff00000)
208                                 ax = _SVID_libm_err(x, y, 4);
209                 }
210         }
211         return (ax);
212 }
```

```
**********************************************************
    2307 Sat May 10 12:08:53 2014
new/usr/src/lib/libm/common/C/ilogb.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak ilogb = __ilogb
#endif

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */

#if defined(USE_FPSCALE) || defined(__x86)
static const double two52 = 4503599627370496.0;
#else
/*
 * v: high part of a non-zero subnormal |x|; w: low part of |x|
 */
static int
ilogb_subnormal(unsigned v, unsigned w) {
        int r = -1022 - 52;

        if (v)
                r += 32;
        else
                v = w;
        if (v & 0xffff0000)
                r += 16, v >>= 16;
        if (v & 0xff00)
                r += 8, v >>= 8;
        if (v & 0xf0)
                r += 4, v >>= 4;
        v <<= 1;
        return (r + ((0xffffaa50 >> v) & 0x3));
}
#endif  /* defined(USE_FPSCALE) */
```



```
static int
raise_invalid(int v) {  /* SUSv3 requires ilogb(0,+/-Inf,NaN) raise invalid */
#ifndef lint
        if ((__xpg6 & _C99SUSv3_ilogb_0InfNaN_raises_invalid) != 0) {
                static const double zero = 0.0;
                volatile double dummy;

                dummy = zero / zero;
        }
#endif
        return (v);
}

int
ilogb(double x) {
        int *px = (int *) &x, k = px[HIWORD] & ~0x80000000;

        if (k < 0x00100000) {
                if ((px[LOWORD] | k) == 0)
                        return (raise_invalid(0x80000001));
                else {
#if defined(USE_FPSCALE) || defined(__x86)
                        x *= two52;
                        return (((px[HIWORD] & 0x7ff00000) >> 20) - 1075);
#else
                        return (ilogb_subnormal(k, px[LOWORD]));
#endif
                }
        } else if (k < 0x7ff00000)
                return ((k >> 20) - 1023);
        else
                return (raise_invalid(0x7fffffff));
}
```

```
**********************************************************
    1565 Sat May 10 12:08:53 2014
new/usr/src/lib/libm/common/C/isnan.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak isnan = __isnan
#pragma weak _isnan = __isnan
#pragma weak _isnand = __isnan
#pragma weak isnand = __isnan

#include "libm.h"

/*
 * The following implementation assumes fast 64-bit integer arith-
 * metic.  This is fine for sparc because we build libm in v8plus
 * mode.  It's also fine for sparcv9 and amd64.  For x86, it would
 * be better to use 32-bit code, but we have assembly for x86.
 */
int
__isnan(double x) {
        long long       llx;

        llx = *(long long *)&x & ~0x8000000000000000ull;
        return ((unsigned long long)(0x7ff0000000000000ll - llx) >> 63);
}
```

```
**********************************************************
    8719 Sat May 10 12:08:53 2014
new/usr/src/lib/libm/common/C/j0.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
 * Floating point Bessel's function of the first and second kinds
 * of order zero: j0(x),y0(x);
 *
 * Special cases:
 *      y0(0)=y1(0)=yn(n,0) = -inf with division by zero signal;
 *      y0(-ve)=y1(-ve)=yn(n,-ve) are NaN with invalid signal.
 */

#pragma weak j0 = __j0
#pragma weak y0 = __y0

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"
#include <math.h>
#include <values.h>

#define GENERIC double
static const GENERIC
zero    = 0.0,
small   = 1.0e-5,
tiny    = 1.0e-18,
one     = 1.0,
eight   = 8.0,
invsqrtpi= 5.64189583547756286948079451560772585844le-0001,
tpi     = 0.63661977236758134307553505349005744 8;

static GENERIC pzero(GENERIC), qzero(GENERIC);
static const GENERIC r0[4] = {  /* [1.e-5, 1.28] */
  -2.50000000000000362213188089483047675553 7e-0001,
   1.09559754733483026323443385593237535330 3e-0002,
```



```
  -1.81973475046332092179918725898709808769 7e-0004,
   9.97700194680613165754421250106989393084 6e-0007,
};
static const GENERIC s0[4] = {  /* [1.e-5, 1.28] */
   1.0,
   1.86760981066295016996678236058819967374 1e-0002,
   1.59038920618156549087843082770697207420 8e-0004,
   6.52086738674258363237552014771449952272 1e-0007,
};
static const GENERIC r1[9] = {  /* [1.28,8] */
   9.99999999999999994215649558439704766094 9e-0001,
  -2.38988772273131913047683983690814373128 1e-0001,
   1.29335947613893902779127039343949364057 0e-0002,
  -2.77098564234314012216885240022856336408 2e-0004,
   2.90524157577206767808673838916962521891 2e-0006,
  -1.63684635626405259796904200926504325127 9e-0008,
   5.07230616072488477508543105905261173782 7e-0011,
  -8.18706073068406682422891477514653613911 2e-0014,
   5.42221932695994986395429786072372342384 2e-0017,
};
static const GENERIC s1[9] = {  /* [1.28,8] */
   1.0,
   1.10112277268680770276210474193207622834 9e-0002,
   6.14016931064164922341142776466914397822 8e-0005,
   2.29203587751515209797694611929321570525 0e-0007,
   6.35691042650464433455883203636221958378 9e-0010,
   1.36662632690021955504509699955394889140 1e-0012,
   2.28039958686673952289183798556048118008 8e-0015,
   2.80155982064893966527049252000483661118 7e-0018,
   2.07310108832034915976441026146635073296 8e-0021,
};

GENERIC
j0(GENERIC x) {
        GENERIC z, s,c,ss,cc,r,u,v,ox;
        int i;

        if(isnan(x)) return x*x;        /* + -> * for Cheetah */
        ox= x;
        x = fabs(x);
        if(x > 8.0){
                if(!finite(x)) return zero;
                s = sin(x);
                c = cos(x);
        /* j0(x) = sqrt(2/(pi*x))*(p0(x)*cos(x0)-q0(x)*sin(x0))
         * where x0 = x-pi/4
         *      Better formula:
         *              cos(x0) = cos(x)cos(pi/4)+sin(x)sin(pi/4)
         *                      = 1/sqrt(2) * (cos(x) + sin(x))
         *              sin(x0) = sin(x)cos(pi/4)-cos(x)sin(pi/4)
         *                      = 1/sqrt(2) * (sin(x) - cos(x))
         * To avoid cancellation, use
         *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
         * to compute the worse one.
         */
                if(x>8.9e307) { /* x+x may overflow */
                        ss = s-c;
                        cc = s+c;
                } else if(signbit(s)!=signbit(c)) {
                        ss = s - c;
                        cc = -cos(x+x)/ss;
                } else {
                        cc = s + c;
                        ss = -cos(x+x)/cc;
                }
        /*
```

```
128          * j0(x) = 1/sqrt(pi) * (P(0,x)*cc - Q(0,x)*ss) / sqrt(x)
129          * y0(x) = 1/sqrt(pi) * (P(0,x)*ss + Q(0,x)*cc) / sqrt(x)
130          */
131                 if(x>1.0e40) z= (invsqrtpi*cc)/sqrt(x);
132                 else {
133                     u = pzero(x); v = qzero(x);
134                     z = invsqrtpi*(u*cc-v*ss)/sqrt(x);
135                 }
136         /* force to pass SVR4 even the result is wrong (sign) */
137                 if (x > X_TLOSS)
138                     return _SVID_libm_err(ox,z,34);
139                 else
140                     return z;
141         }
142         if(x<=small) {
143             if(x<=tiny) return one-x;
144             else return one-x*x*0.25;
145         }
146         z = x*x;
147         if(x<=1.28) {
148             r =  r0[0]+z*(r0[1]+z*(r0[2]+z*r0[3]));
149             s =  s0[0]+z*(s0[1]+z*(s0[2]+z*s0[3]));
150             return one + z*(r/s);
151         } else {
152             for(r=r1[8],s=s1[8],i=7;i>=0;i--) {
153                 r = r*z + r1[i];
154                 s = s*z + s1[i];
155             }
156             return(r/s);
157         }
158 }

160 static const GENERIC u0[13] = {
161   -7.38042951086872252675472302070431764194 1e-0002,
162    1.77260710268486992430145966304987429481 4e-0001,
163   -1.52437066654271382860407809097079935630 6e-0002,
164    4.65081910069389175714377155762992459191 5e-0004,
165   -7.12576887233952897503631610871823994602 2e-0006,
166    6.41101700165610459832756500477151525714 6e-0008,
167   -3.69427515743303255302124681237925878166 5e-0010,
168    1.43436454420626662425282088964844526384 2e-0012,
169   -3.85206473185993645589503628687413989686 1e-0015,
170    7.18205289972613838173994588191487457969 6e-0018,
171   -9.06055657461967756732374119407979798720 0e-0021,
172    7.12443546740886051526555221731123051145 5e-0024,
173   -2.70972677463639761532881312171543204477 1e-0027,
174 };
175 static const GENERIC v0[5] = {
176    1.0,
177    4.67867893151254900258770247734921488647 5e-0003,
178    9.48682895552994853482280082949756517898 5e-0006,
179    1.00149592915886164665901084413668245490 6e-0008,
180    4.72533811625602166020444323568535859361 1e-0012,
181 };

183 GENERIC
184 y0(GENERIC x) {
185         GENERIC z, /* d, */ s,c,ss,cc,u,v;
186         int i;

188         if(isnan(x)) return x*x;        /* + -> * for Cheetah */
189         if(x <= zero){
190                 if(x==zero)
191                     /* d= -one/(x-x); */
192                     return _SVID_libm_err(x,x,8);
193                 else
```



```
194                     /* d = zero/(x-x); */
195                     return _SVID_libm_err(x,x,9);
196         }
197         if(x > 8.0){
198                 if(!finite(x)) return zero;
199                 s = sin(x);
200                 c = cos(x);
201         /* j0(x) = sqrt(2/(pi*x))*(p0(x)*cos(x0)-q0(x)*sin(x0))
202          * where x0 = x-pi/4
203          *      Better formula:
204          *              cos(x0) = cos(x)cos(pi/4)+sin(x)sin(pi/4)
205          *                      = 1/sqrt(2) * (cos(x) + sin(x))
206          *              sin(x0) = sin(x)cos(pi/4)-cos(x)sin(pi/4)
207          *                      = 1/sqrt(2) * (sin(x) - cos(x))
208          * To avoid cancellation, use
209          *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
210          * to compute the worse one.
211          */
212                 if(x>8.9e307) { /* x+x may overflow */
213                         ss = s-c;
214                         cc = s+c;
215                 } else if(signbit(s)!=signbit(c)) {
216                         ss = s - c;
217                         cc = -cos(x+x)/ss;
218                 } else {
219                         cc = s + c;
220                         ss = -cos(x+x)/cc;
221                 }
222         /*
223          * j0(x) = 1/sqrt(pi*x) * (P(0,x)*cc - Q(0,x)*ss)
224          * y0(x) = 1/sqrt(pi*x) * (P(0,x)*ss + Q(0,x)*cc)
225          */
226                 if(x>1.0e40)
227                     z = (invsqrtpi*ss)/sqrt(x);
228                 else
229                     z =  invsqrtpi*(pzero(x)*ss+qzero(x)*cc)/sqrt(x);
230                 if (x > X_TLOSS)
231                     return _SVID_libm_err(x,z,35);
232                 else
233                     return z;

235         }
236         if(x<=tiny) {
237             return(u0[0] + tpi*log(x));
238         }
239         z = x*x;
240         for(u=u0[12],i=11;i>=0;i--) u = u*z + u0[i];
241         v = v0[0]+z*(v0[1]+z*(v0[2]+z*(v0[3]+z*v0[4])));
242         return(u/v + tpi*(j0(x)*log(x)));
243 }

245 static const GENERIC pr[7] = {  /* [8 -- inf]  pzero 6550 */
246         .48613441833860527213912384 47e5,
247         .13776625494071122781334389 45e6,
248         .12224663640882897318691140 04e6,
249         .41070700843151761355833533 74e5,
250         .50260738018606371258890399 15e4,
251         .17831936591254796545415424 19e3,
252         .88010344055383421691677564 e0,
253 };
254 static const GENERIC ps[7] = {  /* [8 -- inf] pzero 6550 */
255         .48613441833860527214140370 58e5,
256         .13781966326303846704775826 99e6,
257         .12239671853410065427489367 87e6,
258         .41201502437953536399958626 17e5,
259         .50682711810535463924901843 53e4,
```

```
260         .18298179054727699605356716 64e3,
261         1.0,
262 };
263 static const GENERIC huge    = 1.0e10;

265 static GENERIC
266 pzero(GENERIC x) {
267         GENERIC s,r,t,z;
268         int i;
269         if(x>huge) return one;
270         t = eight/x; z = t*t;
271         r = pr[5]+z*pr[6];
272         s = ps[5]+z;
273         for(i=4;i>=0;i--) {
274             r = r*z + pr[i];
275             s = s*z + ps[i];
276         }
277         return r/s;
278 }

280 static const GENERIC qr[7] = {  /* [8 -- inf]  qzero 6950 */
281         -.17312109957010685391856119 51e3,
282         -.55225591659361669612352406 13e3,
283         -.56049356066373465906145296 13e3,
284         -.22004303002260093794773650 11e3,
285         -.32386935537564884977129674 6e2,
286         -.14294979207907956223499258 e1,
287         -.83469037410238498815891 8e-2,
288 };
289 static const GENERIC qs[7] = {  /* [8 -- inf] qzero 6950 */
290         .11079750372486838653267096 45e5,
291         .35445816806270826746514718 73e5,
292         .36191189379183941321790190 59e5,
293         .14398955635653980074714858 22e5,
294         .21902770233443639559302262 34e4,
295         .10669515702040798613750168 2e3,
296         1.0,
297 };

299 static GENERIC
300 qzero(GENERIC x) {
301         GENERIC s,r,t,z;
302         int i;
303         if(x>huge) return -0.125/x;
304         t = eight/x; z = t*t;
305         r = qr[5]+z*qr[6];
306         s = qs[5]+z;
307         for(i=4;i>=0;i--) {
308             r = r*z + qr[i];
309             s = s*z + qs[i];
310         }
311         return t*(r/s);
312 }
```

```
**********************************************************
    9398 Sat May 10 12:08:53 2014
new/usr/src/lib/libm/common/C/j1.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
 * floating point Bessel's function of the first and second kinds
 * of order zero: j1(x),y1(x);
 *
 * Special cases:
 *      y0(0)=y1(0)=yn(n,0) = -inf with division by zero signal;
 *      y0(-ve)=y1(-ve)=yn(n,-ve) are NaN with invalid signal.
 */

#pragma weak j1 = __j1
#pragma weak y1 = __y1

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"
#include <math.h>
#include <values.h>

#define GENERIC double
static const GENERIC
zero    = 0.0,
small   = 1.0e-5,
tiny    = 1.0e-20,
one     = 1.0,
invsqrtpi= 5.64189583547756286948079451560772585844 1e-0001,
tpi     = 0.63661977236758134307553505349005744 8;

static GENERIC pone(GENERIC), qone(GENERIC);
static const GENERIC r0[4] = {
  -6.2500000000000022030532009814132189495 48e-0002,
   1.6009984556400729013216051019815012637 62e-0003,
  -1.9638888159483137585525118843901628649 30e-0005,
```



```
   8.2639173410935497597813397134182016209 98e-0008,
};
static const GENERIC s0[7] = {
   1.0e0,
   1.6050691376430042423953568517978737669 27e-0002,
   1.1494546232512999964285002495090984993 83e-0004,
   3.8497016737352609703796818079108523278 25e-0007,
};
static const GENERIC r1[12] = {
   4.9999999999999999955174088943404854717 24e-0001,
  -6.0038250281204756848353845199454680754 23e-0002,
   2.3017198992633218283883444619953554198 32e-0003,
  -4.2084948692388929348595252216540403040 68e-0005,
   4.3777451351888377830315400297002824433 88e-0007,
  -2.8541067556786243351453642267356777541 79e-0009,
   1.2340028654439520243329439013237984136 89e-0011,
  -3.6454984370397910589512735088381771343 10e-0014,
   7.4043205960717974599253771037878378144 22e-0017,
  -1.0094574482775222752628083985170244390 84e-0019,
   8.5201583558248197969687714188010199305 85e-0023,
  -3.4581599260811632744838546146010913614 24e-0026,
};
static const GENERIC s1[5] = {
   1.0e0,
   4.9234994375904848790811385889989863033 06e-0003,
   1.0543894892121841564996695350197668845 2e-0005,
   1.1807683731061665270482403648720438160 50e-0008,
   5.9426657434760993553232457076806485885 40e-0012,
};

GENERIC
j1(GENERIC x) {
        GENERIC z, d, s,c,ss,cc,r;
        int i, sgn;

        if(!finite(x)) return one/x;
        sgn = signbit(x);
        x = fabs(x);
        if(x > 8.00){
                s = sin(x);
                c = cos(x);
        /* j1(x) = sqrt(2/(pi*x))*(p1(x)*cos(x0)-q1(x)*sin(x0))
         * where x0 = x-3pi/4
         *      Better formula:
         *              cos(x0) = cos(x)cos(3pi/4)+sin(x)sin(3pi/4)
         *                      =  1/sqrt(2) * (sin(x) - cos(x))
         *              sin(x0) = sin(x)cos(3pi/4)-cos(x)sin(3pi/4)
         *                      = -1/sqrt(2) * (cos(x) + sin(x))
         * To avoid cancellation, use
         *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
         * to compute the worse one.
         */
                if(x>8.9e307) { /* x+x may overflow */
                        ss = -s-c;
                        cc =  s-c;
                } else if(signbit(s)!=signbit(c)) {
                        cc = s - c;
                        ss = cos(x+x)/cc;
                } else {
                        ss = -s-c;
                        cc = cos(x+x)/ss;
                }
        /*
         * j1(x) = 1/sqrt(pi*x) * (P(1,x)*cc - Q(1,x)*ss)
         * y1(x) = 1/sqrt(pi*x) * (P(1,x)*ss + Q(1,x)*cc)
         */
```

```
128                 if(x>1.0e40)
129                     d = (invsqrtpi*cc)/sqrt(x);
130                 else
131                     d =  invsqrtpi*(pone(x)*cc-qone(x)*ss)/sqrt(x);
132                 if (x > X_TLOSS) {
133                     if(sgn!=0) {d = -d; x = -x;}
134                     return _SVID_libm_err(x,d,36);
135                 } else
136                     if(sgn==0) return d; else return -d;
137         }
138         if(x<=small) {
139             if(x<=tiny) d = 0.5*x;
140             else d =  x*(0.5-x*x*0.125);
141             if(sgn==0) return d; else return -d;
142         }
143         z = x*x;
144         if(x<1.28) {
145             r = r0[3];
146             s = s0[3];
147             for(i=2;i>=0;i--) {
148                 r = r*z + r0[i];
149                 s = s*z + s0[i];
150             }
151             d = x*0.5+x*(z*(r/s));
152         } else {
153             r = r1[11];
154             for(i=10;i>=0;i--) r = r*z + r1[i];
155             s = s1[0]+z*(s1[1]+z*(s1[2]+z*(s1[3]+z*s1[4])));
156             d = x*(r/s);
157         }
158         if(sgn==0) return d; else return -d;
159 }

161 static const GENERIC u0[4] = {
162   -1.960570906462389461018983259589655961560e-0001,
163    4.931824118350661953459180060007970291139e-0002,
164   -1.626975871565393656845930125424683008677e-0003,
165    1.359657517926394132692884168082224258360e-0005,
166 };
167 static const GENERIC v0[5] = {
168    1.0e0,
169    2.565807214838390835108224713630901653793e-0002,
170    3.374175208978404268650522752520906231508e-0004,
171    2.840368571306070719539936935220728843177e-0006,
172    1.396387402048998277638900944415752207592e-0008,
173 };
174 static const GENERIC u1[12] = {
175   -1.960570906462389473336339614647555351626e-0001,
176    5.336268030335074494231369159933012844735e-0002,
177   -2.684137504382748094149184541866332033280e-0003,
178    5.737671618979185736981543498580051903060e-0005,
179   -6.642696350686335339171171785557663224892e-0007,
180    4.692417922568160354012347591960362101664e-0009,
181   -2.161728635907789319335231338621412258355e-0011,
182    6.727353419738316107197644431844194668702e-0014,
183   -1.427502986803861372125234355906790573422e-0016,
184    2.020392498726806769468143219616642940371e-0019,
185   -1.761371948595104156753045457888272716340e-0022,
186    7.352828391941157905175042420249225115816e-0026,
187 };
188 static const GENERIC v1[5] = {
189    1.0e0,
190    5.029187436727947764916247076102283399442e-0003,
191    1.102693095808242775074856548927801750627e-0005,
192    1.268035774543174837829534603830227216291e-0008,
193    6.579416271766610825192542295821308730206e-0012,
```



```
194 };


197 GENERIC
198 y1(GENERIC x) {
199         GENERIC z, d, s,c,ss,cc,u,v;
200         int i;

202         if(isnan(x)) return x*x;        /* + -> * for Cheetah */
203         if(x <= zero){
204                 if(x==zero)
205                     /* return -one/zero;  */
206                     return _SVID_libm_err(x,x,10);
207                 else
208                     /* return zero/zero; */
209                     return _SVID_libm_err(x,x,11);
210         }
211         if(x > 8.0){
212                 if(!finite(x)) return zero;
213                 s = sin(x);
214                 c = cos(x);
215         /* j1(x) = sqrt(2/(pi*x))*(p1(x)*cos(x0)-q1(x)*sin(x0))
216          * where x0 = x-3pi/4
217          *      Better formula:
218          *              cos(x0) = cos(x)cos(3pi/4)+sin(x)sin(3pi/4)
219          *                      =  1/sqrt(2) * (sin(x) - cos(x))
220          *              sin(x0) = sin(x)cos(3pi/4)-cos(x)sin(3pi/4)
221          *                      = -1/sqrt(2) * (cos(x) + sin(x))
222          * To avoid cancellation, use
223          *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
224          * to compute the worse one.
225          */
226                 if(x>8.9e307) { /* x+x may overflow */
227                         ss = -s-c;
228                         cc =  s-c;
229                 } else if(signbit(s)!=signbit(c)) {
230                         cc = s - c;
231                         ss = cos(x+x)/cc;
232                 } else {
233                         ss = -s-c;
234                         cc = cos(x+x)/ss;
235                 }
236         /*
237          * j1(x) = 1/sqrt(pi*x) * (P(1,x)*cc - Q(1,x)*ss)
238          * y1(x) = 1/sqrt(pi*x) * (P(1,x)*ss + Q(1,x)*cc)
239          */
240                 if(x>1.0e91)
241                     d =  (invsqrtpi*ss)/sqrt(x);
242                 else
243                     d = invsqrtpi*(pone(x)*ss+qone(x)*cc)/sqrt(x);
244                 if (x > X_TLOSS)
245                     return _SVID_libm_err(x,d,37);
246                 else
247                     return d;
248         }
249         if(x<=tiny) {
250            return(-tpi/x);
251         }
252         z = x*x;
253         if(x<1.28) {
254             u = u0[3]; v = v0[3]+z*v0[4];
255             for(i=2;i>=0;i--){
256                 u = u*z + u0[i];
257                 v = v*z + v0[i];
258             }
259         } else {
```

```
260             for (u = u1[11], i=10;i>=0;i--) u = u*z+u1[i];
261             v = v1[0]+z*(v1[1]+z*(v1[2]+z*(v1[3]+z*v1[4])));
262         }
263         return(x*(u/v) + tpi*(j1(x)*log(x)-one/x));
264 }

266 static const GENERIC pr0[6] = {
267         -.44357578167941278571147207 94e7,
268         -.99422465050776411956583778 99e7,
269         -.66033732483649391092552454 34e7,
270         -.15235293511811373832551057 22e7,
271         -.10982405543459346727374131 39e6,
272         -.16116166443246101164774128 98e4,
273 };
274 static const GENERIC ps0[6] = {
275         -.44357578167941278568280169 62e7,
276         -.99341243899345856589675563 09e7,
277         -.65853394797230870728269150 69e7,
278         -.15118095066341608816445463 58e7,
279         -.10726385991103820119030638 67e6,
280         -.14550094401904961824535650 68e4,
281 };
282 static const GENERIC huge    = 1.0e10;

284 static GENERIC
285 pone(GENERIC x) {
286         GENERIC s,r,t,z;
287         int i;
288         /* assume x > 8 */
289         if(x>huge) return one;
290         t = 8.0/x; z = t*t;
291             r = pr0[5]; s = ps0[5]+z;
292             for(i=4;i>=0;i--) {
293                 r = z*r + pr0[i];
294                 s = z*s + ps0[i];
295             }
296         return r/s;
297 }


300 static const GENERIC qr0[6] = {
301         0.33220913409857223518597044 42e5,
302         0.85145160675335701965550011 71e5,
303         0.66178836581270835179399921 66e5,
304         0.18494262873223866796520098 19e5,
305         0.17063754290207680020612835 46e4,
306         0.35265133846636032185921755 80e2,
307 };
308 static const GENERIC qs0[6] = {
309         0.70871281941028743573775024 72e6,
310         0.18194580422439972989245538 39e7,
311         0.14194606696037208928557552 53e7,
312         0.40029443582266975117086108 13e6,
313         0.37890229745772202641429522 56e5,
314         0.86383677696049909674755171 83e3,
315 };

317 static GENERIC
318 qone(GENERIC x) {
319         GENERIC s,r,t,z;
320         int i;
321         if(x>huge) return 0.375/x;
322         t = 8.0/x; z = t*t;
323         /* assume x > 8 */
324             r = qr0[5]; s = qs0[5]+z;
325             for(i=4;i>=0;i--) {
```



```
326                 r = z*r + qr0[i];
327                 s = z*s + qs0[i];
328             }
329         return t*(r/s);
330 }
```

```
**********************************************************
    7265 Sat May 10 12:08:53 2014
new/usr/src/lib/libm/common/C/jn.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

#pragma weak jn = __jn
#pragma weak yn = __yn

/*
 * floating point Bessel's function of the 1st and 2nd kind
 * of order n: jn(n,x),yn(n,x);
 *
 * Special cases:
 *      y0(0)=y1(0)=yn(n,0) = -inf with division by zero signal;
 *      y0(-ve)=y1(-ve)=yn(n,-ve) are NaN with invalid signal.
 * Note 2. About jn(n,x), yn(n,x)
 *      For n=0, j0(x) is called,
 *      for n=1, j1(x) is called,
 *      for n<x, forward recursion us used starting
 *      from values of j0(x) and j1(x).
 *      for n>x, a continued fraction approximation to
 *      j(n,x)/j(n-1,x) is evaluated and then backward
 *      recursion is used starting from a supposed value
 *      for j(n,x). The resulting value of j(0,x) is
 *      compared with the actual value to correct the
 *      supposed value of j(n,x).
 *
 *      yn(n,x) is similar in all respects, except
 *      that forward recursion is used for all
 *      values of n>1.
 *
 */

#include "libm.h"
#include <float.h>      /* DBL_MIN */
#include <values.h>     /* X_TLOSS */
```



```
#include "xpg6.h"       /* __xpg6 */

#define GENERIC double

static const GENERIC
        invsqrtpi = 5.64189583547756286948079451560772585844le-0001,
        two     = 2.0,
        zero    = 0.0,
        one     = 1.0;

GENERIC
jn(int n, GENERIC x) {
        int i, sgn;
        GENERIC a, b, temp = 0;
        GENERIC z, w, ox, on;

    /* J(-n,x) = (-1)^n * J(n, x), J(n, -x) = (-1)^n * J(n, x)
     * Thus, J(-n,x) = J(n,-x)
     */
        ox = x; on = (GENERIC)n;
        if(n<0){
                n = -n;
                x = -x;
        }
        if(isnan(x)) return x*x;        /* + -> * for Cheetah */
        if (!((int) _lib_version == libm_ieee ||
                (__xpg6 & _C99SUSv3_math_errexcept) != 0)) {
            if(fabs(x) > X_TLOSS) return _SVID_libm_err(on,ox,38);
        }
        if(n==0) return(j0(x));
        if(n==1) return(j1(x));
        if((n&1)==0)
                sgn=0;                  /* even n */
        else
                sgn = signbit(x);       /* old n  */
        x = fabs(x);
        if(x == zero||!finite(x)) b = zero;
        else if((GENERIC)n<=x) {        /* Safe to use
                                           J(n+1,x)=2n/x *J(n,x)-J(n-1,x)
                                         */
            if(x>1.0e91) {      /* x >> n**2
                                    Jn(x) = cos(x-(2n+1)*pi/4)*sqrt(2/x*pi)
                                    Yn(x) = sin(x-(2n+1)*pi/4)*sqrt(2/x*pi)
                                    Let s=sin(x), c=cos(x),
                                        xn=x-(2n+1)*pi/4, sqt2 = sqrt(2),then

                                           n    sin(xn)*sqt2    cos(xn)*sqt2
                                        ----------------------------------
                                           0     s-c             c+s
                                           1    -s-c            -c+s
                                           2    -s+c            -c-s
                                           3     s+c             c-s
                                 */
                switch(n&3) {
                    case 0: temp =  cos(x)+sin(x); break;
                    case 1: temp = -cos(x)+sin(x); break;
                    case 2: temp = -cos(x)-sin(x); break;
                    case 3: temp =  cos(x)-sin(x); break;
                }
                b = invsqrtpi*temp/sqrt(x);
            } else {
                a = j0(x);
                b = j1(x);
                for(i=1;i<n;i++){
                    temp = b;
                    b = b*((GENERIC)(i+i)/x) - a; /* avoid underflow */
```

```
127                     a = temp;
128                 }
129             }
130         } else {
131             if(x<1e-9) {        /* use J(n,x) = 1/n!*(x/2)^n */
132                 b = pow(0.5*x,(GENERIC) n);
133                 if (b!=zero) {
134                     for(a=one,i=1;i<=n;i++) a *= (GENERIC)i;
135                     b = b/a;
136                 }
137             } else {
138                 /* use backward recurrence */
139                 /*                         x      x^2      x^2
140                  *  J(n,x)/J(n-1,x) =  ----   ------   ------   .....
141                  *                         2n  - 2(n+1) - 2(n+2)
142                  *
143                  *                         1      1        1
144                  *  (for large x)   =  ----  ------   ------   .....
145                  *                         2n   2(n+1)   2(n+2)
146                  *                         -- - ------ - ------ -
147                  *                          x     x         x
148                  *
149                  * Let w = 2n/x and h=2/x, then the above quotient
150                  * is equal to the continued fraction:
151                  *                   1
152                  *      = -----------------------
153                  *                  1
154                  *         w - -----------------
155                  *                    1
156                  *              w+h - ---------
157                  *                    w+2h - ...
158                  *
159                  * To determine how many terms needed, let
160                  * Q(0) = w, Q(1) = w(w+h) - 1,
161                  * Q(k) = (w+k*h)*Q(k-1) - Q(k-2),
162                  * When Q(k) > 1e4      good for single
163                  * When Q(k) > 1e9      good for double
164                  * When Q(k) > 1e17     good for quaduple
165                  */
166             /* determin k */
167                 GENERIC t,v;
168                 double q0,q1,h,tmp; int k,m;
169                 w  = (n+n)/(double)x; h = 2.0/(double)x;
170                 q0 = w;  z = w+h; q1 = w*z - 1.0; k=1;
171                 while(q1<1.0e9) {
172                         k += 1; z += h;
173                         tmp = z*q1 - q0;
174                         q0 = q1;
175                         q1 = tmp;
176                 }
177                 m = n+n;
178                 for(t=zero, i = 2*(n+k); i>=m; i -= 2) t = one/(i/x-t);
179                 a = t;
180                 b = one;
181                 /* estimate log((2/x)^n*n!) = n*log(2/x)+n*ln(n)
182                    hence, if n*(log(2n/x)) > ...
183                     single 8.8722839355e+01
184                     double 7.09782712893383973096e+02
185                     long double 1.13565234062941439494919310779707650060170e+04
186                     then recurrent value may overflow and the result is
187                     likely underflow to zero
188                  */
189                 tmp = n;
190                 v = two/x;
191                 tmp = tmp*log(fabs(v*tmp));
192                 if(tmp<7.09782712893383973096e+02) {
```



```
193                     for(i=n-1;i>0;i--){
194                         temp = b;
195                         b = ((i+i)/x)*b - a;
196                         a = temp;
197                     }
198                 } else {
199                     for(i=n-1;i>0;i--){
200                         temp = b;
201                         b = ((i+i)/x)*b - a;
202                         a = temp;
203                         if(b>1e100) {
204                             a /= b;
205                             t /= b;
206                             b  = 1.0;
207                         }
208                     }
209                 }
210                 b = (t*j0(x)/b);
211             }
212         }
213         if(sgn==1) return -b; else return b;
214 }

216 GENERIC
217 yn(int n, GENERIC x) {
218         int i;
219         int sign;
220         GENERIC a, b, temp = 0, ox, on;

222         ox = x; on = (GENERIC)n;
223         if(isnan(x)) return x*x;        /* + -> * for Cheetah */
224         if (x <= zero) {
225                 if(x==zero) {
226                         /* return -one/zero; */
227                         return _SVID_libm_err((GENERIC)n,x,12);
228                 } else {
229                         /* return zero/zero; */
230                         return _SVID_libm_err((GENERIC)n,x,13);
231                 }
232         }
233         if (!((int) _lib_version == libm_ieee ||
234               (__xpg6 & _C99SUSv3_math_errexcept) != 0)) {
235             if(x > X_TLOSS) return _SVID_libm_err(on,ox,39);
236         }
237         sign = 1;
238         if(n<0){
239                 n = -n;
240                 if((n&1) == 1) sign = -1;
241         }
242         if(n==0) return(y0(x));
243         if(n==1) return(sign*y1(x));
244         if(!finite(x)) return zero;

246         if(x>1.0e91) {  /* x >> n**2
247                                     Jn(x) = cos(x-(2n+1)*pi/4)*sqrt(2/x*pi)
248                                     Yn(x) = sin(x-(2n+1)*pi/4)*sqrt(2/x*pi)
249                                     Let s=sin(x), c=cos(x),
250                                         xn=x-(2n+1)*pi/4, sqt2 = sqrt(2),then

252                                            n    sin(xn)*sqt2    cos(xn)*sqt2
253                                         ----------------------------------
254                                            0     s-c              c+s
255                                            1    -s-c             -c+s
256                                            2    -s+c             -c-s
257                                            3     s+c              c-s
258                                 */
```

```
259                 switch(n&3) {
260                     case 0: temp =  sin(x)-cos(x); break;
261                     case 1: temp = -sin(x)-cos(x); break;
262                     case 2: temp = -sin(x)+cos(x); break;
263                     case 3: temp =  sin(x)+cos(x); break;
264                 }
265                 b = invsqrtpi*temp/sqrt(x);
266         } else {
267                 a = y0(x);
268                 b = y1(x);
269                 /*
270                  * fix 1262058 and take care of non-default rounding
271                  */
272                 for (i = 1; i < n; i++) {
273                         temp = b;
274                         b *= (GENERIC) (i + i) / x;
275                         if (b <= -DBL_MAX)
276                                 break;
277                         b -= a;
278                         a = temp;
279                 }
280         }
281         if(sign>0) return b; else return -b;
282 }
```

```
**********************************************************
    1336 Sat May 10 12:08:53 2014
new/usr/src/lib/libm/common/C/lgamma.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak lgamma = __lgamma

#include "libm.h"

extern int signgam;

double
lgamma(double x) {
        double  g;

        if (!finite(x))
                return (x * x);

        g = rint(x);
        if (x == g && x <= 0.0) {
                signgam = 1;
                return (_SVID_libm_err(x, x, 15));
        }

        g = __k_lgamma(x, &signgam);
        if (!finite(g))
            g = _SVID_libm_err(x, x, 14);
        return (g);
}
```

```
**********************************************************
    1336 Sat May 10 12:08:53 2014
new/usr/src/lib/libm/common/C/lgamma_r.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak lgamma_r = __lgamma_r

#include "libm.h"

double
lgamma_r(double x, int *signgamp) {
        double  g;

        if (isnan(x))
                return (x * x);

        g = rint(x);
        if (x == g && x <= 0.0) {
                *signgamp = 1;
                return (_SVID_libm_err(x, x, 15));
        }

        g = __k_lgamma(x, signgamp);
        if (!finite(g))
            g = _SVID_libm_err(x, x, 14);
        return (g);
}
```

```
**********************************************************
    5104 Sat May 10 12:08:53 2014
new/usr/src/lib/libm/common/C/libm.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#ifndef _LIBM_H
#define _LIBM_H

#include <sys/isa_defs.h>

#ifdef _ASM
/* BEGIN CSTYLED */

/*
 * Disable amd64 assembly code profiling for now.
 */
#if defined(__amd64)
#undef PROF
#endif

#include <sys/asm_linkage.h>

#define NAME(x) x
#define TEXT    .section        ".text"
#define DATA    .section        ".data"
#define RO_DATA .section        ".rodata"
#define IDENT(x)        .ident  x

#if defined(__sparc)

#define LIBM_ANSI_PRAGMA_WEAK(sym,stype) \
        .weak sym; \
        .type sym,#stype; \
sym     = __/**/sym

#ifndef SET_FILE
#define SET_FILE(x) \
        .file   x
```



```
#endif  /* !defined(SET_FILE) */

#ifdef PIC
/*
 * One should *never* pass o7 to PIC_SETUP.
 */
#define PIC_SETUP(via) \
9:      call    8f; \
        sethi   %hi(NAME(_GLOBAL_OFFSET_TABLE_)-(9b-.)),%via; \
8:      or      %via,%lo(NAME(_GLOBAL_OFFSET_TABLE_)-(9b-.)),%via; \
        add     %via,%o7,%via
/*
 * Must save/restore %o7 in leaf routines; may *not* use jmpl!
 */
#define PIC_LEAF_SETUP(via) \
        or      %g0,%o7,%g1; \
9:      call    8f; \
        sethi   %hi(NAME(_GLOBAL_OFFSET_TABLE_)-(9b-.)),%via; \
8:      or      %via,%lo(NAME(_GLOBAL_OFFSET_TABLE_)-(9b-.)),%via; \
        add     %via,%o7,%via; \
        or      %g0,%g1,%o7
#ifdef __sparcv9
#define PIC_SET(via,sym,dst)    ldx     [%via+sym],%dst
#else   /* defined(__sparcv9) */
#define PIC_SET(via,sym,dst)    ld      [%via+sym],%dst
#endif  /* defined(__sparcv9) */
#else   /* defined(PIC) */
#define PIC_SETUP(via)
#define PIC_LEAF_SETUP(via)
#ifdef __sparcv9
/*
 * g1 is used as scratch register in V9 mode
 */
#define PIC_SET(via,sym,dst)    setx    sym,%g1,%dst
#else   /* defined(__sparcv9) */
#define PIC_SET(via,sym,dst)    set     sym,%dst
#endif  /* defined(__sparcv9) */
#endif  /* defined(PIC) */

/*
 * Workaround for 4337025: MCOUNT in asm_linkage.h does not support __sparcv9
 */
#if defined(PROF) && defined(__sparcv9)

#undef MCOUNT_SIZE
#undef MCOUNT

#if !defined(PIC)
#define MCOUNT_SIZE     (9*4)   /* 9 instructions */
#define MCOUNT(x) \
        save    %sp, -SA(MINFRAME), %sp; \
        sethi   %hh(.L_/**/x/**/1), %o0; \
        sethi   %lm(.L_/**/x/**/1), %o1; \
        or      %o0, %hm(.L_/**/x/**/1), %o0; \
        or      %o1, %lo(.L_/**/x/**/1), %o1; \
        sllx    %o0, 32, %o0; \
        call    _mcount; \
        or      %o0, %o1, %o0; \
        restore; \
        .common .L_/**/x/**/1, 8, 8
#elif defined(PIC32)
#define MCOUNT_SIZE     (10*4)  /* 10 instructions */
#define MCOUNT(x) \
        save    %sp,-SA(MINFRAME),%sp; \
1:      call    .+8; \
        sethi   %hi(_GLOBAL_OFFSET_TABLE_-(1b-.)),%o0; \
```

```
128         sethi   %hi(.L_/**/x/**/1),%o1; \
129         add     %o0,%lo(_GLOBAL_OFFSET_TABLE_-(1b-.)),%o0; \
130         add     %o1,%lo(.L_/**/x/**/1),%o1; \
131         add     %o0,%o7,%o0; \
132         call    _mcount; \
133         ldx     [%o0+%o1],%o0; \
134         restore; \
135         .common .L_/**/x/**/1,8,8
136 #else   /* PIC13 */
137 #define MCOUNT_SIZE     (8*4)   /* 8 instructions */
138 #define MCOUNT(x) \
139         save    %sp,-SA(MINFRAME),%sp; \
140 1:      call    .+8; \
141         sethi   %hi(_GLOBAL_OFFSET_TABLE_-(1b-.)),%o0; \
142         add     %o0,%lo(_GLOBAL_OFFSET_TABLE_-(1b-.)),%o0; \
143         add     %o0,%o7,%o0; \
144         call    _mcount; \
145         ldx     [%o0+%lo(.L_/**/x/**/1)],%o0; \
146         restore; \
147         .common .L_/**/x/**/1,8,8
148 #endif  /* !defined(PIC) */
149 #endif /* defined(PROF) && defined(__sparcv9) */

151 #elif defined(__x86)

153 #define LIBM_ANSI_PRAGMA_WEAK(sym,stype) \
154         .weak sym; \
155         .type sym,@stype; \
156 sym     = __/**/sym

158 #ifdef PIC
159 #if defined(__amd64)
160 #define PIC_SETUP(x)
161 #define PIC_WRAPUP
162 #define PIC_F(x)        x@PLT
163 #define PIC_G(x)        x@GOTPCREL(%rip)
164 #define PIC_L(x)        x(%rip)
165 #define PIC_G_LOAD(insn,sym,dst) \
166         movq    PIC_G(sym),%dst; \
167         insn    (%dst),%dst
168 #else
169 #define PIC_SETUP(label) \
170         pushl   %ebx; \
171         call    .label; \
172 .label: popl    %ebx; \
173         addl    $_GLOBAL_OFFSET_TABLE_+[.-.label],%ebx
174 #define PIC_WRAPUP      popl    %ebx
175 #define PIC_F(x)        x@PLT
176 #define PIC_G(x)        x@GOT(%ebx)
177 #define PIC_L(x)        x@GOTOFF(%ebx)
178 #define PIC_G_LOAD(insn,sym,dst) \
179         mov     PIC_G(sym),%dst; \
180         insn    (%dst),%dst
181 #endif
182 #else   /* defined(PIC) */
183 #define PIC_SETUP(x)
184 #define PIC_WRAPUP
185 #define PIC_F(x)        x
186 #define PIC_G(x)        x
187 #define PIC_L(x)        x
188 #define PIC_G_LOAD(insn,sym,dst)        insn    sym,%dst
189 #endif  /* defined(PIC) */

191 #else
192 #error Unknown architecture
193 #endif
```



```
195 /* END CSTYLED */
196 #else   /* defined(_ASM) */

198 #include "libm_macros.h"
199 #include "libm_synonyms.h"
200 #include "libm_protos.h"
201 #include "libm_inlines.h"
202 #include <math.h>
203 #if defined(__SUNPRO_C)
204 #include <sunmath.h>
205 #endif

207 #endif  /* defined(_ASM) */

209 #endif  /* defined(_LIBM_H) */
```

```
**********************************************************
    2433 Sat May 10 12:08:53 2014
new/usr/src/lib/libm/common/C/libm_macros.h
patch01 - 693 import Sun Devpro Math Library
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```

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 */

#ifndef _LIBM_MACROS_H
#define _LIBM_MACROS_H

#include <sys/isa_defs.h>

#if defined(__sparc)

#define HIWORD          0
#define LOWORD          1
#define HIXWORD         0               /* index of int containing exponent */
#define XSGNMSK         0x80000000      /* exponent bit mask within the int */
#define XBIASED_EXP(x)  ((((int *)&x)[HIXWORD] & ~0x80000000) >> 16)
#define ISZEROL(x)      (((((int *)&x)[0] & ~XSGNMSK) | ((int *)&x)[1] | \
                                ((int *)&x)[2] | ((int *)&x)[3]) == 0)

#elif defined(__x86)

#define HIWORD          1
#define LOWORD          0
#define HIXWORD         2
#define XSGNMSK         0x8000
#define XBIASED_EXP(x)  (((int *)&x)[HIXWORD] & 0x7fff)
#define ISZEROL(x)      (x == 0.0L)

#define HANDLE_UNSUPPORTED

/*
 * "convert" the high-order 32 bits of a SPARC quad precision
 * value ("I") to the sign, exponent, and high-order bits of an
 * x86 extended double precision value ("E"); the low-order bits
 * in the 12-byte quantity are left intact
 */
#define ITOX(I, E)       \
```



```
                E[2] = 0xffff & ((I) >> 16); \
                E[1] = (((I) & 0x7fff0000) == 0)? \
                    (E[1] & 0x7fff) | (0x7fff8000 & ((I) << 15)) :\
                    0x80000000 | (E[1] & 0x7fff) | (0x7fff8000 & ((I) << 15))

/*
 * "convert" the sign, exponent, and high-order bits of an x86
 * extended double precision value ("E") to the high-order 32 bits
 * of a SPARC quad precision value ("I")
 */
#define XTOI(E, I)      \
                I = ((E[2]<<16) | (0xffff & (E[1]>>15)))

#else
#error Unknown architecture
#endif

#endif  /* !defined(_LIBM_MACROS_H) */
```

```
**********************************************************
    9165 Sat May 10 12:08:54 2014
new/usr/src/lib/libm/common/C/libm_protos.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#ifndef _LIBM_PROTOS_H
#define _LIBM_PROTOS_H

#ifdef LIBMOPT_BUILD
#define _TBL_cos        __libmopt_TBL_cos
#define _TBL_exp2_512   __libmopt_TBL_exp2_512
#define _TBL_ipio2_inf  __libmopt_TBL_ipio2_inf
#define _TBL_jlog_n1    __libmopt_TBL_jlog_n1
#define _TBL_jlog_n2    __libmopt_TBL_jlog_n2
#define _TBL_jlog_p1    __libmopt_TBL_jlog_p1
#define _TBL_jlog_p2    __libmopt_TBL_jlog_p2
#define _TBL_log10      __libmopt_TBL_log10
#define _TBL_log2_14    __libmopt_TBL_log2_14
#define _TBL_log2_9     __libmopt_TBL_log2_9
#define _TBL_sin        __libmopt_TBL_sin
#define _TBL_sincosx    __libmopt_TBL_sincosx
#define _TBL_xexp       __libmopt_TBL_xexp
#define _TBL_xlog       __libmopt_TBL_xlog
#define __k_cos_        __libmopt__k_cos_
#define __k_sin_        __libmopt__k_sin_
#define __k_sincos_     __libmopt__k_sincos_
#define __reduction     __libmopt__reduction
#define __rem_pio2      __libmopt__rem_pio2
#define __rem_pio2m     __libmopt__rem_pio2m
#else   /* defined(LIBMOPT_BUILD) */
#ifdef LIBM_BUILD
#define _SVID_libm_err  __libm_SVID_libm_err    /* not used by -lsunmath */
#define _TBL_atan       __libm_TBL_atan
#define _TBL_atan1      __libm_TBL_atan1
#define _TBL_atan_hi    __libm_TBL_atan_hi      /* not used by -lsunmath */
#define _TBL_atan_lo    __libm_TBL_atan_lo      /* not used by -lsunmath */
#define _TBL_exp2_hi    __libm_TBL_exp2_hi      /* not used by -lsunmath */
#define _TBL_exp2_lo    __libm_TBL_exp2_lo      /* not used by -lsunmath */
```



```
#define _TBL_ipio2_inf  __libm_TBL_ipio2_inf
#define _TBL_log        __libm_TBL_log
#define _TBL_log2_hi    __libm_TBL_log2_hi      /* not used by -lsunmath */
#define _TBL_log2_lo    __libm_TBL_log2_lo      /* not used by -lsunmath */
#define _TBL_log_hi     __libm_TBL_log_hi       /* not used by -lsunmath */
#define _TBL_log_lo     __libm_TBL_log_lo       /* not used by -lsunmath */
#define _TBL_sincos     __libm_TBL_sincos
#define _TBL_sincosx    __libm_TBL_sincosx
#define _TBL_tan_hi     __libm_TBL_tan_hi       /* not used by -lsunmath */
#define _TBL_tan_lo     __libm_TBL_tan_lo       /* not used by -lsunmath */
#define __k_cexp        __libm__k_cexp          /* C99 libm */
#define __k_cexpl       __libm__k_cexpl         /* C99 libm */
#define __k_clog_r      __libm__k_clog_r        /* C99 libm */
#define __k_clog_rl     __libm__k_clog_rl       /* C99 libm */
#define __k_atan2       __libm__k_atan2         /* C99 libm */
#define __k_atan2l      __libm__k_atan2l        /* C99 libm */
#define __k_cos         __libm__k_cos
#define __k_lgamma      __libm__k_lgamma
#define __k_sin         __libm__k_sin
#define __k_sincos      __libm__k_sincos
#define __k_tan         __libm__k_tan
#define __reduction     __libm__reduction       /* i386 only */
#define __rem_pio2      __libm__rem_pio2
#define __rem_pio2m     __libm__rem_pio2m
#define __k_cosf        __libm__k_cosf          /* C99 libm */
#define __k_cosl        __libm__k_cosl          /* C99 libm */
#define __k_lgammal     __libm__k_lgammal       /* C99 libm */
#define __k_sincosf     __libm__k_sincosf       /* C99 libm */
#define __k_sincosl     __libm__k_sincosl       /* C99 libm */
#define __k_sinf        __libm__k_sinf          /* C99 libm */
#define __k_sinl        __libm__k_sinl          /* C99 libm */
#define __k_tanf        __libm__k_tanf          /* C99 libm */
#define __k_tanl        __libm__k_tanl          /* C99 libm */
#define __poly_libmq    __libm__poly_libmq      /* C99 libm */
#define __rem_pio2l     __libm__rem_pio2l       /* C99 libm */
#define _TBL_atanl_hi   __libm_TBL_atanl_hi     /* C99 libm */
#define _TBL_atanl_lo   __libm_TBL_atanl_lo     /* C99 libm */
#define _TBL_cosl_hi    __libm_TBL_cosl_hi      /* C99 libm */
#define _TBL_cosl_lo    __libm_TBL_cosl_lo      /* C99 libm */
#define _TBL_expl_hi    __libm_TBL_expl_hi      /* C99 libm */
#define _TBL_expl_lo    __libm_TBL_expl_lo      /* C99 libm */
#define _TBL_expm1l     __libm_TBL_expm1l       /* C99 libm */
#define _TBL_expm1lx    __libm_TBL_expm1lx      /* C99 libm */
#define _TBL_ipio2l_inf __libm_TBL_ipio2l_inf   /* C99 libm */
#define _TBL_logl_hi    __libm_TBL_logl_hi      /* C99 libm */
#define _TBL_logl_lo    __libm_TBL_logl_lo      /* C99 libm */
#define _TBL_r_atan_hi  __libm_TBL_r_atan_hi    /* C99 libm */
#define _TBL_r_atan_lo  __libm_TBL_r_atan_lo    /* C99 libm */
#define _TBL_sinl_hi    __libm_TBL_sinl_hi      /* C99 libm */
#define _TBL_sinl_lo    __libm_TBL_sinl_lo      /* C99 libm */
#define _TBL_tanl_hi    __libm_TBL_tanl_hi      /* C99 libm */
#define _TBL_tanl_lo    __libm_TBL_tanl_lo      /* C99 libm */
#endif  /* defined(LIBM_BUILD) */
#endif  /* defined(LIBMOPT_BUILD) */

#ifndef _ASM
#ifdef __STDC__
#define __P(p)  p
#else
#define __P(p)  ()
#endif

#include <sys/ieeefp.h>

extern double _SVID_libm_err __P((double, double, int));
extern double __k_cos __P((double, double));
```

```
128 extern double __k_cos_ __P((double *));
129 extern double __k_lgamma __P((double, int *));
130 extern double __k_sin __P((double, double));
131 extern double __k_sin_ __P((double *));
132 extern double __k_sincos __P((double, double, double *));
133 extern double __k_sincos_ __P((double *, double *));
134 extern double __k_tan __P((double, double, int));
135 extern double __k_cexp __P((double, int *));
136 extern long double __k_cexpl __P((long double, int *));
137 extern double __k_clog_r __P((double, double, double *));
138 extern long double __k_clog_rl __P((long double, long double, long double *));
139 extern double __k_atan2 __P((double, double, double *));
140 extern long double __k_atan2l __P((long double, long double, long double *));
141 extern int __rem_pio2 __P((double, double *));
142 extern int __rem_pio2m __P((double *, double *, int, int, int, const int *));

144 /*
145  * entry points that are in-lined
146  */
147 extern double copysign __P((double, double));
148 extern int finite __P((double));
149 extern enum fp_class_type fp_class __P((double));
150 extern double infinity __P((void));
151 extern int isinf __P((double));
152 extern int signbit __P((double));

154 /*
155  * new C99 entry points
156  */
157 extern double fdim __P((double, double));
158 extern double fma __P((double, double, double));
159 extern double fmax __P((double, double));
160 extern double fmin __P((double, double));
161 extern double frexp __P((double, int *));
162 extern double ldexp __P((double, int));
163 extern double modf __P((double, double *));
164 extern double nan __P((const char *));
165 extern double nearbyint __P((double));
166 extern double nexttoward __P((double, long double));
167 extern double remquo __P((double, double, int *));
168 extern double round __P((double));
169 extern double scalbln __P((double, long int));
170 extern double tgamma __P((double));
171 extern double trunc __P((double));
172 extern float fdimf __P((float, float));
173 extern float fmaf __P((float, float, float));
174 extern float fmaxf __P((float, float));
175 extern float fminf __P((float, float));
176 extern float frexpf __P((float, int *));
177 extern float ldexpf __P((float, int));
178 extern float modff __P((float, float *));
179 extern float nanf __P((const char *));
180 extern float nearbyintf __P((float));
181 extern float nextafterf __P((float, float));
182 extern float nexttowardf __P((float, long double));
183 extern float remquof __P((float, float, int *));
184 extern float roundf __P((float));
185 extern float scalblnf __P((float, long int));
186 extern float tgammaf __P((float));
187 extern float truncf __P((float));
188 extern long double frexpl(long double, int *);
189 extern long double fdiml __P((long double, long double));
190 extern long double fmal __P((long double, long double, long double));
191 extern long double fmaxl __P((long double, long double));
192 extern long double fminl __P((long double, long double));
193 extern long double ldexpl __P((long double, int));
```



```
194 extern long double modfl __P((long double, long double *));
195 extern long double nanl __P((const char *));
196 extern long double nearbyintl __P((long double));
197 extern long double nextafterl __P((long double, long double));
198 extern long double nexttowardl __P((long double, long double));
199 extern long double remquol __P((long double, long double, int *));
200 extern long double roundl __P((long double));
201 extern long double scalblnl __P((long double, long int));
202 extern long double tgammal __P((long double));
203 extern long double truncl __P((long double));
204 extern long int lrint __P((double));
205 extern long int lrintf __P((float));
206 extern long int lrintl __P((long double));
207 extern long int lround __P((double));
208 extern long int lroundf __P((float));
209 extern long int lroundl __P((long double));
210 extern long long int llrint __P((double));
211 extern long long int llrintf __P((float));
212 extern long long int llrintl __P((long double));
213 extern long long int llround __P((double));
214 extern long long int llroundf __P((float));
215 extern long long int llroundl __P((long double));
216 #endif  /* !defined(_ASM) */

218 #endif  /* !defined(_LIBM_PROTOS_H) */
```

```
**********************************************************
   23546 Sat May 10 12:08:54 2014
new/usr/src/lib/libm/common/C/libm_synonyms.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

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 */

#ifndef _LIBM_SYNONYMS_H
#define _LIBM_SYNONYMS_H

#if defined(ELFOBJ) && !defined(lint)

#define cabs                    __cabs                  /* C99 <complex.h> */
#define cabsf                   __cabsf                 /* C99 <complex.h> */
#define cabsl                   __cabsl                 /* C99 <complex.h> */
#define cacos                   __cacos                 /* C99 <complex.h> */
#define cacosf                  __cacosf                /* C99 <complex.h> */
#define cacosl                  __cacosl                /* C99 <complex.h> */
#define cacosh                  __cacosh                /* C99 <complex.h> */
#define cacoshf                 __cacoshf               /* C99 <complex.h> */
#define cacoshl                 __cacoshl               /* C99 <complex.h> */
#define carg                    __carg                  /* C99 <complex.h> */
#define cargf                   __cargf                 /* C99 <complex.h> */
#define cargl                   __cargl                 /* C99 <complex.h> */
#define casin                   __casin                 /* C99 <complex.h> */
#define casinf                  __casinf                /* C99 <complex.h> */
#define casinl                  __casinl                /* C99 <complex.h> */
#define casinh                  __casinh                /* C99 <complex.h> */
#define casinhf                 __casinhf               /* C99 <complex.h> */
#define casinhl                 __casinhl               /* C99 <complex.h> */
#define catan                   __catan                 /* C99 <complex.h> */
#define catanf                  __catanf                /* C99 <complex.h> */
#define catanl                  __catanl                /* C99 <complex.h> */
#define catanh                  __catanh                /* C99 <complex.h> */
#define catanhf                 __catanhf               /* C99 <complex.h> */
#define catanhl                 __catanhl               /* C99 <complex.h> */
#define ccos                    __ccos                  /* C99 <complex.h> */
#define ccosf                   __ccosf                 /* C99 <complex.h> */
#define ccosl                   __ccosl                 /* C99 <complex.h> */
```



```
#define ccosh                   __ccosh                 /* C99 <complex.h> */
#define ccoshf                  __ccoshf                /* C99 <complex.h> */
#define ccoshl                  __ccoshl                /* C99 <complex.h> */
#define cexp                    __cexp                  /* C99 <complex.h> */
#define cexpf                   __cexpf                 /* C99 <complex.h> */
#define cexpl                   __cexpl                 /* C99 <complex.h> */
#define cimag                   __cimag                 /* C99 <complex.h> */
#define cimagf                  __cimagf                /* C99 <complex.h> */
#define cimagl                  __cimagl                /* C99 <complex.h> */
#define clog                    __clog                  /* C99 <complex.h> */
#define clogf                   __clogf                 /* C99 <complex.h> */
#define clogl                   __clogl                 /* C99 <complex.h> */
#define conj                    __conj                  /* C99 <complex.h> */
#define conjf                   __conjf                 /* C99 <complex.h> */
#define conjl                   __conjl                 /* C99 <complex.h> */
#define cpow                    __cpow                  /* C99 <complex.h> */
#define cpowf                   __cpowf                 /* C99 <complex.h> */
#define cpowl                   __cpowl                 /* C99 <complex.h> */
#define cproj                   __cproj                 /* C99 <complex.h> */
#define cprojf                  __cprojf                /* C99 <complex.h> */
#define cprojl                  __cprojl                /* C99 <complex.h> */
#define creal                   __creal                 /* C99 <complex.h> */
#define crealf                  __crealf                /* C99 <complex.h> */
#define creall                  __creall                /* C99 <complex.h> */
#define csin                    __csin                  /* C99 <complex.h> */
#define csinf                   __csinf                 /* C99 <complex.h> */
#define csinl                   __csinl                 /* C99 <complex.h> */
#define csinh                   __csinh                 /* C99 <complex.h> */
#define csinhf                  __csinhf                /* C99 <complex.h> */
#define csinhl                  __csinhl                /* C99 <complex.h> */
#define csqrt                   __csqrt                 /* C99 <complex.h> */
#define csqrtf                  __csqrtf                /* C99 <complex.h> */
#define csqrtl                  __csqrtl                /* C99 <complex.h> */
#define ctan                    __ctan                  /* C99 <complex.h> */
#define ctanf                   __ctanf                 /* C99 <complex.h> */
#define ctanl                   __ctanl                 /* C99 <complex.h> */
#define ctanh                   __ctanh                 /* C99 <complex.h> */
#define ctanhf                  __ctanhf                /* C99 <complex.h> */
#define ctanhl                  __ctanhl                /* C99 <complex.h> */
#define abrupt_underflow_       __abrupt_underflow_
#define acos                    __acos
#define acosd                   __acosd
#define acosdf                  __acosdf
#define acosdl                  __acosdl
#define acosf                   __acosf
#define acosh                   __acosh
#define acoshf                  __acoshf
#define acoshl                  __acoshl
#define acosl                   __acosl
#define acosp                   __acosp
#define acospf                  __acospf
#define acospi                  __acospi
#define acospif                 __acospif
#define acospil                 __acospil
#define acospl                  __acospl
#define aint                    __aint
#define aintf                   __aintf
#define aintl                   __aintl
#define anint                   __anint
#define anintf                  __anintf
#define anintl                  __anintl
#define annuity                 __annuity
#define annuityf                __annuityf
#define annuityl                __annuityl
#define asin                    __asin
#define asind                   __asind
```

```
128 #define asindf                  __asindf
129 #define asindl                  __asindl
130 #define asinf                   __asinf
131 #define asinh                   __asinh
132 #define asinhf                  __asinhf
133 #define asinhl                  __asinhl
134 #define asinl                   __asinl
135 #define asinp                   __asinp
136 #define asinpf                  __asinpf
137 #define asinpi                  __asinpi
138 #define asinpif                 __asinpif
139 #define asinpil                 __asinpil
140 #define asinpl                  __asinpl
141 #define atan                    __atan
142 #define atan2                   __atan2
143 #define atan2d                  __atan2d
144 #define atan2df                 __atan2df
145 #define atan2dl                 __atan2dl
146 #define atan2f                  __atan2f
147 #define atan2l                  __atan2l
148 #define atan2pi                 __atan2pi
149 #define atan2pif                __atan2pif
150 #define atan2pil                __atan2pil
151 #define atand                   __atand
152 #define atandf                  __atandf
153 #define atandl                  __atandl
154 #define atanf                   __atanf
155 #define atanh                   __atanh
156 #define atanhf                  __atanhf
157 #define atanhl                  __atanhl
158 #define atanl                   __atanl
159 #define atanp                   __atanp
160 #define atanpf                  __atanpf
161 #define atanpi                  __atanpi
162 #define atanpif                 __atanpif
163 #define atanpil                 __atanpil
164 #define atanpl                  __atanpl
165 #define cbrt                    __cbrt
166 #define cbrtf                   __cbrtf
167 #define cbrtl                   __cbrtl
168 #define ceil                    __ceil
169 #define ceilf                   __ceilf
170 #define ceill                   __ceill
171 #define compound                __compound
172 #define compoundf               __compoundf
173 #define compoundl               __compoundl
174 #define convert_external        __convert_external
175 #define convert_external_       __convert_external_
176 #define copysign                __copysign
177 #define copysignf               __copysignf
178 #define copysignl               __copysignl
179 #define cos                     __cos
180 #define cosd                    __cosd
181 #define cosdf                   __cosdf
182 #define cosdl                   __cosdl
183 #define cosf                    __cosf
184 #define cosh                    __cosh
185 #define coshf                   __coshf
186 #define coshl                   __coshl
187 #define cosl                    __cosl
188 #define cosp                    __cosp
189 #define cospf                   __cospf
190 #define cospi                   __cospi
191 #define cospif                  __cospif
192 #define cospil                  __cospil
193 #define cospl                   __cospl
```



```
194 #define d_acos_                 __d_acos_
195 #define d_acosd_                __d_acosd_
196 #define d_acosh_                __d_acosh_
197 #define d_acosp_                __d_acosp_
198 #define d_acospi_               __d_acospi_
199 #define d_addran_               __d_addran_
200 #define d_addrans_              __d_addrans_
201 #define d_aint_                 __d_aint_
202 #define d_anint_                __d_anint_
203 #define d_annuity_              __d_annuity_
204 #define d_asin_                 __d_asin_
205 #define d_asind_                __d_asind_
206 #define d_asinh_                __d_asinh_
207 #define d_asinp_                __d_asinp_
208 #define d_asinpi_               __d_asinpi_
209 #define d_atan2_                __d_atan2_
210 #define d_atan2d_               __d_atan2d_
211 #define d_atan2pi_              __d_atan2pi_
212 #define d_atan_                 __d_atan_
213 #define d_atand_                __d_atand_
214 #define d_atanh_                __d_atanh_
215 #define d_atanp_                __d_atanp_
216 #define d_atanpi_               __d_atanpi_
217 #define d_cbrt_                 __d_cbrt_
218 #define d_ceil_                 __d_ceil_
219 #define d_compound_             __d_compound_
220 #define d_copysign_             __d_copysign_
221 #define d_cos_                  __d_cos_
222 #define d_cosd_                 __d_cosd_
223 #define d_cosh_                 __d_cosh_
224 #define d_cosp_                 __d_cosp_
225 #define d_cospi_                __d_cospi_
226 #define d_erf_                  __d_erf_
227 #define d_erfc_                 __d_erfc_
228 #define d_exp10_                __d_exp10_
229 #define d_exp2_                 __d_exp2_
230 #define d_exp_                  __d_exp_
231 #define d_expm1_                __d_expm1_
232 #define d_fabs_                 __d_fabs_
233 #define d_floor_                __d_floor_
234 #define d_fmod_                 __d_fmod_
235 #define d_get_addrans_          __d_get_addrans_
236 #define d_hypot_                __d_hypot_
237 #define d_infinity_             __d_infinity_
238 #define d_init_addrans_         __d_init_addrans_
239 #define d_j0_                   __d_j0_
240 #define d_j1_                   __d_j1_
241 #define d_jn_                   __d_jn_
242 #define d_lcran_                __d_lcran_
243 #define d_lcrans_               __d_lcrans_
244 #define d_lgamma_               __d_lgamma_
245 #define d_lgamma_r_             __d_lgamma_r_
246 #define d_log10_                __d_log10_
247 #define d_log1p_                __d_log1p_
248 #define d_log2_                 __d_log2_
249 #define d_log_                  __d_log_
250 #define d_logb_                 __d_logb_
251 #define d_max_normal_           __d_max_normal_
252 #define d_max_subnormal_        __d_max_subnormal_
253 #define d_min_normal_           __d_min_normal_
254 #define d_min_subnormal_        __d_min_subnormal_
255 #define d_mwcran_               __d_mwcran_
256 #define d_mwcrans_              __d_mwcrans_
257 #define d_nextafter_            __d_nextafter_
258 #define d_pow_                  __d_pow_
259 #define d_quiet_nan_            __d_quiet_nan_
```

```
260 #define d_remainder_            __d_remainder_
261 #define d_rint_                 __d_rint_
262 #define d_scalb_                __d_scalb_
263 #define d_scalbn_               __d_scalbn_
264 #define d_set_addrans_          __d_set_addrans_
265 #define d_shufrans_             __d_shufrans_
266 #define d_signaling_nan_        __d_signaling_nan_
267 #define d_significand_          __d_significand_
268 #define d_sin_                  __d_sin_
269 #define d_sincos_               __d_sincos_
270 #define d_sincosd_              __d_sincosd_
271 #define d_sincosp_              __d_sincosp_
272 #define d_sincospi_             __d_sincospi_
273 #define d_sind_                 __d_sind_
274 #define d_sinh_                 __d_sinh_
275 #define d_sinp_                 __d_sinp_
276 #define d_sinpi_                __d_sinpi_
277 #define d_sqrt_                 __d_sqrt_
278 #define d_tan_                  __d_tan_
279 #define d_tand_                 __d_tand_
280 #define d_tanh_                 __d_tanh_
281 #define d_tanp_                 __d_tanp_
282 #define d_tanpi_                __d_tanpi_
283 #define d_y0_                   __d_y0_
284 #define d_y1_                   __d_y1_
285 #define d_yn_                   __d_yn_
286 #define drem                    __drem
287 #define erf                     __erf
288 #define erfc                    __erfc
289 #define erfcf                   __erfcf
290 #define erfcl                   __erfcl
291 #define erff                    __erff
292 #define erfl                    __erfl
293 #define exp                     __exp
294 #define exp10                   __exp10
295 #define exp10f                  __exp10f
296 #define exp10l                  __exp10l
297 #define exp2                    __exp2
298 #define exp2f                   __exp2f
299 #define exp2l                   __exp2l
300 #define expf                    __expf
301 #define expl                    __expl
302 #define expm1                   __expm1
303 #define expm1f                  __expm1f
304 #define expm1l                  __expm1l
305 #define fabs                    __fabs
306 #define fabsf                   __fabsf
307 #define fabsl                   __fabsl
308 #define fdim                    __fdim                  /* C99 */
309 #define fdimf                   __fdimf                 /* C99 */
310 #define fdiml                   __fdiml                 /* C99 */
311 #define finitef                 __finitef
312 #define finitel                 __finitel
313 #define floor                   __floor
314 #define floorf                  __floorf
315 #define floorl                  __floorl
316 #define fma                     __fma                   /* C99 */
317 #define fmaf                    __fmaf                  /* C99 */
318 #define fmal                    __fmal                  /* C99 */
319 #define fmax                    __fmax                  /* C99 */
320 #define fmaxf                   __fmaxf                 /* C99 */
321 #define fmaxl                   __fmaxl                 /* C99 */
322 #define fmin                    __fmin                  /* C99 */
323 #define fminf                   __fminf                 /* C99 */
324 #define fminl                   __fminl                 /* C99 */
325 #define fmod                    __fmod
```



```
326 #define fmodf                   __fmodf
327 #define fmodl                   __fmodl
328 #define fp_class                __fp_class
329 #define fp_classf               __fp_classf
330 #define fp_classl               __fp_classl
331 #define frexp                   __frexp                 /* S10 */
332 #define frexpf                  __frexpf                /* S10 */
333 #define frexpl                  __frexpl                /* S10 */
334 #define gamma                   __gamma
335 #define gamma_r                 __gamma_r
336 #define gammaf                  __gammaf
337 #define gammaf_r                __gammaf_r
338 #define gammal                  __gammal
339 #define gammal_r                __gammal_r
340 #define gradual_underflow_      __gradual_underflow_
341 #define hypot                   __hypot
342 #define hypotf                  __hypotf
343 #define hypotl                  __hypotl
344 #define i_addran_               __i_addran_
345 #define i_addrans_              __i_addrans_
346 #define i_get_addrans_          __i_get_addrans_
347 #define i_get_lcrans_           __i_get_lcrans_
348 #define i_get_mwcrans_          __i_get_mwcrans_
349 #define i_init_addrans_         __i_init_addrans_
350 #define i_init_lcrans_          __i_init_lcrans_
351 #define i_init_mwcrans_         __i_init_mwcrans_
352 #define i_lcran_                __i_lcran_
353 #define i_lcrans_               __i_lcrans_
354 #define i_llmwcran_             __i_llmwcran_
355 #define i_llmwcrans_            __i_llmwcrans_
356 #define i_mwcran_               __i_mwcran_
357 #define i_mwcrans_              __i_mwcrans_
358 #define i_set_addrans_          __i_set_addrans_
359 #define i_set_lcrans_           __i_set_lcrans_
360 #define i_set_mwcrans_          __i_set_mwcrans_
361 #define i_shufrans_             __i_shufrans_
362 #define id_finite_              __id_finite_
363 #define id_fp_class_            __id_fp_class_
364 #define id_ilogb_               __id_ilogb_
365 #define id_irint_               __id_irint_
366 #define id_isinf_               __id_isinf_
367 #define id_isnan_               __id_isnan_
368 #define id_isnormal_            __id_isnormal_
369 #define id_issubnormal_         __id_issubnormal_
370 #define id_iszero_              __id_iszero_
371 #define id_nint_                __id_nint_
372 #define id_signbit_             __id_signbit_
373 #define ieee_flags              __ieee_flags
374 #define ieee_flags_             __ieee_flags_
375 #define ieee_handler            __ieee_handler
376 #define ieee_handler_           __ieee_handler_
377 #define ieee_handlers           __ieee_handlers
378 #define ieee_retrospective      __ieee_retrospective
379 #define ieee_retrospective_     __ieee_retrospective_
380 #define ilogb                   __ilogb
381 #define ilogbf                  __ilogbf
382 #define ilogbl                  __ilogbl
383 #define infinity                __infinity
384 #define infinityf               __infinityf
385 #define infinityl               __infinityl
386 #define iq_finite_              __iq_finite_
387 #define iq_fp_class_            __iq_fp_class_
388 #define iq_ilogb_               __iq_ilogb_
389 #define iq_isinf_               __iq_isinf_
390 #define iq_isnan_               __iq_isnan_
391 #define iq_isnormal_            __iq_isnormal_
```

```
392 #define iq_issubnormal_         __iq_issubnormal_
393 #define iq_iszero_              __iq_iszero_
394 #define iq_signbit_             __iq_signbit_
395 #define ir_finite_              __ir_finite_
396 #define ir_fp_class_            __ir_fp_class_
397 #define ir_ilogb_               __ir_ilogb_
398 #define ir_irint_               __ir_irint_
399 #define ir_isinf_               __ir_isinf_
400 #define ir_isnan_               __ir_isnan_
401 #define ir_isnormal_            __ir_isnormal_
402 #define ir_issubnormal_         __ir_issubnormal_
403 #define ir_iszero_              __ir_iszero_
404 #define ir_nint_                __ir_nint_
405 #define ir_signbit_             __ir_signbit_
406 #define irint                   __irint
407 #define irintf                  __irintf
408 #define irintl                  __irintl
409 #define isinf                   __isinf
410 #define isinff                  __isinff
411 #define isinfl                  __isinfl
412 #define isnan                   __isnan
413 #define isnanf                  __isnanf
414 #define isnanl                  __isnanl
415 #define isnormal                __isnormal
416 #define isnormalf               __isnormalf
417 #define isnormall               __isnormall
418 #define issubnormal             __issubnormal
419 #define issubnormalf            __issubnormalf
420 #define issubnormall            __issubnormall
421 #define iszero                  __iszero
422 #define iszerof                 __iszerof
423 #define iszerol                 __iszerol
424 #define j0                      __j0
425 #define j0f                     __j0f
426 #define j0l                     __j0l
427 #define j1                      __j1
428 #define j1f                     __j1f
429 #define j1l                     __j1l
430 #define jn                      __jn
431 #define jnf                     __jnf
432 #define jnl                     __jnl
433 #define ldexp                   __ldexp                 /* S10 */
434 #define ldexpf                  __ldexpf                /* S10 */
435 #define ldexpl                  __ldexpl                /* S10 */
436 #define lgamma                  __lgamma
437 #define lgamma_r                __lgamma_r
438 #define lgammaf                 __lgammaf
439 #define lgammaf_r               __lgammaf_r
440 #define lgammal                 __lgammal
441 #define lgammal_r               __lgammal_r
442 #define llrint                  __llrint                /* C99 */
443 #define llrintf                 __llrintf               /* C99 */
444 #define llrintl                 __llrintl               /* C99 */
445 #define llround                 __llround               /* C99 */
446 #define llroundf                __llroundf              /* C99 */
447 #define llroundl                __llroundl              /* C99 */
448 #define lrint                   __lrint                 /* C99 */
449 #define lrintf                  __lrintf                /* C99 */
450 #define lrintl                  __lrintl                /* C99 */
451 #define lround                  __lround                /* C99 */
452 #define lroundf                 __lroundf               /* C99 */
453 #define lroundl                 __lroundl               /* C99 */
454 #define log                     __log
455 #define log10                   __log10
456 #define log10f                  __log10f
457 #define log10l                  __log10l
```



```
458 #define log1p                   __log1p
459 #define log1pf                  __log1pf
460 #define log1pl                  __log1pl
461 #define log2                    __log2
462 #define log2f                   __log2f
463 #define log2l                   __log2l
464 #define logb                    __logb
465 #define logbf                   __logbf
466 #define logbl                   __logbl
467 #define logf                    __logf
468 #define logl                    __logl
469 #define max_normal              __max_normal
470 #define max_normalf             __max_normalf
471 #define max_normall             __max_normall
472 #define max_subnormal           __max_subnormal
473 #define max_subnormalf          __max_subnormalf
474 #define max_subnormall          __max_subnormall
475 #define min_normal              __min_normal
476 #define min_normalf             __min_normalf
477 #define min_normall             __min_normall
478 #define min_subnormal           __min_subnormal
479 #define min_subnormalf          __min_subnormalf
480 #define min_subnormall          __min_subnormall
481 #define modf                    __modf                  /* S10 */
482 #define modff                   __modff                 /* S10 */
483 #define modfl                   __modfl                 /* S10 */
484 #define nan                     __nan                   /* C99 */
485 #define nanf                    __nanf                  /* C99 */
486 #define nanl                    __nanl                  /* C99 */
487 #define nearbyint               __nearbyint             /* C99 */
488 #define nearbyintf              __nearbyintf            /* C99 */
489 #define nearbyintl              __nearbyintl            /* C99 */
490 #define nextafter               __nextafter
491 #define nextafterf              __nextafterf
492 #define nextafterl              __nextafterl
493 #define nexttoward              __nexttoward            /* C99 */
494 #define nexttowardf             __nexttowardf           /* C99 */
495 #define nexttowardl             __nexttowardl           /* C99 */
496 #define nint                    __nint
497 #define nintf                   __nintf
498 #define nintl                   __nintl
499 #define nonstandard_arithmetic  __nonstandard_arithmetic
500 #define nonstandard_arithmetic_ __nonstandard_arithmetic_
501 #define pow                     __pow
502 #define pow_di                  __pow_di
503 #define pow_li                  __pow_li
504 #define pow_ri                  __pow_ri
505 #define powf                    __powf
506 #define powl                    __powl
507 #define q_copysign_             __q_copysign_
508 #define q_fabs_                 __q_fabs_
509 #define q_fmod_                 __q_fmod_
510 #define q_infinity_             __q_infinity_
511 #define q_max_normal_           __q_max_normal_
512 #define q_max_subnormal_        __q_max_subnormal_
513 #define q_min_normal_           __q_min_normal_
514 #define q_min_subnormal_        __q_min_subnormal_
515 #define q_nextafter_            __q_nextafter_
516 #define q_quiet_nan_            __q_quiet_nan_
517 #define q_remainder_            __q_remainder_
518 #define q_scalbn_               __q_scalbn_
519 #define q_signaling_nan_        __q_signaling_nan_
520 #define quiet_nan               __quiet_nan
521 #define quiet_nanf              __quiet_nanf
522 #define quiet_nanl              __quiet_nanl
523 #define r_acos_                 __r_acos_
```

```
524 #define r_acosd_                __r_acosd_
525 #define r_acosh_                __r_acosh_
526 #define r_acosp_                __r_acosp_
527 #define r_acospi_               __r_acospi_
528 #define r_addran_               __r_addran_
529 #define r_addrans_              __r_addrans_
530 #define r_aint_                 __r_aint_
531 #define r_anint_                __r_anint_
532 #define r_annuity_              __r_annuity_
533 #define r_asin_                 __r_asin_
534 #define r_asind_                __r_asind_
535 #define r_asinh_                __r_asinh_
536 #define r_asinp_                __r_asinp_
537 #define r_asinpi_               __r_asinpi_
538 #define r_atan2_                __r_atan2_
539 #define r_atan2d_               __r_atan2d_
540 #define r_atan2pi_              __r_atan2pi_
541 #define r_atan_                 __r_atan_
542 #define r_atand_                __r_atand_
543 #define r_atanh_                __r_atanh_
544 #define r_atanp_                __r_atanp_
545 #define r_atanpi_               __r_atanpi_
546 #define r_cbrt_                 __r_cbrt_
547 #define r_ceil_                 __r_ceil_
548 #define r_compound_             __r_compound_
549 #define r_copysign_             __r_copysign_
550 #define r_cos_                  __r_cos_
551 #define r_cosd_                 __r_cosd_
552 #define r_cosh_                 __r_cosh_
553 #define r_cosp_                 __r_cosp_
554 #define r_cospi_                __r_cospi_
555 #define r_erf_                  __r_erf_
556 #define r_erfc_                 __r_erfc_
557 #define r_exp10_                __r_exp10_
558 #define r_exp2_                 __r_exp2_
559 #define r_exp_                  __r_exp_
560 #define r_expm1_                __r_expm1_
561 #define r_fabs_                 __r_fabs_
562 #define r_floor_                __r_floor_
563 #define r_fmod_                 __r_fmod_
564 #define r_get_addrans_          __r_get_addrans_
565 #define r_hypot_                __r_hypot_
566 #define r_infinity_             __r_infinity_
567 #define r_init_addrans_         __r_init_addrans_
568 #define r_j0_                   __r_j0_
569 #define r_j1_                   __r_j1_
570 #define r_jn_                   __r_jn_
571 #define r_lcran_                __r_lcran_
572 #define r_lcrans_               __r_lcrans_
573 #define r_lgamma_               __r_lgamma_
574 #define r_lgamma_r_             __r_lgamma_r_
575 #define r_log10_                __r_log10_
576 #define r_log1p_                __r_log1p_
577 #define r_log2_                 __r_log2_
578 #define r_log_                  __r_log_
579 #define r_logb_                 __r_logb_
580 #define r_max_normal_           __r_max_normal_
581 #define r_max_subnormal_        __r_max_subnormal_
582 #define r_min_normal_           __r_min_normal_
583 #define r_min_subnormal_        __r_min_subnormal_
584 #define r_mwcran_               __r_mwcran_
585 #define r_mwcrans_              __r_mwcrans_
586 #define r_nextafter_            __r_nextafter_
587 #define r_pow_                  __r_pow_
588 #define r_quiet_nan_            __r_quiet_nan_
589 #define r_remainder_            __r_remainder_
```



```
590 #define r_rint_                 __r_rint_
591 #define r_scalb_                __r_scalb_
592 #define r_scalbn_               __r_scalbn_
593 #define r_set_addrans_          __r_set_addrans_
594 #define r_shufrans_             __r_shufrans_
595 #define r_signaling_nan_        __r_signaling_nan_
596 #define r_significand_          __r_significand_
597 #define r_sin_                  __r_sin_
598 #define r_sincos_               __r_sincos_
599 #define r_sincosd_              __r_sincosd_
600 #define r_sincosp_              __r_sincosp_
601 #define r_sincospi_             __r_sincospi_
602 #define r_sind_                 __r_sind_
603 #define r_sinh_                 __r_sinh_
604 #define r_sinp_                 __r_sinp_
605 #define r_sinpi_                __r_sinpi_
606 #define r_sqrt_                 __r_sqrt_
607 #define r_tan_                  __r_tan_
608 #define r_tand_                 __r_tand_
609 #define r_tanh_                 __r_tanh_
610 #define r_tanp_                 __r_tanp_
611 #define r_tanpi_                __r_tanpi_
612 #define r_y0_                   __r_y0_
613 #define r_y1_                   __r_y1_
614 #define r_yn_                   __r_yn_
615 #define remainder               __remainder
616 #define remainderf              __remainderf
617 #define remainderl              __remainderl
618 #define remquo                  __remquo                /* C99 */
619 #define remquof                 __remquof               /* C99 */
620 #define remquol                 __remquol               /* C99 */
621 #define rint                    __rint
622 #define rintf                   __rintf
623 #define rintl                   __rintl
624 #define round                   __round                 /* C99 */
625 #define roundf                  __roundf                /* C99 */
626 #define roundl                  __roundl                /* C99 */
627 #define scalb                   __scalb
628 #define scalbf                  __scalbf
629 #define scalbl                  __scalbl
630 #define scalbln                 __scalbln               /* C99 */
631 #define scalblnf                __scalblnf              /* C99 */
632 #define scalblnl                __scalblnl              /* C99 */
633 #define scalbn                  __scalbn
634 #define scalbnf                 __scalbnf
635 #define scalbnl                 __scalbnl
636 #define sigfpe                  __sigfpe
637 #define sigfpe_                 __sigfpe_
638 #define signaling_nan           __signaling_nan
639 #define signaling_nanf          __signaling_nanf
640 #define signaling_nanl          __signaling_nanl
641 #define signbit                 __signbit
642 #define signbitf                __signbitf
643 #define signbitl                __signbitl
644 #define signgam                 __signgam
645 #define signgamf                __signgamf
646 #define signgaml                __signgaml
647 #define significand             __significand
648 #define significandf            __significandf
649 #define significandl            __significandl
650 #define sin                     __sin
651 #define sincos                  __sincos
652 #define sincosd                 __sincosd
653 #define sincosdf                __sincosdf
654 #define sincosdl                __sincosdl
655 #define sincosf                 __sincosf
```

```
#define sincosl                 __sincosl
#define sincosp                 __sincosp
#define sincospf                __sincospf
#define sincospi                __sincospi
#define sincospif               __sincospif
#define sincospil               __sincospil
#define sincospl                __sincospl
#define sind                    __sind
#define sindf                   __sindf
#define sindl                   __sindl
#define sinf                    __sinf
#define sinh                    __sinh
#define sinhf                   __sinhf
#define sinhl                   __sinhl
#define sinl                    __sinl
#define sinp                    __sinp
#define sinpf                   __sinpf
#define sinpi                   __sinpi
#define sinpif                  __sinpif
#define sinpil                  __sinpil
#define sinpl                   __sinpl
#define smwcran_                __smwcran_
#define sqrt                    __sqrt
#define sqrtf                   __sqrtf
#define sqrtl                   __sqrtl
#define standard_arithmetic     __standard_arithmetic
#define standard_arithmetic_    __standard_arithmetic_
#define tan                     __tan
#define tand                    __tand
#define tandf                   __tandf
#define tandl                   __tandl
#define tanf                    __tanf
#define tanh                    __tanh
#define tanhf                   __tanhf
#define tanhl                   __tanhl
#define tanl                    __tanl
#define tanp                    __tanp
#define tanpf                   __tanpf
#define tanpi                   __tanpi
#define tanpif                  __tanpif
#define tanpil                  __tanpil
#define tanpl                   __tanpl
#define tgamma                  __tgamma                        /* C99 */
#define tgammaf                 __tgammaf                       /* C99 */
#define tgammal                 __tgammal                       /* C99 */
#define trunc                   __trunc                         /* C99 */
#define truncf                  __truncf                        /* C99 */
#define truncl                  __truncl                        /* C99 */
#define u_addrans_              __u_addrans_
#define u_lcrans_               __u_lcrans_
#define u_llmwcran_             __u_llmwcran_
#define u_llmwcrans_            __u_llmwcrans_
#define u_mwcran_               __u_mwcran_
#define u_mwcrans_              __u_mwcrans_
#define u_shufrans_             __u_shufrans_
#define y0                      __y0
#define y0f                     __y0f
#define y0l                     __y0l
#define y1                      __y1
#define y1f                     __y1f
#define y1l                     __y1l
#define yn                      __yn
#define ynf                     __ynf
#define ynl                     __ynl

/*
```



```
 *  these are libdl entry points
 */
#define dlclose                 _dlclose
#define dlopen                  _dlopen
#define dlsym                   _dlsym

/*
 *  these are libc entry points
 */
#define finite                  _finite
#define fpclass                 _fpclass
#define isnand                  _isnand
#define sigaction               _sigaction
#define sigemptyset             _sigemptyset
#define unordered               _unordered
#define write                   _write
#ifdef _REENTRANT
#define mutex_lock              _mutex_lock
#define mutex_unlock            _mutex_unlock
#define thr_getspecific         _thr_getspecific
#define thr_keycreate           _thr_keycreate
#define thr_main                _thr_main
#define thr_setspecific         _thr_setspecific
#endif

#endif /* defined(ELFOBJ) && !defined(lint) */

#endif  /* _LIBM_SYNONYMS_H */
```

```
**********************************************************
    1293 Sat May 10 12:08:54 2014
new/usr/src/lib/libm/common/C/libm_thread.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

/*
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 */
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 */

#ifndef _LIBM_THREAD_H
#define _LIBM_THREAD_H

#include <synch.h>
#include <thread.h>

/*
 * -lthread function(s) not prototyped anywhere
 */
extern int thr_main(void);
/*
 * function call(s) local to libsunmath
 */
extern void *__tsd_alloc(thread_key_t *, int, int);
#endif  /* _LIBM_THREAD_H */
```

```
**********************************************************
    7989 Sat May 10 12:08:54 2014
new/usr/src/lib/libm/common/C/log.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
/*
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 */
/*
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 * Use is subject to license terms.
 */

#pragma weak log = __log

/* INDENT OFF */
/*
 * log(x)
 * Table look-up algorithm with product polynomial approximation.
 * By K.C. Ng, Oct 23, 2004. Updated Oct 18, 2005.
 *
 * (a). For x in [1-0.125, 1+0.1328125], using a special approximation:
 *      Let f = x - 1 and z = f*f.
 *      return f + ((a1*z) *
 *                  ((a2 + (a3*f)*(a4+f)) + (f*z)*(a5+f))) *
 *                  (((a6 + f*(a7+f)) + (f*z)*(a8+f)) *
 *                  ((a9 + (a10*f)*(a11+f)) + (f*z)*(a12+f)))
 * a1   -6.88821452420390473170286327331268694251775741577e-0002,
 * a2    1.97493380704769294631262255279580131173133850098e+0000,
 * a3    2.24963218866067560242072431719861924648284912109e+0000,
 * a4   -9.02975906958474405783476868236903101205825805664e-0001,
 * a5   -1.47391630715542865104339398385491222143173217773e+0000,
 * a6    1.86846544648220058704168877738993614912033081055e+0000,
 * a7    1.82277370459347465292410106485476717352867126465e+0000,
 * a8    1.25295479915214102994980294170090928673744201660e+0000,
 * a9    1.96709676945198275177517643896828644943233730469e+0000,
 * a10  -4.00127989749189894030934055990655906498432159424e-0001,
 * a11   3.01675528558798333733648178167641162872314453125e+0000,
 * a12  -9.52325445049240770778453679668018594384193420410e-0001,
 *
 *      with remez error |(log(1+f) - P(f))/f| <= 2**-56.81 and
 *
 * (b). For 0.09375 <= x < 24
 *      Use an 8-bit table look-up (3-bit for exponent and 5 bit for
 *      significand):
 *      Let ix stands for the high part of x in IEEE double format.
```



```
 *      Since 0.09375 <= x < 24, we have
 *                    0x3fb80000 <= ix < 0x40380000.
 *      Let j = (ix - 0x3fb80000) >> 15. Then  0 <= j < 256. Choose
 *      a Y[j] such that HIWORD(Y[j]) ~ 0x3fb8400 + (j<<15) (the middle
 *      number between 0x3fb80000 + (j<<15) and 3fb80000 + ((j+1)<<15)),
 *      and at the same time 1/Y[j] as well as log(Y[j]) are very close
 *      to 53-bits floating point numbers.
 *      A table of Y[j], 1/Y[j], and log(Y[j]) are pre-computed and thus
 *              log(x)  = log(Y[j]) + log(1 + (x-Y[j])*(1/Y[j]))
 *                      = log(Y[j]) + log(1 + s)
 *      where
 *              s = (x-Y[j])*(1/Y[j])
 *      We compute max (x-Y[j])*(1/Y[j]) for the chosen Y[j] and obtain
 *      |s| < 0.0154. By applying remez algorithm with Product Polynomial
 *      Approximiation, we find the following approximated of log(1+s)
 *              (b1*s)*(b2+s*(b3+s))*((b4+s*b5)+(s*s)*(b6+s))*(b7+s*(b8+s))
 *      with remez error |log(1+s) - P(s)| <= 2**-63.5
 *
 * (c). Otherwise, get "n", the exponent of x, and then normalize x to
 *      z in [1,2). Then similar to (b) find a Y[i] that matches z to 5.5
 *      significant bits. Then
 *          log(x) = n*ln2 + log(Y[i]) + log(z/Y[i]).
 *
 * Special cases:
 *      log(x) is NaN with signal if x < 0 (including -INF) ;
 *      log(+INF) is +INF; log(0) is -INF with signal;
 *      log(NaN) is that NaN with no signal.
 *
 * Maximum error observed: less than 0.90 ulp
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */
/* INDENT ON */

#include "libm.h"

extern const double _TBL_log[];

static const double P[] = {
/* ONE   */  1.0,
/* TWO52 */  4503599627370496.0,
/* LN2HI */  6.93147180369123816490e-01,        /* 3fe62e42, fee00000 */
/* LN2LO */  1.90821492927058770002e-10,        /* 3dea39ef, 35793c76 */
/* A1    */ -6.88821452420390473170286327331268694251775741577e-0002,
/* A2    */  1.97493380704769294631262255279580131173133850098e+0000,
/* A3    */  2.24963218866067560242072431719861924648284912109e+0000,
/* A4    */ -9.02975906958474405783476868236903101205825805664e-0001,
/* A5    */ -1.47391630715542865104339398385491222143173217773e+0000,
/* A6    */  1.86846544648220058704168877738993614912033081055e+0000,
/* A7    */  1.82277370459347465292410106485476717352867126465e+0000,
/* A8    */  1.25295479915214102994980294170090928673744201660e+0000,
/* A9    */  1.96709676945198275177517643896828644943233730469e+0000,
/* A10   */ -4.00127989749189894030934055990655906498432159424e-0001,
/* A11   */  3.01675528558798333733648178167641162872314453125e+0000,
/* A12   */ -9.52325445049240770778453679668018594384193420410e-0001,
/* B1    */ -1.25041641589283658575482149899471551179885864258e-0001,
/* B2    */  1.87161713283355151891381127914642725337613123482e+0000,
/* B3    */ -1.89082956295731507978530316904652863740921020508e+0000,
/* B4    */ -2.50562891673640253387134180229622870683670043945e+0000,
/* B5    */  1.64822828085258366037635369139024987816810607910e+0000,
/* B6    */ -1.24409107065868340669112512841820716857910156250e+0000,
/* B7    */  1.70534231658220414296067701798165217041969299316e+0000,
```

```
/* B8    */  1.99196833784655646937267192697618156671524047852e+0000,
};

#define ONE   P[0]
#define TWO52 P[1]
#define LN2HI P[2]
#define LN2LO P[3]
#define A1    P[4]
#define A2    P[5]
#define A3    P[6]
#define A4    P[7]
#define A5    P[8]
#define A6    P[9]
#define A7    P[10]
#define A8    P[11]
#define A9    P[12]
#define A10   P[13]
#define A11   P[14]
#define A12   P[15]
#define B1    P[16]
#define B2    P[17]
#define B3    P[18]
#define B4    P[19]
#define B5    P[20]
#define B6    P[21]
#define B7    P[22]
#define B8    P[23]

double
log(double x) {
        double  *tb, dn, dn1, s, z, r, w;
        int     i, hx, ix, n, lx;

        n = 0;
        hx = ((int *)&x)[HIWORD];
        ix = hx & 0x7fffffff;
        lx = ((int *)&x)[LOWORD];

        /* subnormal,0,negative,inf,nan */
        if ((hx + 0x100000) < 0x200000) {
                if (ix > 0x7ff00000 || (ix == 0x7ff00000 && lx != 0)) /* nan */
                        return (x * x);
                if (((hx << 1) | lx) == 0)              /* zero */
                        return (_SVID_libm_err(x, x, 16));
                if (hx < 0)                             /* negative */
                        return (_SVID_libm_err(x, x, 17));
                if (((hx - 0x7ff00000) | lx) == 0)      /* +inf */
                        return (x);

                /* x must be positive and subnormal */
                x *= TWO52;
                n = -52;
                ix = ((int *)&x)[HIWORD];
                lx = ((int *)&x)[LOWORD];
        }

        i = ix >> 19;
        if (i >= 0x7f7 && i <= 0x806) {
                /* 0.09375 (0x3fb80000) <= x < 24 (0x40380000) */
                if (ix >= 0x3fec0000 && ix < 0x3ff22000) {
                        /* 0.875 <= x < 1.125 */
                        s = x - ONE;
                        z = s * s;
                        if (((ix - 0x3ff00000) | lx) == 0) /* x = 1 */
                                return (z);
                        r = (A10 * s) * (A11 + s);
```



```
                        w = z * s;
                        return (s + ((A1 * z) *
                                (A2 + ((A3 * s) * (A4 + s) + w * (A5 + s)))) *
                                ((A6 + (s * (A7 + s) + w * (A8 + s))) *
                                (A9 + (r + w * (A12 + s)))));
                } else {
                        i = (ix - 0x3fb80000) >> 15;
                        tb = (double *)_TBL_log + (i + i + i);
                        s = (x - tb[0]) * tb[1];
                        return (tb[2] +  ((B1 * s) * (B2 + s * (B3 + s))) *
                                (((B4 + s * B5) + (s * s) * (B6 + s)) *
                                (B7 + s * (B8 + s))));
                }
        } else {
                dn = (double)(n + ((ix >> 20) - 0x3ff));
                dn1 = dn * LN2HI;
                i = (ix & 0x000fffff) | 0x3ff00000;     /* scale x to [1,2] */
                ((int *)&x)[HIWORD] = i;
                i = (i - 0x3fb80000) >> 15;
                tb = (double *)_TBL_log + (i + i + i);
                s = (x - tb[0]) * tb[1];
                dn = dn * LN2LO + tb[2];
                return (dn1 + (dn + ((B1 * s) * (B2 + s * (B3 + s))) *
                        (((B4 + s * B5) + (s * s) * (B6 + s)) *
                        (B7 + s * (B8 + s)))));
        }
}
```

```
**********************************************************
    7235 Sat May 10 12:08:54 2014
new/usr/src/lib/libm/common/C/log10.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak log10 = __log10

/* INDENT OFF */
/*
 * log10(x) = log(x)/log10
 *
 * Base on Table look-up algorithm with product polynomial
 * approximation for log(x).
 *
 * By K.C. Ng, Nov 29, 2004
 *
 * (a). For x in [1-0.125, 1+0.125], from log.c we have
 *      log(x) =  f + ((a1*f^2) *
 *                ((a2 + (a3*f)*(a4+f)) + (f^3)*(a5+f))) *
 *                (((a6 + f*(a7+f)) + (f^3)*(a8+f)) *
 *                ((a9 + (a10*f)*(a11+f)) + (f^3)*(a12+f)))
 *      where f = x - 1.
 *      (i) modify a1 <- a1 / log10
 *      (ii) 1/log10 = 0.4342944819...
 *                   = 0.4375 - 0.003205518... (7 bit shift)
 *           Let lgv = 0.4375 - 1/log10, then
 *           lgv = 0.00320551809674817234887108108339 5...,
 *      (iii) f*0.4375 is exact because f has 3 trailing zero.
 *      (iv) Thus, log10(x) = f*0.4375 - (lgv*f - PPoly)
 *
 * (b). For 0.09375 <= x < 24
 *      Let j = (ix - 0x3fb80000) >> 15. Look up Y[j], 1/Y[j], and log(Y[j])
 *      from _TBL_log.c. Then
 *             log10(x)  = log10(Y[j]) + log10(1 + (x-Y[j])*(1/Y[j]))
 *                       = log(Y[j])(1/log10) + log10(1 + s)
 *      where
 *             s = (x-Y[j])*(1/Y[j])
 *      From log.c, we have log(1+s) =
```



```
 *                                2             2                    2
 *             (b s) (b + b s + s ) [b + b s + s (b + s)] (b + b s + s )
 *               1     2   3          4   5        6        7   8
 *
 *      By setting b1 <- b1/log10, we have
 *             log10(x) = 0.4375 * T - (lgv * T - POLY(s))
 *
 * (c). Otherwise, get "n", the exponent of x, and then normalize x to
 *      z in [1,2). Then similar to (b) find a Y[i] that matches z to 5.5
 *      significant bits. Then
 *          log(x) = n*ln2 + log(Y[i]) + log(z/Y[i]).
 *          log10(x) = n*(ln2/ln10) + log10(z).
 *
 * Special cases:
 *      log10(x) is NaN with signal if x < 0 (including -INF) ;
 *      log10(+INF) is +INF; log10(0) is -INF with signal;
 *      log10(NaN) is that NaN with no signal.
 *
 * Maximum error observed: less than 0.89 ulp
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */
/* INDENT ON */

#include "libm.h"

extern const double _TBL_log[];

static const double P[] = {
/* ONE   */  1.0,
/* TWO52 */  4503599627370496.0,
/* LNAHI */  3.01029995607677847147e-01,        /* 3FD34413 50900000 */
/* LNALO */  5.63033480667509769841e-11,        /* 3DCEF3FD E623E256 */
/* A1    */ -2.91425219601365825073854807070445828021 84e-02,
/* A2    */  1.99628461483039965074226529395673424005508422852e+0000,
/* A3    */  2.26812367662950720159642514772713184356689453125e+0000,
/* A4    */ -9.05030639084976384900471657601883634924888610840e-0001,
/* A5    */ -1.48275767132434044270894446526654064655303955078e+0000,
/* A6    */  1.88158320939722756293122074566781520843505859375e+0000,
/* A7    */  1.83309386046986411145098827546462416648864746094e+0000,
/* A8    */  1.24847063988317086291601754055591300129890441895e+0000,
/* A9    */  1.98372421445537705508854742220137268304824829102e+0000,
/* A10   */ -3.94711735767898475035764249696512706577777862549e-0001,
/* A11   */  3.07890395362954372160402272129431366920471191406e+0000,
/* A12   */ -9.60099585275022149311041630426188930869102478027e-0001,
/* B1    */ -5.43048949503500529608380967524915402866 89e-02,
/* B2    */  1.87161713283355151891381127914642725337613123482e+0000,
/* B3    */ -1.89082956295731507978530316904652863740921020508e+0000,
/* B4    */ -2.50562891673640253387134180229622870683670043945e+0000,
/* B5    */  1.64822828085258366037635369139024987816810607910e+0000,
/* B6    */ -1.24409107065868340669112512841820716857910156250e+0000,
/* B7    */  1.70534231658220414296067701798165217041969299316e+0000,
/* B8    */  1.99196833784655646937267192697618156671524047852e+0000,
/* LGH   */  0.4375,
/* LGL   */  0.00320551809674817234887108108339 5,
/* LG10V */  0.43429448190325182765112891891660509576226,
};

#define ONE   P[0]
#define TWO52 P[1]
#define LNAHI P[2]
#define LNALO P[3]
```

```
#define A1    P[4]
#define A2    P[5]
#define A3    P[6]
#define A4    P[7]
#define A5    P[8]
#define A6    P[9]
#define A7    P[10]
#define A8    P[11]
#define A9    P[12]
#define A10   P[13]
#define A11   P[14]
#define A12   P[15]
#define B1    P[16]
#define B2    P[17]
#define B3    P[18]
#define B4    P[19]
#define B5    P[20]
#define B6    P[21]
#define B7    P[22]
#define B8    P[23]
#define LGH   P[24]
#define LGL   P[25]
#define LG10V P[26]

double
log10(double x) {
        double  *tb, dn, dn1, s, z, r, w;
        int     i, hx, ix, n, lx;

        n = 0;
        hx = ((int *)&x)[HIWORD];
        ix = hx & 0x7fffffff;
        lx = ((int *)&x)[LOWORD];

        /* subnormal,0,negative,inf,nan */
        if ((hx + 0x100000) < 0x200000) {
                if (ix > 0x7ff00000 || (ix == 0x7ff00000 && lx != 0)) /* nan */
                        return (x * x);
                if (((hx << 1) | lx) == 0)              /* zero */
                        return (_SVID_libm_err(x, x, 18));
                if (hx < 0)                             /* negative */
                        return (_SVID_libm_err(x, x, 19));
                if (((hx - 0x7ff00000) | lx) == 0)      /* +inf */
                        return (x);

                /* x must be positive and subnormal */
                x *= TWO52;
                n = -52;
                ix = ((int *)&x)[HIWORD];
                lx = ((int *)&x)[LOWORD];
        }

        i = ix >> 19;
        if (i >= 0x7f7 && i <= 0x806) {
                /* 0.09375 (0x3fb80000) <= x < 24 (0x40380000) */
                if (ix >= 0x3fec0000 && ix < 0x3ff20000) {
                        /* 0.875 <= x < 1.125 */
                        s = x - ONE;
                        z = s * s;
                        if (((ix - 0x3ff00000) | lx) == 0) /* x = 1 */
                                return (z);
                        r = (A10 * s) * (A11 + s);
                        w = z * s;
                        return (LGH * s - (LGL * s - ((A1 * z) *
                                ((A2 + (A3 * s) * (A4 + s)) + w * (A5 + s))) *
                                (((A6 + s * (A7 + s)) + w * (A8 + s)) *
```



```
                                ((A9 + r) + w * (A12 + s)))));
                } else {
                        i = (ix - 0x3fb80000) >> 15;
                        tb = (double *)_TBL_log + (i + i + i);
                        s = (x - tb[0]) * tb[1];
                        return (LGH * tb[2] - (LGL * tb[2] - ((B1 * s) *
                                (B2 + s * (B3 + s))) *
                                (((B4 + s * B5) + (s * s) * (B6 + s)) *
                                (B7 + s * (B8 + s)))));
                }
        } else {
                dn = (double)(n + ((ix >> 20) - 0x3ff));
                dn1 = dn * LNAHI;
                i = (ix & 0x000fffff) | 0x3ff00000;     /* scale x to [1,2] */
                ((int *)&x)[HIWORD] = i;
                i = (i - 0x3fb80000) >> 15;
                tb = (double *)_TBL_log + (i + i + i);
                s = (x - tb[0]) * tb[1];
                dn = dn * LNALO + tb[2] * LG10V;
                return (dn1 + (dn + ((B1 * s) *
                        (B2 + s * (B3 + s))) *
                        (((B4 + s * B5) + (s * s) * (B6 + s)) *
                        (B7 + s * (B8 + s)))));
        }
}
```

```
**********************************************************
    6359 Sat May 10 12:08:54 2014
new/usr/src/lib/libm/common/C/log1p.c
log1p.c
It is safe to initialize c with 0 at the beginning.
We will use 'c' only if (k != 0).
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak log1p = __log1p

/* INDENT OFF */
/*
 * Method :
 *   1. Argument Reduction: find k and f such that
 *                      1+x = 2^k * (1+f),
 *         where  sqrt(2)/2 < 1+f < sqrt(2) .
 *
 *      Note. If k=0, then f=x is exact. However, if k!=0, then f
 *      may not be representable exactly. In that case, a correction
 *      term is need. Let u=1+x rounded. Let c = (1+x)-u, then
 *      log(1+x) - log(u) ~ c/u. Thus, we proceed to compute log(u),
 *      and add back the correction term c/u.
 *      (Note: when x > 2**53, one can simply return log(x))
 *
 *   2. Approximation of log1p(f).
 *      Let s = f/(2+f) ; based on log(1+f) = log(1+s) - log(1-s)
 *               = 2s + 2/3 s**3 + 2/5 s**5 + .....,
 *               = 2s + s*R
 *      We use a special Reme algorithm on [0,0.1716] to generate
 *      a polynomial of degree 14 to approximate R The maximum error
 *      of this polynomial approximation is bounded by 2**-58.45. In
 *      other words,
 *                      2      4      6      8      10      12      14
 *          R(z) ~ Lp1*s +Lp2*s +Lp3*s +Lp4*s +Lp5*s  +Lp6*s  +Lp7*s
 *      (the values of Lp1 to Lp7 are listed in the program)
 *      and
 *          |      2          14          |     -58.45
```



```
 *          | Lp1*s +...+Lp7*s    -  R(z) | <= 2
 *          |                             |
 *      Note that 2s = f - s*f = f - hfsq + s*hfsq, where hfsq = f*f/2.
 *      In order to guarantee error in log below 1ulp, we compute log
 *      by
 *              log1p(f) = f - (hfsq - s*(hfsq+R)).
 *
 *      3. Finally, log1p(x) = k*ln2 + log1p(f).
 *                           = k*ln2_hi+(f-(hfsq-(s*(hfsq+R)+k*ln2_lo)))
 *         Here ln2 is splitted into two floating point number:
 *                      ln2_hi + ln2_lo,
 *         where n*ln2_hi is always exact for |n| < 2000.
 *
 * Special cases:
 *      log1p(x) is NaN with signal if x < -1 (including -INF) ;
 *      log1p(+INF) is +INF; log1p(-1) is -INF with signal;
 *      log1p(NaN) is that NaN with no signal.
 *
 * Accuracy:
 *      according to an error analysis, the error is always less than
 *      1 ulp (unit in the last place).
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following
 * constants. The decimal values may be used, provided that the
 * compiler will convert from decimal to binary accurately enough
 * to produce the hexadecimal values shown.
 *
 * Note: Assuming log() return accurate answer, the following
 *       algorithm can be used to compute log1p(x) to within a few ULP:
 *
 *              u = 1+x;
 *              if(u==1.0) return x ; else
 *                         return log(u)*(x/(u-1.0));
 *
 *       See HP-15C Advanced Functions Handbook, p.193.
 */
/* INDENT ON */

#include "libm.h"

static const double xxx[] = {
/* ln2_hi */    6.93147180369123816490e-01,     /* 3fe62e42 fee00000 */
/* ln2_lo */    1.90821492927058770002e-10,     /* 3dea39ef 35793c76 */
/* two54 */     1.80143985094819840000e+16,     /* 43500000 00000000 */
/* Lp1 */       6.66666666666735130e-01,        /* 3FE55555 55555593 */
/* Lp2 */       3.99999999940941908e-01,        /* 3FD99999 9997FA04 */
/* Lp3 */       2.85714874366239149e-01,        /* 3FD24924 94229359 */
/* Lp4 */       2.22221984321497839 6e-01,      /* 3FCC71C5 1D8E78AF */
/* Lp5 */       1.81835721616180501 2e-01,      /* 3FC74664 96CB03DE */
/* Lp6 */       1.53138376992093733 2e-01,      /* 3FC39A09 D078C69F */
/* Lp7 */       1.47981986051165859 1e-01,      /* 3FC2F112 DF3E5244 */
/* zero */      0.0
};
#define ln2_hi  xxx[0]
#define ln2_lo  xxx[1]
#define two54   xxx[2]
#define Lp1     xxx[3]
#define Lp2     xxx[4]
#define Lp3     xxx[5]
#define Lp4     xxx[6]
#define Lp5     xxx[7]
#define Lp6     xxx[8]
#define Lp7     xxx[9]
#define zero    xxx[10]
```

```
124 double
125 log1p(double x) {
126         double  hfsq, f, c = 0.0, s, z, R, u;
127         int     k, hx, hu, ax;
128
129         hx = ((int *)&x)[HIWORD];               /* high word of x */
130         ax = hx & 0x7fffffff;
131
132         if (ax >= 0x7ff00000) { /* x is inf or nan */
133                 if (((hx - 0xfff00000) | ((int *)&x)[LOWORD]) == 0) /* -inf */
134                         return (_SVID_libm_err(x, x, 44));
135                 return (x * x);
136         }
137
138         k = 1;
139         if (hx < 0x3FDA827A) {  /* x < 0.41422  */
140                 if (ax >= 0x3ff00000)   /* x <= -1.0 */
141                         return (_SVID_libm_err(x, x, x == -1.0 ? 43 : 44));
142                 if (ax < 0x3e200000) {  /* |x| < 2**-29 */
143                         if (two54 + x > zero && /* raise inexact */
144                             ax < 0x3c900000)    /* |x| < 2**-54 */
145                                 return (x);
146                         else
147                                 return (x - x * x * 0.5);
148                 }
149                 if (hx > 0 || hx <= (int)0xbfd2bec3) {  /* -0.2929<x<0.41422 */
150                         k = 0;
151                         f = x;
152                         hu = 1;
153                 }
154         }
155         /* We will initialize 'c' here. */
156         if (k != 0) {
157                 if (hx < 0x43400000) {
158                         u = 1.0 + x;
159                         hu = ((int *)&u)[HIWORD];       /* high word of u */
160                         k = (hu >> 20) - 1023;
161                         /*
162                          * correction term
163                          */
164                         c = k > 0 ? 1.0 - (u - x) : x - (u - 1.0);
165                         c /= u;
166                 } else {
167                         u = x;
168                         hu = ((int *)&u)[HIWORD];       /* high word of u */
169                         k = (hu >> 20) - 1023;
170                         c = 0;
171                 }
172                 hu &= 0x000fffff;
173                 if (hu < 0x6a09e) {     /* normalize u */
174                         ((int *)&u)[HIWORD] = hu | 0x3ff00000;
175                 } else {                        /* normalize u/2 */
176                         k += 1;
177                         ((int *)&u)[HIWORD] = hu | 0x3fe00000;
178                         hu = (0x00100000 - hu) >> 2;
179                 }
180                 f = u - 1.0;
181         }
182         hfsq = 0.5 * f * f;
183         if (hu == 0) {          /* |f| < 2**-20 */
184                 if (f == zero) {
185                         if (k == 0)
186                                 return (zero);
187                         /* We already initialized 'c' before, when (k != 0) */
188                         c += k * ln2_lo;
189                         return (k * ln2_hi + c);
```



```
190                 }
191                 R = hfsq * (1.0 - 0.66666666666666666 * f);
192                 if (k == 0)
193                         return (f - R);
194                 return (k * ln2_hi - ((R - (k * ln2_lo + c)) - f));
195         }
196         s = f / (2.0 + f);
197         z = s * s;
198         R = z * (Lp1 + z * (Lp2 + z * (Lp3 + z * (Lp4 + z * (Lp5 +
199                 z * (Lp6 + z * Lp7))))));
200         if (k == 0)
201                 return (f - (hfsq - s * (hfsq + R)));
202         return (k * ln2_hi - ((hfsq - (s * (hfsq + R) +
203                 (k * ln2_lo + c))) - f));
204 }
```

```
**********************************************************
    7393 Sat May 10 12:08:54 2014
new/usr/src/lib/libm/common/C/log2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak log2 = __log2

/* INDENT OFF */
/*
 * log2(x) = log(x)/log2
 *
 * Base on Table look-up algorithm with product polynomial
 * approximation for log(x).
 *
 * By K.C. Ng, Nov 29, 2004
 *
 * (a). For x in [1-0.125, 1+0.125], from log.c we have
 *      log(x) =  f + ((a1*f^2) *
 *                ((a2 + (a3*f)*(a4+f)) + (f^3)*(a5+f))) *
 *                (((a6 + f*(a7+f)) + (f^3)*(a8+f)) *
 *                ((a9 + (a10*f)*(a11+f)) + (f^3)*(a12+f)))
 *      where f = x - 1.
 *      (i) modify a1 <- a1 / log2
 *      (ii) 1/log2 = 1.4426950408889634...
 *                  = 1.5 - 0.057304959... (4 bit shift)
 *           Let lv = 1.5 - 1/log2, then
 *           lv = 0.05730495911103659264007531899810795666532 5,
 *      (iii) f*1.5 is exact because f has 3 trailing zero.
 *      (iv) Thus, log2(x) = f*1.5 - (lv*f - PPoly)
 *
 * (b). For 0.09375 <= x < 24
 *      Let j = (ix - 0x3fb80000) >> 15. Look up Y[j], 1/Y[j], and log(Y[j])
 *      from _TBL_log.c. Then
 *              log2(x)  = log2(Y[j]) + log2(1 + (x-Y[j])*(1/Y[j]))
 *                       = log(Y[j])(1/log2) + log2(1 + s)
 *      where
 *              s = (x-Y[j])*(1/Y[j])
```



```
 *      From log.c, we have log(1+s) =
 *                                 2                2                   2
 *             (b s) (b + b s + s ) [b + b s + s (b + s)] (b + b s + s )
 *               1     2   3          4   5        6        7   8
 *
 *      By setting b1 <- b1/log2, we have
 *             log2(x) = 1.5 * T - (lv * T - POLY(s))
 *
 * (c). Otherwise, get "n", the exponent of x, and then normalize x to
 *      z in [1,2). Then similar to (b) find a Y[i] that matches z to 5.5
 *      significant bits. Then
 *          log2(x) = n + log2(z).
 *
 * Special cases:
 *      log2(x) is NaN with signal if x < 0 (including -INF) ;
 *      log2(+INF) is +INF; log2(0) is -INF with signal;
 *      log2(NaN) is that NaN with no signal.
 *
 * Maximum error observed: less than 0.84 ulp
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */
/* INDENT ON */

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"

extern const double _TBL_log[];

static const double P[] = {
/* ONE   */  1.0,
/* TWO52 */  4503599627370496.0,
/* LN10V */  1.44269504088896340735992468100189204333 47,   /* 1/log10 */
/* ZERO  */  0.0,
/* A1    */ -9.68093624552496382178419322289671946401 16e-02,
/* A2    */  1.99628461483039965074226529395673424005508422852e+0000,
/* A3    */  2.26812367662950720159642514772713184356689453125e+0000,
/* A4    */ -9.05030639084976384900471657601883634924888610840e-0001,
/* A5    */ -1.48275767132434044270894446526654064655303955078e+0000,
/* A6    */  1.88158320939722756293122074566781520843505859375e+0000,
/* A7    */  1.83309386046986411145098827546462416648864746094e+0000,
/* A8    */  1.24847063988317086291601754055591300129890441895e+0000,
/* A9    */  1.98372421445537705508854742220137268304824829102e+0000,
/* A10   */ -3.94711735767898475035764249696512706577777862549e-0001,
/* A11   */  3.07890395362954372160402272129431366920471191406e+0000,
/* A12   */ -9.60099585275022149311041630426188930869102478027e-0001,
/* B1    */ -1.80396956225474695148989632046165328854 51e-01,
/* B2    */  1.87161713283355151891381127914642725337613123482e+0000,
/* B3    */ -1.89082956295731507978530316904652863740921020508e+0000,
/* B4    */ -2.50562891673640253387134180229622870683670043945e+0000,
/* B5    */  1.64822828085258366037635369139024987816810607910e+0000,
/* B6    */ -1.24409107065868340669112512841820716857910156250e+0000,
/* B7    */  1.70534231658220414296067701798165217041969299316e+0000,
/* B8    */  1.99196833784655646937267192697618156671524047852e+0000,
/* LGH   */  1.5,
/* LGL   */  0.05730495911103659264007531899810795666532 5,
};

#define ONE   P[0]
#define TWO52 P[1]
#define LN10V P[2]
```

```
128 #define ZERO  P[3]
129 #define A1    P[4]
130 #define A2    P[5]
131 #define A3    P[6]
132 #define A4    P[7]
133 #define A5    P[8]
134 #define A6    P[9]
135 #define A7    P[10]
136 #define A8    P[11]
137 #define A9    P[12]
138 #define A10   P[13]
139 #define A11   P[14]
140 #define A12   P[15]
141 #define B1    P[16]
142 #define B2    P[17]
143 #define B3    P[18]
144 #define B4    P[19]
145 #define B5    P[20]
146 #define B6    P[21]
147 #define B7    P[22]
148 #define B8    P[23]
149 #define LGH   P[24]
150 #define LGL   P[25]

152 double
153 log2(double x) {
154         int i, hx, ix, n, lx;

156         n = 0;
157         hx = ((int *) &x)[HIWORD]; ix = hx & 0x7fffffff;
158         lx = ((int *) &x)[LOWORD];

160         /* subnormal,0,negative,inf,nan */
161         if ((hx + 0x100000) < 0x200000) {
162 #if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
163                 if (ix >= 0x7ff80000)           /* assumes sparc-like QNaN */
164                         return (x);             /* for Cheetah when x is QNaN */
165 #endif
166                 if (((hx << 1) | lx) == 0)      /* log(0.0) = -inf */
167                         return (A5 / fabs(x));
168                 if (hx < 0) {   /* x < 0 */
169                         if (ix >= 0x7ff00000)
170                                 return (x - x); /* x is -inf or NaN */
171                         else
172                                 return (ZERO / (x - x));
173                 }
174                 if (((hx - 0x7ff00000) | lx) == 0)      /* log(inf) = inf */
175                         return (x);
176                 if (ix >= 0x7ff00000)           /* log(NaN) = NaN */
177                         return (x - x);
178                 x *= TWO52;
179                 n = -52;
180                 hx = ((int *) &x)[HIWORD]; ix = hx & 0x7fffffff;
181                 lx = ((int *) &x)[LOWORD];
182         }

184         /* 0.09375 (0x3fb80000) <= x < 24 (0x40380000) */
185         i = ix >> 19;
186         if (i >= 0x7f7 && i <= 0x806) {
187                 /* 0.875 <= x < 1.125 */
188                 if (ix >= 0x3fec0000 && ix < 0x3ff20000) {
189                         double s, z, r, w;
190                         s = x - ONE; z = s * s; r = (A10 * s) * (A11 + s);
191                         w = z * s;
192                         if (((ix << 12) | lx) == 0)
193                                 return (z);
```



```
194                         else
195                                 return (LGH * s - (LGL * s - ((A1 * z) *
196                                 ((A2 + (A3 * s) * (A4 + s)) + w * (A5 + s))) *
197                                 (((A6 + s * (A7 + s)) + w * (A8 + s)) *
198                                 ((A9 + r) + w * (A12 + s)))));
199                 } else {
200                         double *tb, s;
201                         i = (ix - 0x3fb80000) >> 15;
202                         tb = (double *) _TBL_log + (i + i + i);
203                         if (((ix << 12) | lx) == 0)     /* 2's power */
204                                 return ((double) ((ix >> 20) - 0x3ff));
205                         s = (x - tb[0]) * tb[1];
206                         return (LGH * tb[2] - (LGL * tb[2] - ((B1 * s) *
207                                 (B2 + s * (B3 + s))) *
208                                 (((B4 + s * B5) + (s * s) * (B6 + s)) *
209                                 (B7 + s * (B8 + s)))));
210                 }
211         } else {
212                 double *tb, dn, s;
213                 dn = (double) (n + ((ix >> 20) - 0x3ff));
214                 ix <<= 12;
215                 if ((ix | lx) == 0)
216                         return (dn);
217                 i = ((unsigned) ix >> 12) | 0x3ff00000; /* scale x to [1,2) */
218                 ((int *) &x)[HIWORD] = i;
219                 i = (i - 0x3fb80000) >> 15;
220                 tb = (double *) _TBL_log + (i + i + i);
221                 s = (x - tb[0]) * tb[1];
222                 return (dn + (tb[2] * LN10V + ((B1 * s) *
223                         (B2 + s * (B3 + s))) *
224                         (((B4 + s * B5) + (s * s) * (B6 + s)) *
225                         (B7 + s * (B8 + s)))));
226         }
227 }
```

```
**********************************************************
    2199 Sat May 10 12:08:54 2014
new/usr/src/lib/libm/common/C/logb.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak logb = __logb
#pragma weak _logb = __logb
#endif

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */
#define _C99SUSv3_logb  _C99SUSv3_logb_subnormal_is_like_ilogb

#if defined(USE_FPSCALE) || defined(__x86)
static const double two52 = 4503599627370496.0;
#else
/*
 * v: high part of a non-zero subnormal |x|; w: low part of |x|
 */
static int
ilogb_subnormal(unsigned v, unsigned w) {
        int r = -1022 - 52;

        if (v)
                r += 32;
        else
                v = w;
        if (v & 0xffff0000)
                r += 16, v >>= 16;
        if (v & 0xff00)
                r += 8, v >>= 8;
        if (v & 0xf0)
                r += 4, v >>= 4;
        v <<= 1;
        return (r + ((0xffffaa50 >> v) & 0x3));
```



```
}
#endif  /* defined(USE_FPSCALE) */

double
logb(double x) {
        int *px = (int *) &x, k = px[HIWORD] & ~0x80000000;

        if (k < 0x00100000) {
                if ((px[LOWORD] | k) == 0)
                        return (_SVID_libm_err(x, x, 45));
                else if ((__xpg6 & _C99SUSv3_logb) != 0) {
#if defined(USE_FPSCALE) || defined(__x86)
                        x *= two52;
                        return ((double) (((px[HIWORD] & 0x7ff00000) >> 20)
                                - 1075));
#else
                        return ((double) ilogb_subnormal(k, px[LOWORD]));
#endif
                } else
                        return (-1022.0);
        } else if (k < 0x7ff00000)
                return ((double) ((k >> 20) - 1023));
        else
                return (x * x);
}
```

****
1116 Sat May 10 12:08:55 2014
new/usr/src/lib/libm/common/C/matherr.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#pragma weak matherr = __matherr

#include "libm.h"

/* ARGSUSED0 */
int
__matherr(struct exception *x) {
        return 0;
}
```

```
**********************************************************
    2274 Sat May 10 12:08:55 2014
new/usr/src/lib/libm/common/C/nextafter.c
nextafter.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak nextafter = __nextafter
#pragma weak _nextafter = __nextafter

#include "libm.h"
#include <float.h>              /* DBL_MIN */

double
nextafter(double x, double y) {
        int             hx, hy, k;
        double          ans;
        unsigned        lx;
        volatile double dummy;

        hx = ((int *)&x)[HIWORD];
        lx = ((int *)&x)[LOWORD];
        hy = ((int *)&y)[HIWORD];
        k = (hx & ~0x80000000) | lx;

        if (x == y)
                return (y);             /* C99 requirement */
        if (x != x || y != y)
                return (x * y);
        if (k == 0) {                   /* x = 0 */
                k = hy & 0x80000000;
                ((int *)&ans)[HIWORD] = k;
                ((int *)&ans)[LOWORD] = 1;
        } else if (hx >= 0) {
                if (x > y) {
                        ((int *)&ans)[LOWORD] = lx - 1;
                        k = (lx == 0)? hx - 1 : hx;
                        ((int *)&ans)[HIWORD] = k;
                } else {
                        ((int *)&ans)[LOWORD] = lx + 1;
                        k  = (lx == 0xffffffff)? hx + 1 : hx;
                        ((int *)&ans)[HIWORD] = k;
                }
        } else {
                if (x < y) {
                        ((int *)&ans)[LOWORD] = lx - 1;
                        k = (lx == 0)? hx - 1 : hx;
                        ((int *)&ans)[HIWORD] = k;
                } else {
                        ((int *)&ans)[LOWORD] = lx + 1;
                        k  = (lx == 0xffffffff)? hx + 1 : hx;
                        ((int *)&ans)[HIWORD] = k;
                }
        }
        k = (k >> 20) & 0x7ff;
        if (k == 0x7ff) {
                /* overflow */
                return (_SVID_libm_err(x, y, 46));
#if !defined(__lint)
        } else if (k == 0) {
                /* underflow */
                dummy = DBL_MIN * copysign(DBL_MIN, x);
#endif
        }
        return (ans);
}
```

```
**********************************************************
   10202 Sat May 10 12:08:55 2014
new/usr/src/lib/libm/common/C/pow.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak pow = __pow
#endif

/*
 * pow(x,y) return x**y
 *                      n
 * Method:  Let x =  2   * (1+f)
 *      1. Compute and return log2(x) in two pieces:
 *              log2(x) = w1 + w2,
 *         where w1 has 24 bits trailing zero.
 *      2. Perform y*log2(x) by simulating muti-precision arithmetic
 *      3. Return x**y = exp2(y*log(x))
 *
 * Special cases:
 *      1.  (anything) ** +-0 is 1
 *      1'. 1 ** (anything)   is 1      (C99; 1 ** +-INF/NAN used to be NAN)
 *      2.  (anything) ** 1   is itself
 *      3.  (anything except 1) ** NAN is NAN ("except 1" is C99)
 *      4.  NAN ** (anything except 0) is NAN
 *      5.  +-(|x| > 1) **  +INF is +INF
 *      6.  +-(|x| > 1) **  -INF is +0
 *      7.  +-(|x| < 1) **  +INF is +0
 *      8.  +-(|x| < 1) **  -INF is +INF
 *      9.  -1              ** +-INF is 1   (C99; -1 ** +-INF used to be NAN)
 *      10. +0 ** (+anything except 0, NAN)               is +0
 *      11. -0 ** (+anything except 0, NAN, odd integer)  is +0
 *      12. +0 ** (-anything except 0, NAN)               is +INF
 *      13. -0 ** (-anything except 0, NAN, odd integer)  is +INF
 *      14. -0 ** (odd integer) = -( +0 ** (odd integer) )
 *      15. +INF ** (+anything except 0,NAN) is +INF
```



```
 *      16. +INF ** (-anything except 0,NAN) is +0
 *      17. -INF ** (anything)  = -0 ** (-anything)
 *      18. (-anything) ** (integer) is (-1)**(integer)*(+anything**integer)
 *      19. (-anything except 0 and inf) ** (non-integer) is NAN
 *
 * Accuracy:
 *      pow(x,y) returns x**y nearly rounded. In particular
 *                      pow(integer,integer)
 *      always returns the correct integer provided it is representable.
 */

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */
#define _C99SUSv3_pow   _C99SUSv3_pow_treats_Inf_as_an_even_int

static const double zero = 0.0, one = 1.0, two = 2.0;

extern const double _TBL_log2_hi[], _TBL_log2_lo[];
static const double
        two53 = 9007199254740992.0,
        A1_hi = 2.885390043258666992187 5,
        A1_lo = 3.851925982503504196306002e-8,
        A1 = 2.885390081777926817222541963606002026086e+0000,
        A2 = 9.617966939207270828380543979852286255862e-0001,
        A3 = 5.770807680887875964868853124873696201995e-0001,
        B0_hi = 2.885390043258666992187 5,
        B0_lo = 3.851925982253279305637432058 5e-8,
        B0 = 2.885390081777926814720293056374320585689e+0000,
        B1 = 9.617966939259755138949202350396200257632e-0001,
        B2 = 5.770780163585687000782112776448797953382e-0001,
        B3 = 4.121985488948771523290174512461778354953e-0001,
        B4 = 3.207590534812432970433641789022666850193e-0001;

static double
log2_x(double x, double *w) {
        double f, s, z, qn, h, t;
        int *px = (int *) &x;
        int *pz = (int *) &z;
        int i, j, ix, n;

        n = 0;
        ix = px[HIWORD];
        if (ix >= 0x3fef03f1 && ix < 0x3ff08208) {      /* 65/63 > x > 63/65 */
                double f1, v;
                f = x - one;
                if (((ix - 0x3ff00000) | px[LOWORD]) == 0) {
                        *w = zero;
                        return (zero);          /* log2(1)= +0 */
                }
                qn = one / (two + f);
                s = f * qn;                             /* |s|<2**-6 */
                v = s * s;
                h = (double) ((float) s);
                f1 = (double) ((float) f);
                t = qn * (((f - two * h) - h * f1) - h * (f - f1));
                                                                /* s = h+t */
                f1 = h * B0_lo + s * (v * (B1 + v * (B2 + v * (B3 + v * B4))));
                t = f1 + t * B0;
                h *= B0_hi;
                s = (double) ((float) (h + t));
                *w = t - (s - h);
                return (s);
        }
        if (ix < 0x00100000) {                          /* subnormal x */
                x *= two53;
                n = -53;
```

```
127                 ix = px[HIWORD];
128         }
129         /* LARGE N */
130         n += ((ix + 0x1000) >> 20) - 0x3ff;
131         ix = (ix & 0x000fffff) | 0x3ff00000;            /* scale x to [1,2] */
132         px[HIWORD] = ix;
133         i = ix + 0x1000;
134         pz[HIWORD] = i & 0xfffffe000;
135         pz[LOWORD] = 0;
136         qn = one / (x + z);
137         f = x - z;
138         s = f * qn;
139         h = (double) ((float) s);
140         t = qn * ((f - (h + h) * z) - h * f);
141         j = (i >> 13) & 0x7f;
142         f = s * s;
143         t = t * A1 + h * A1_lo;
144         t += (s * f) * (A2 + f * A3);
145         qn = h * A1_hi;
146         s = n + _TBL_log2_hi[j];
147         h = qn + s;
148         t += _TBL_log2_lo[j] - ((h - s) - qn);
149         f = (double) ((float) (h + t));
150         *w = t - (f - h);
151         return (f);
152 }

154 extern const double _TBL_exp2_hi[], _TBL_exp2_lo[];
155 static const double             /* poly app of 2^x-1 on [-1e-10,2^-7+1e-10] */
156         E1 = 6.93147180559945310067495853381034619732 8e-0001,
157         E2 = 2.40226506958777934784676915171749381597 9e-0001,
158         E3 = 5.55041086647541051263112489277393786469 9e-0002,
159         E4 = 9.61814320999102682485371274016245142335 5e-0003,
160         E5 = 1.33335767654994034509677412223184908299 1e-0003;

162 double
163 pow(double x, double y) {
164         double z, ax;
165         double y1, y2, w1, w2;
166         int sbx, sby, j, k, yisint;
167         int hx, hy, ahx, ahy;
168         unsigned lx, ly;
169         int *pz = (int *) &z;

171         hx = ((int *) &x)[HIWORD];
172         lx = ((unsigned *) &x)[LOWORD];
173         hy = ((int *) &y)[HIWORD];
174         ly = ((unsigned *) &y)[LOWORD];
175         ahx = hx & ~0x80000000;
176         ahy = hy & ~0x80000000;
177         if ((ahy | ly) == 0) {  /* y==zero  */
178                 if ((ahx | lx) == 0)
179                         z = _SVID_libm_err(x, y, 20);   /* +-0**+-0 */
180                 else if ((ahx | (((lx | -lx) >> 31) & 1)) > 0x7ff00000)
181                         z = _SVID_libm_err(x, y, 42);   /* NaN**+-0 */
182                 else
183                         z = one;                        /* x**+-0 = 1 */
184                 return (z);
185         } else if (hx == 0x3ff00000 && lx == 0 &&
186                 (__xpg6 & _C99SUSv3_pow) != 0)
187                 return (one);                   /* C99: 1**anything = 1 */
188         else if (ahx > 0x7ff00000 || (ahx == 0x7ff00000 && lx != 0) ||
189                 ahy > 0x7ff00000 || (ahy == 0x7ff00000 && ly != 0))
190                 return (x * y); /* +-NaN return x*y; + -> * for Cheetah */
191                                 /* includes Sun: 1**NaN = NaN */
192         sbx = (unsigned) hx >> 31;
```



```
193         sby = (unsigned) hy >> 31;
194         ax = fabs(x);

196         /*
197          * determine if y is an odd int when x < 0
198          * yisint = 0 ... y is not an integer
199          * yisint = 1 ... y is an odd int
200          * yisint = 2 ... y is an even int
201          */
202         yisint = 0;
203         if (sbx) {
204                 if (ahy >= 0x43400000)
205                         yisint = 2;             /* even integer y */
206                 else if (ahy >= 0x3ff00000) {
207                         k = (ahy >> 20) - 0x3ff;        /* exponent */
208                         if (k > 20) {
209                                 j = ly >> (52 - k);
210                                 if ((j << (52 - k)) == ly)
211                                         yisint = 2 - (j & 1);
212                         } else if (ly == 0) {
213                                 j = ahy >> (20 - k);
214                                 if ((j << (20 - k)) == ahy)
215                                         yisint = 2 - (j & 1);
216                         }
217                 }
218         }
219         /* special value of y */
220         if (ly == 0) {
221                 if (ahy == 0x7ff00000) {        /* y is +-inf */
222                         if (((ahx - 0x3ff00000) | lx) == 0) {
223                                 if ((__xpg6 & _C99SUSv3_pow) != 0)
224                                         return (one);
225                                                 /* C99: (-1)**+-inf = 1 */
226                                 else
227                                         return (y - y);
228                                                 /* Sun: (+-1)**+-inf = NaN */
229                         } else if (ahx >= 0x3ff00000)
230                                                 /* (|x|>1)**+,-inf = inf,0 */
231                                 return (sby == 0 ? y : zero);
232                         else                    /* (|x|<1)**-,+inf = inf,0 */
233                                 return (sby != 0 ? -y : zero);
234                 }
235                 if (ahy == 0x3ff00000) {        /* y is  +-1 */
236                         if (sby != 0) { /* y is -1 */
237                                 if (x == zero)  /* divided by zero */
238                                         return (_SVID_libm_err(x, y, 23));
239                                 else if (ahx < 0x40000 || ((ahx - 0x40000) |
240                                         lx) == 0)       /* overflow */
241                                         return (_SVID_libm_err(x, y, 21));
242                                 else
243                                         return (one / x);
244                         } else
245                                 return (x);
246                 }
247                 if (hy == 0x40000000) {         /* y is  2 */
248                         if (ahx >= 0x5ff00000 && ahx < 0x7ff00000)
249                                 return (_SVID_libm_err(x, y, 21));
250                                                         /* x*x overflow */
251                         else if ((ahx < 0x1e56a09e && (ahx | lx) != 0) ||
252                                 (ahx == 0x1e56a09e && lx < 0x667f3bcd))
253                                 return (_SVID_libm_err(x, y, 22));
254                                                         /* x*x underflow */
255                         else
256                                 return (x * x);
257                 }
258                 if (hy == 0x3fe00000) {
```

```
259                         if (!((ahx | lx) == 0 || ((ahx - 0x7ff00000) | lx) ==
260                                 0 || sbx == 1))
261                                 return (sqrt(x));       /* y is 0.5 and x > 0 */
262                 }
263         }
264         /* special value of x */
265         if (lx == 0) {
266                 if (ahx == 0x7ff00000 || ahx == 0 || ahx == 0x3ff00000) {
267                         /* x is +-0,+-inf,-1 */
268                         z = ax;
269                         if (sby == 1) {
270                                 z = one / z;    /* z = |x|**y */
271                                 if (ahx == 0)
272                                         return (_SVID_libm_err(x, y, 23));
273                         }
274                         if (sbx == 1) {
275                                 if (ahx == 0x3ff00000 && yisint == 0)
276                                         z = _SVID_libm_err(x, y, 24);
277                                         /* neg**non-integral is NaN + invalid */
278                                 else if (yisint == 1)
279                                         z = -z; /* (x<0)**odd = -(|x|**odd) */
280                         }
281                         return (z);
282                 }
283         }
284         /* (x<0)**(non-int) is NaN */
285         if (sbx == 1 && yisint == 0)
286                 return (_SVID_libm_err(x, y, 24));
287         /* Now ax is finite, y is finite */
288         /* first compute log2(ax) = w1+w2, with 24 bits w1 */
289         w1 = log2_x(ax, &w2);

291         /* split up y into y1+y2 and compute (y1+y2)*(w1+w2) */
292         if (((ly & 0x07ffffff) == 0) || ahy >= 0x47e00000 ||
293                 ahy <= 0x38100000) {
294                 /* no need to split if y is short or too large or too small */
295                 y1 = y * w1;
296                 y2 = y * w2;
297         } else {
298                 y1 = (double) ((float) y);
299                 y2 = (y - y1) * w1 + y * w2;
300                 y1 *= w1;
301         }
302         z = y1 + y2;
303         j = pz[HIWORD];
304         if (j >= 0x40900000) {                          /* z >= 1024 */
305                 if (!(j == 0x40900000 && pz[LOWORD] == 0))      /* z > 1024 */
306                         return (_SVID_libm_err(x, y, 21));      /* overflow */
307                 else {
308                         w2 = y1 - z;
309                         w2 += y2;
310                                                         /* rounded to inf */
311                         if (w2 >= -8.008566259537296567160e-17)
312                                 return (_SVID_libm_err(x, y, 21));
313                                                         /* overflow */
314                 }
315         } else if ((j & ~0x80000000) >= 0x4090cc00) {   /* z <= -1075 */
316                 if (!(j == 0xc090cc00 && pz[LOWORD] == 0))      /* z < -1075 */
317                         return (_SVID_libm_err(x, y, 22));      /* underflow */
318                 else {
319                         w2 = y1 - z;
320                         w2 += y2;
321                         if (w2 <= zero)                 /* underflow */
322                                 return (_SVID_libm_err(x, y, 22));
323                 }
324         }
```



```
325         /*
326          * compute 2**(k+f[j]+g)
327          */
328         k = (int) (z * 64.0 + (((hy ^ (ahx - 0x3ff00000)) > 0) ? 0.5 : -0.5));
329         j = k & 63;
330         w1 = y2 - ((double) k * 0.015625 - y1);
331         w2 = _TBL_exp2_hi[j];
332         z = _TBL_exp2_lo[j] + (w2 * w1) * (E1 + w1 * (E2 + w1 * (E3 + w1 *
333                 (E4 + w1 * E5))));
334         z += w2;
335         k >>= 6;
336         if (k < -1021)
337                 z = scalbn(z, k);
338         else                            /* subnormal output */
339                 pz[HIWORD] += k << 20;
340         if (sbx == 1 && yisint == 1)
341                 z = -z;                 /* (-ve)**(odd int) */
342         return (z);
343 }
```

```
**********************************************************
    2344 Sat May 10 12:08:55 2014
new/usr/src/lib/libm/common/C/remainder.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak remainder = __remainder

/*
 * remainder(x,p)
 * Code originated from 4.3bsd.
 * Modified by K.C. Ng for SUN 4.0 libm.
 * Return :
 *      returns  x REM p  =  x - [x/p]*p as if in infinite precise arithmetic,
 *      where [x/p] is the (inifinite bit) integer nearest x/p (in half way
 *      case choose the even one).
 * Method :
 *      Based on fmod() return x-[x/p]chopped*p exactly.
 */

#include "libm.h"

static const double zero = 0.0, half = 0.5;

double
remainder(double x, double p) {
        double  halfp;
        int     ix, hx, hp;

        ix = ((int *)&x)[HIWORD];
        hx = ix & ~0x80000000;
        hp = ((int *)&p)[HIWORD] & ~0x80000000;

        if (hp > 0x7ff00000 || (hp == 0x7ff00000 && ((int *)&p)[LOWORD] != 0))
                return (x * p);
        if (hx > 0x7ff00000 || (hx == 0x7ff00000 && ((int *)&x)[LOWORD] != 0))
                return (x * p);

        if ((hp | ((int *)&p)[LOWORD]) == 0 || hx == 0x7ff00000)
```



```
                return (_SVID_libm_err(x, p, 28));

        p = fabs(p);
        if (hp < 0x7fe00000)
                x = fmod(x, p + p);
        x = fabs(x);
        if (hp < 0x00200000) {
                if (x + x > p) {
                        if (x == p)     /* avoid x-x=-0 in RM mode */
                                return ((ix < 0)? -zero : zero);
                        x -= p;
                        if (x + x >= p)
                                x -= p;
                }
        } else {
                halfp = half * p;
                if (x > halfp) {
                        if (x == p)     /* avoid x-x=-0 in RM mode */
                                return ((ix < 0)? -zero : zero);
                        x -= p;
                        if (x >= halfp)
                                x -= p;
                }
        }
        return ((ix < 0)? -x : x);
}
```

```
**********************************************************
    2042 Sat May 10 12:08:55 2014
new/usr/src/lib/libm/common/C/rint.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak rint = __rint

/*
 * rint(x) return x rounded to integral according to the rounding direction
 * rint(x) returns result with the same sign as x's,  including 0.0.
 */

#include "libm.h"

#if defined(__i386) && !defined(__amd64) && (!defined(__FLT_EVAL_METHOD__) || \
        __FLT_EVAL_METHOD__ != 0)
extern enum fp_precision_type __swapRP(enum fp_precision_type);
#define DECLRP(x)       enum fp_precision_type x;
#define SWAPRP(new, x)  x = __swapRP(new);
#define RESTRP(x)       (void) __swapRP(x);
#else
#define DECLRP(x)
#define SWAPRP(new, x)
#define RESTRP(x)
#endif

static const double
        two52 = 4503599627370496.0,
        zero = 0.0,
        one = 1.0;

double
rint(double x) {
        DECLRP(rp)
        double  t, w;
        int     ix, hx;

        ix = ((int *)&x)[HIWORD];
```



```
        hx = ix & ~0x80000000;

        if (hx >= 0x43300000)
                return (x * one);
        t = (ix < 0)? -two52 : two52;
        SWAPRP(fp_double, rp)           /* set precision mode to double */
        w = x + t;                      /* x+sign(x)*2**52 rounded */
        RESTRP(rp)                      /* restore precision mode */
        if (w == t)
                return ((ix < 0)? -zero : zero);
        return (w - t);
}
```

```
**********************************************************
    2084 Sat May 10 12:08:55 2014
new/usr/src/lib/libm/common/C/scalb.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak scalb = __scalb
#pragma weak _scalb = __scalb

#include "libm.h"

double
scalb(double x, double fn) {
        int     hn, in, n;
        double  z;

        if (isnan(x) || isnan(fn))
                return (x * fn);

        in = ((int *)&fn)[HIWORD];
        hn = in & ~0x80000000;
        if (hn == 0x7ff00000)   /* fn is inf */
                return (_SVID_libm_err(x, fn, 47));

        /* see if fn is an integer without raising inexact */
        if (hn >= 0x43300000) {
                /* |fn| >= 2^52, so it must be an integer */
                n = (in < 0)? -65000 : 65000;
        } else if (hn < 0x3ff00000) {
                /* |fn| < 1, so it must be zero or non-integer */
                return ((fn == 0.0)? x : (x - x) / (x - x));
        } else if (hn < 0x41400000) {
                /* |fn| < 2^21 */
                if ((hn & ((1 << (0x413 - (hn >> 20))) - 1))
                    | ((int *)&fn)[LOWORD])
                        return ((x - x) / (x - x));
                n = (int)fn;
        } else {
                if (((int *)&fn)[LOWORD] & ((1 << (0x433 - (hn >> 20))) - 1))
```



```
                        return ((x - x) / (x - x));
                n = (in < 0)? -65000 : 65000;
        }
        z = scalbn(x, n);
        if (z != x) {
                if (z == 0.0)
                        return (_SVID_libm_err(x, fn, 33));
                if (!finite(z))
                        return (_SVID_libm_err(x, fn, 32));
        }
        return (z);
}
```

```
**********************************************************
    2817 Sat May 10 12:08:55 2014
new/usr/src/lib/libm/common/C/scalbn.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak scalbn = __scalbn

#include "libm.h"

static const double
        one     = 1.0,
        huge    = 1.0e300,
        tiny    = 1.0e-300,
        twom54  = 5.55111512312578270211815834045410156250e-17;

#if defined(USE_FPSCALE) || defined(__x86)
static const double two52 = 4503599627370496.0;
#else
/*
 * Normalize non-zero subnormal x and return biased exponent of x in [-51,0]
 */
static int
ilogb_biased(unsigned *px) {
        int s = 52;
        unsigned v = px[HIWORD] & ~0x80000000, w = px[LOWORD], t = v;

        if (t)
                s -= 32;
        else
                t = w;
        if (t & 0xffff0000)
                s -= 16, t >>= 16;
        if (t & 0xff00)
                s -= 8, t >>= 8;
        if (t & 0xf0)
                s -= 4, t >>= 4;
        t <<= 1;
```



```
        s -= (0xffffaa50 >> t) & 0x3;
        if (s < 32) {
                v = (v << s) | w >> (32 - s);
                w <<= s;
        } else {
                v = w << (s - 32);
                w = 0;
        }
        px[HIWORD] = (px[HIWORD] & 0x80000000) | v;
        px[LOWORD] = w;
        return (1 - s);
}
#endif  /* defined(USE_FPSCALE) */

double
scalbn(double x, int n) {
        int     *px, ix, hx, k;

        px = (int *)&x;
        ix = px[HIWORD];
        hx = ix & ~0x80000000;
        k = hx >> 20;

        if (k == 0x7ff) /* x is inf or NaN */
                return (x * one);

        if (k == 0) {
                if ((hx | px[LOWORD]) == 0 || n == 0)
                        return (x);
#if defined(USE_FPSCALE) || defined(__x86)
                x *= two52;
                ix = px[HIWORD];
                k = ((ix & ~0x80000000) >> 20) - 52;
#else
                k = ilogb_biased((unsigned *)px);
                ix = px[HIWORD];
#endif
                /* now k is in the range -51..0 */
                k += n;
                if (k > n)      /* integer overflow occurred */
                        k = -100;
        } else {
                /* k is in the range 1..1023 */
                k += n;
                if (k < n)      /* integer overflow occurred */
                        k = 0x7ff;
        }

        if (k > 0x7fe)
                return (huge * ((ix < 0)? -huge : huge));
        if (k < 1) {
                if (k <= -54)
                        return (tiny * ((ix < 0)? -tiny : tiny));
                k += 54;
                px[HIWORD] = (ix & ~0x7ff00000) | (k << 20);
                return (x * twom54);
        }
        px[HIWORD] = (ix & ~0x7ff00000) | (k << 20);
        return (x);
}
```

```
**********************************************************
    1094 Sat May 10 12:08:55 2014
new/usr/src/lib/libm/common/C/signgam.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak signgam = __signgam

#include "libm_synonyms.h"
#include <math.h>

int signgam = 0;
```

****
1482 Sat May 10 12:08:56 2014
new/usr/src/lib/libm/common/C/significand.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#if defined(ELFOBJ)
#pragma weak significand = __significand
#endif

#include "libm.h"

double
significand(double x) {
        int ix = ((int *) &x)[HIWORD] & ~0x80000000;

        /* weed out 0/+-Inf/NaN because C99 ilogb raises invalid on them */
        if ((ix | ((int *) &x)[LOWORD]) == 0 || ix >= 0x7ff00000)
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return ((ix & 0x80000) != 0 ? x : x + x);
                /* assumes sparc-like QNaN */
#else
                return (x + x);
#endif
        else
                return (scalbn(x, -ilogb(x)));
}
```

```
**********************************************************
    5187 Sat May 10 12:08:56 2014
new/usr/src/lib/libm/common/C/sin.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
/*
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 */
/*
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 */
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 */

#pragma weak sin = __sin

/* INDENT OFF */
/*
 * sin(x)
 * Accurate Table look-up algorithm by K.C. Ng, May, 1995.
 *
 * Algorithm: see sincos.c
 */

#include "libm.h"

static const double sc[] = {
/* ONE  = */  1.0,
/* NONE = */ -1.0,
/*
 * |sin(x) - (x+pp1*x^3+pp2*x^5)| <= 2^-58.79 for |x| < 0.008
 */
/* PP1  = */ -0.166666666666631655886725205237888952148062785868305 5567,
/* PP2  = */   .008333315652997472323564894248466758248475374977974017927,
/*
 * |(sin(x) - (x+p1*x^3+...+p4*x^9)|
 * |------------------------------ | <= 2^-57.63 for |x| < 0.1953125
 * |               x               |
 */
/* P1   = */ -1.6666666666662966980521513892030158965 6e-0001,
/* P2   = */  8.3333333329095129568399345528033637666 3e-0003,
/* P3   = */ -1.9841262379979766927915517782300984039 60e-0004,
/* P4   = */  2.7534036248542772376499876228483303511 10e-0006,
/*
 * |cos(x) - (1+qq1*x^2+qq2*x^4)| <= 2^-55.99 for |x| <= 0.008 (0x3f80624d)
 */
/* QQ1  = */ -0.499999999997549238184291198194841854274 2729,
```



```
/* QQ2  = */  0.041666542904352059294545209158357640398771740,
/* PI_H = */  3.141592653589793115997963468 5,
/* PI_L    = */  1.224646799147353177226065932274 25e-16,
/* PI_L0   = */  1.224646799145584433112838792050 95e-16,
/* PI_L1   = */  1.768744113227140223300005233735517376e-28,
/* PI2_H   = */  6.283185307179586231995926937 0,
/* PI2_L   = */  2.449293598294706354452131864548 50e-16,
/* PI2_L0  = */  2.449293598291168866225677584101 90e-16,
/* PI2_L1  = */  3.537488226454280446600010467471034752e-28,
};
/* INDENT ON */

#define ONEA    sc
#define ONE     sc[0]
#define NONE    sc[1]
#define PP1     sc[2]
#define PP2     sc[3]
#define P1      sc[4]
#define P2      sc[5]
#define P3      sc[6]
#define P4      sc[7]
#define QQ1     sc[8]
#define QQ2     sc[9]
#define PI_H    sc[10]
#define PI_L    sc[11]
#define PI_L0   sc[12]
#define PI_L1   sc[13]
#define PI2_H   sc[14]
#define PI2_L   sc[15]
#define PI2_L0  sc[16]
#define PI2_L1  sc[17]

extern const double  _TBL_sincos[], _TBL_sincosx[];

double
sin(double x) {
        double  z, y[2], w, s, v, p, q;
        int     i, j, n, hx, ix, lx;

        hx = ((int *)&x)[HIWORD];
        lx = ((int *)&x)[LOWORD];
        ix = hx & ~0x80000000;

        if (ix <= 0x3fc50000) { /* |x| < .1640625 */
                if (ix < 0x3e400000)    /* |x| < 2**-27 */
                        if ((int)x == 0)
                                return (x);
                z = x * x;
                if (ix < 0x3f800000)    /* |x| < 2**-8 */
                        w = (z * x) * (PP1 + z * PP2);
                else
                        w = (x * z) * ((P1 + z * P2) + (z * z) * (P3 + z * P4));
                return (x + w);
        }

        /* for .1640625 < x < M, */
        n = ix >> 20;
        if (n < 0x402) {        /* x < 8 */
                i = (((ix >> 12) & 0xff) | 0x100) >> (0x401 - n);
                j = i - 10;
                x = fabs(x);
                v = x - _TBL_sincosx[j];
                if (((j - 181) ^ (j - 201)) < 0) {
                        /* near pi, sin(x) = sin(pi-x) */
                        p = PI_H - x;
                        i = ix - 0x400921fb;
```

```
128                         x = p + PI_L;
129                         if ((i | ((lx - 0x54442D00) & 0xffffff00)) == 0) {
130                                 /* very close to pi */
131                                 x = p + PI_L0;
132                                 return ((hx >= 0)? x + PI_L1 : -(x + PI_L1));
133                         }
134                         z = x * x;
135                         if (((ix - 0x40092000) >> 11) == 0) {
136                                 /* |pi-x|<2**-8 */
137                                 w = PI_L + (z * x) * (PP1 + z * PP2);
138                         } else {
139                                 w = PI_L + (z * x) * ((P1 + z * P2) +
140                                     (z * z) * (P3 + z * P4));
141                         }
142                         return ((hx >= 0)? p + w : -p - w);
143                 }
144                 s = v * v;
145                 if (((j - 382) ^ (j - 402)) < 0) {
146                         /* near 2pi, sin(x) = sin(x-2pi) */
147                         p = x - PI2_H;
148                         i = ix - 0x401921fb;
149                         x = p - PI2_L;
150                         if ((i | ((lx - 0x54442D00) & 0xffffff00)) == 0) {
151                                 /* very close to 2pi */
152                                 x = p - PI2_L0;
153                                 return ((hx >= 0)? x - PI2_L1 : -(x - PI2_L1));
154                         }
155                         z = x * x;
156                         if (((ix - 0x40192000) >> 10) == 0) {
157                                 /* |x-2pi|<2**-8 */
158                                 w = (z * x) * (PP1 + z * PP2) - PI2_L;
159                         } else {
160                                 w = (z * x) * ((P1 + z * P2) +
161                                     (z * z) * (P3 + z * P4)) - PI2_L;
162                         }
163                         return ((hx >= 0)? p + w : -p - w);
164                 }
165                 j <<= 1;
166                 w = _TBL_sincos[j+1];
167                 z = _TBL_sincos[j];
168                 p = v + (v * s) * (PP1 + s * PP2);
169                 q = s * (QQ1 + s * QQ2);
170                 v = w * p + z * q;
171                 return ((hx >= 0)? z + v : -z - v);
172         }

174         if (ix >= 0x7ff00000)   /* sin(Inf or NaN) is NaN */
175                 return (x / x);

177         /* argument reduction needed */
178         n = __rem_pio2(x, y);
179         switch (n & 3) {
180         case 0:
181                 return (__k_sin(y[0], y[1]));
182         case 1:
183                 return (__k_cos(y[0], y[1]));
184         case 2:
185                 return (-__k_sin(y[0], y[1]));
186         default:
187                 return (-__k_cos(y[0], y[1]));
188         }
189 }
```

```
**********************************************************
   10669 Sat May 10 12:08:56 2014
new/usr/src/lib/libm/common/C/sincos.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak sincos = __sincos

/* INDENT OFF */
/*
 * sincos(x,s,c)
 * Accurate Table look-up algorithm by K.C. Ng, 2000.
 *
 * 1. Reduce x to x>0 by cos(-x)=cos(x), sin(-x)=-sin(x).
 * 2. For 0<= x < 8, let i = (64*x chopped)-10. Let d = x - a[i], where
 *    a[i] is a double that is close to (i+10.5)/64 (and hence |d|< 10.5/64)
 *    and such that sin(a[i]) and cos(a[i]) is close to a double (with error
 *    less than 2**-8 ulp). Then
 *
 *      cos(x) = cos(a[i]+d) = cos(a[i])cos(d) - sin(a[i])*sin(d)
 *             = TBL_cos_a[i]*(1+QQ1*d^2+QQ2*d^4) -
 *                       TBL_sin_a[i]*(d+PP1*d^3+PP2*d^5)
 *             = TBL_cos_a[i] + (TBL_cos_a[i]*d^2*(QQ1+QQ2*d^2) -
 *                       TBL_sin_a[i]*(d+PP1*d^3+PP2*d^5))
 *
 *      sin(x) = sin(a[i]+d) = sin(a[i])cos(d) + cos(a[i])*sin(d)
 *             = TBL_sin_a[i]*(1+QQ1*d^2+QQ2*d^4) +
 *                       TBL_cos_a[i]*(d+PP1*d^3+PP2*d^5)
 *             = TBL_sin_a[i] + (TBL_sin_a[i]*d^2*(QQ1+QQ2*d^2) +
 *                       TBL_cos_a[i]*(d+PP1*d^3+PP2*d^5))
 *
 *    Note: for x close to n*pi/2, special treatment is need for either
 *    sin or cos:
 *    i in [81, 100] (  pi/2 +-10.5/64 => tiny cos(x) = sin(pi/2-x)
 *    i in [181,200] (  pi   +-10.5/64 => tiny sin(x) = sin(pi-x)
 *    i in [282,301] (  3pi/2+-10.5/64 => tiny cos(x) = sin(x-3pi/2)
 *    i in [382,401] (  2pi  +-10.5/64 => tiny sin(x) = sin(x-2pi)
 *    i in [483,502] (  5pi/2+-10.5/64 => tiny cos(x) = sin(5pi/2-x)
 *
```



```
 * 3. For x >= 8.0, use kernel function __rem_pio2 to perform argument
 *    reduction and call __k_sincos_ to compute sin and cos.
 *
 * kernel function:
 *      __rem_pio2      ... argument reduction routine
 *      __k_sincos_     ... sine and cosine function on [-pi/4,pi/4]
 *
 * Method.
 *      Let S and C denote the sin and cos respectively on [-PI/4, +PI/4].
 *      1. Assume the argument x is reduced to y1+y2 = x-k*pi/2 in
 *         [-pi/2 , +pi/2], and let n = k mod 4.
 *      2. Let S=S(y1+y2), C=C(y1+y2). Depending on n, we have
 *
 *          n        sin(x)      cos(x)        tan(x)
 *     ----------------------------------------------------------
 *          0          S           C             S/C
 *          1          C           -S            -C/S
 *          2          -S          -C            S/C
 *          3          -C          S             -C/S
 *     ----------------------------------------------------------
 *
 * Special cases:
 *      Let trig be any of sin, cos, or tan.
 *      trig(+-INF)  is NaN, with signals;
 *      trig(NaN)    is that NaN;
 *
 * Accuracy:
 *      TRIG(x) returns trig(x) nearly rounded (less than 1 ulp)
 */

#include "libm.h"

static const double sc[] = {
/* ONE  = */  1.0,
/* NONE = */ -1.0,
/*
 * |sin(x) - (x+pp1*x^3+pp2*x^5)| <= 2^-58.79 for |x| < 0.008
 */
/* PP1  = */ -0.16666666666631655886725205237888952148062785868305556 7,
/* PP2  = */   .00833331565299747232356489424846675824847537497797401 7927,
/*
 * |(sin(x) - (x+p1*x^3+...+p4*x^9)|
 * |------------------------------ | <= 2^-57.63 for |x| < 0.1953125
 * |                x              |
 */
/* P1   = */ -1.66666666666662966980521513892030158965 6e-0001,
/* P2   = */  8.33333332390951295683993455280336376663e-0003,
/* P3   = */ -1.98412623799797669279155177823009840396 0e-0004,
/* P4   = */  2.75340362485427723764998762284833035111 0e-0006,
/*
 * |cos(x) - (1+qq1*x^2+qq2*x^4)| <= 2^-55.99 for |x| <= 0.008 (0x3f80624d)
 */
/* QQ1  = */ -0.49999999999754923818429119819484841854 2742729,
/* QQ2  = */  0.04166654290435205929454520915835764039877 1740,
/* Q1   = */ -0.5,
/* Q2   = */  4.16666666500350703680945520860748617445e-0002,
/* Q3   = */ -1.38888859643697221069426629057784869600 6e-0003,
/* Q4   = */  2.47856307885858947367951951789295349219 2e-0005,
/* PIO2_H    = */  1.57079632679489655799 9,
/* PIO2_L    = */  6.12323399573676588613 0e-17,
/* PIO2_L0   = */  6.12323399572792216556 4e-17,
/* PIO2_L1   = */  8.84372056613570112025 5e-29,
/* PI_H      = */  3.14159265358979311599 79634685,
/* PI_L      = */  1.22464679914735317722 606593227425e-16,
/* PI_L0     = */  1.22464679914558443311 283879205095e-16,
/* PI_L1     = */  1.76874411322714022330 00052337355517376e-28,
```

```
/* PI3O2_H   = */  4.712388980384689673997,
/* PI3O2_L   = */  1.836970198721029765839e-16,
/* PI3O2_L0  = */  1.836970198720396133587e-16,
/* PI3O2_L1  = */  6.336322524749201142226e-29,
/* PI2_H     = */  6.283185307179586231959269370,
/* PI2_L     = */  2.449293598294706354452131864545850e-16,
/* PI2_L0    = */  2.449293598291168866225677584101900e-16,
/* PI2_L1    = */  3.537488226454280446600010467471034752e-28,
/* PI5O2_H   = */  7.853981633974483789995,
/* PI5O2_L   = */  3.061616997868382943065e-16,
/* PI5O2_L0  = */  3.061616997861941598865e-16,
/* PI5O2_L1  = */  6.441344200433640781982e-28,
};
/* INDENT ON */

#define ONE             sc[0]
#define PP1             sc[2]
#define PP2             sc[3]
#define P1              sc[4]
#define P2              sc[5]
#define P3              sc[6]
#define P4              sc[7]
#define QQ1             sc[8]
#define QQ2             sc[9]
#define Q1              sc[10]
#define Q2              sc[11]
#define Q3              sc[12]
#define Q4              sc[13]
#define PIO2_H          sc[14]
#define PIO2_L          sc[15]
#define PIO2_L0         sc[16]
#define PIO2_L1         sc[17]
#define PI_H            sc[18]
#define PI_L            sc[19]
#define PI_L0           sc[20]
#define PI_L1           sc[21]
#define PI3O2_H         sc[22]
#define PI3O2_L         sc[23]
#define PI3O2_L0        sc[24]
#define PI3O2_L1        sc[25]
#define PI2_H           sc[26]
#define PI2_L           sc[27]
#define PI2_L0          sc[28]
#define PI2_L1          sc[29]
#define PI5O2_H         sc[30]
#define PI5O2_L         sc[31]
#define PI5O2_L0        sc[32]
#define PI5O2_L1        sc[33]
#define PoS(x, z)       ((x * z) * (PP1 + z * PP2))
#define PoL(x, z)       ((x * z) * ((P1 + z * P2) + (z * z) * (P3 + z * P4)))

extern const double _TBL_sincos[], _TBL_sincosx[];

void
sincos(double x, double *s, double *c) {
        double  z, y[2], w, t, v, p, q;
        int     i, j, n, hx, ix, lx;

        hx = ((int *)&x)[HIWORD];
        lx = ((int *)&x)[LOWORD];
        ix = hx & ~0x80000000;

        if (ix <= 0x3fc50000) { /* |x| < 10.5/64 = 0.164062500 */
                if (ix < 0x3e400000) {  /* |x| < 2**-27 */
                        if ((int)x == 0)
                                *c = ONE;
```



```
                        *s = x;
                } else {
                        z = x * x;
                        if (ix < 0x3f800000) {  /* |x| < 0.008 */
                                q = z * (QQ1 + z * QQ2);
                                p = PoS(x, z);
                        } else {
                                q = z * ((Q1 + z * Q2) + (z * z) *
                                    (Q3 + z * Q4));
                                p = PoL(x, z);
                        }
                        *c = ONE + q;
                        *s = x + p;
                }
                return;
        }

        n = ix >> 20;
        i = (((ix >> 12) & 0xff) | 0x100) >> (0x401 - n);
        j = i - 10;
        if (n < 0x402) {        /* |x| < 8 */
                x = fabs(x);
                v = x - _TBL_sincosx[j];
                t = v * v;
                w = _TBL_sincos[(j<<1)];
                z = _TBL_sincos[(j<<1)+1];
                p = v + PoS(v, t);
                q = t * (QQ1 + t * QQ2);
                if ((((j - 81) ^ (j - 101)) |
                    ((j - 282) ^ (j - 302)) |
                    ((j - 483) ^ (j - 503)) |
                    ((j - 181) ^ (j - 201)) |
                    ((j - 382) ^ (j - 402))) < 0) {
                        if (j <= 101) {
                                /* near pi/2, cos(x) = sin(pi/2-x) */
                                t = w * q + z * p;
                                *s = (hx >= 0)? w + t : -w - t;
                                p = PIO2_H - x;
                                i = ix - 0x3ff921fb;
                                x = p + PIO2_L;
                                if ((i | ((lx - 0x54442D00) &
                                    0xffffff00)) == 0) {
                                        /* very close to pi/2 */
                                        x = p + PIO2_L0;
                                        *c = x + PIO2_L1;
                                } else {
                                        z = x * x;
                                        if (((ix - 0x3ff92000) >> 12) == 0) {
                                                /* |pi/2-x|<2**-8 */
                                                w = PIO2_L + PoS(x, z);
                                        } else {
                                                w = PIO2_L + PoL(x, z);
                                        }
                                        *c = p + w;
                                }
                        } else if (j <= 201) {
                                /* near pi, sin(x) = sin(pi-x) */
                                *c = z - (w * p - z * q);
                                p = PI_H - x;
                                i = ix - 0x400921fb;
                                x = p + PI_L;
                                if ((i | ((lx - 0x54442D00) &
                                    0xffffff00)) == 0) {
                                        /* very close to pi */
                                        x = p + PI_L0;
                                        *s = (hx >= 0)? x + PI_L1 :
```

```
260                                         -(x + PI_L1);
261                         } else {
262                                 z = x * x;
263                                 if (((ix - 0x40092000) >> 11) == 0) {
264                                         /* |pi-x|<2**-8 */
265                                         w = PI_L + PoS(x, z);
266                                 } else {
267                                         w = PI_L + PoL(x, z);
268                                 }
269                                 *s = (hx >= 0)? p + w : -p - w;
270                         }
271                 } else if (j <= 302) {
272                         /* near 3/2pi, cos(x)=sin(x-3/2pi) */
273                         t = w * q + z * p;
274                         *s = (hx >= 0)? w + t : -w - t;
275                         p = x - PI3O2_H;
276                         i = ix - 0x4012D97C;
277                         x = p - PI3O2_L;
278                         if ((i | ((lx - 0x7f332100) &
279                             0xffffff00)) == 0) {
280                                 /* very close to 3/2pi */
281                                 x = p - PI3O2_L0;
282                                 *c = x - PI3O2_L1;
283                         } else {
284                                 z = x * x;
285                                 if (((ix - 0x4012D800) >> 9) == 0) {
286                                         /* |3/2pi-x|<2**-8 */
287                                         w = PoS(x, z) - PI3O2_L;
288                                 } else {
289                                         w = PoL(x, z) - PI3O2_L;
290                                 }
291                                 *c = p + w;
292                         }
293                 } else if (j <= 402) {
294                         /* near 2pi, sin(x)=sin(x-2pi) */
295                         *c = z - (w * p - z * q);
296                         p = x - PI2_H;
297                         i = ix - 0x401921fb;
298                         x = p - PI2_L;
299                         if ((i | ((lx - 0x54442D00) &
300                             0xffffff00)) == 0) {
301                                 /* very close to 2pi */
302                                 x = p - PI2_L0;
303                                 *s = (hx >= 0)? x - PI2_L1 :
304                                     -(x - PI2_L1);
305                         } else {
306                                 z = x * x;
307                                 if (((ix - 0x40192000) >> 10) == 0) {
308                                         /* |x-2pi|<2**-8 */
309                                         w = PoS(x, z) - PI2_L;
310                                 } else {
311                                         w = PoL(x, z) - PI2_L;
312                                 }
313                                 *s = (hx >= 0)? p + w : -p - w;
314                         }
315                 } else {
316                         /* near 5pi/2, cos(x) = sin(5pi/2-x) */
317                         t = w * q + z * p;
318                         *s = (hx >= 0)? w + t : -w - t;
319                         p = PI5O2_H - x;
320                         i = ix - 0x401F6A7A;
321                         x = p + PI5O2_L;
322                         if ((i | ((lx - 0x29553800) &
323                             0xffffff00)) == 0) {
324                                 /* very close to pi/2 */
325                                 x = p + PI5O2_L0;
```



```
326                                         *c = x + PI5O2_L1;
327                                 } else {
328                                         z = x * x;
329                                         if (((ix - 0x401F6A7A) >> 7) == 0) {
330                                                 /* |5pi/2-x|<2**-8 */
331                                                 w = PI5O2_L + PoS(x, z);
332                                         } else {
333                                                 w = PI5O2_L + PoL(x, z);
334                                         }
335                                         *c = p + w;
336                                 }
337                         }
338                 } else {
339                         *c = z - (w * p - z * q);
340                         t = w * q + z * p;
341                         *s = (hx >= 0)? w + t : -w - t;
342                 }
343                 return;
344         }

346         if (ix >= 0x7ff00000) {
347                 *s = *c = x / x;
348                 return;
349         }

351         /* argument reduction needed */
352         n = __rem_pio2(x, y);
353         switch (n & 3) {
354         case 0:
355                 *s = __k_sincos(y[0], y[1], c);
356                 break;
357         case 1:
358                 *c = -__k_sincos(y[0], y[1], s);
359                 break;
360         case 2:
361                 *s = -__k_sincos(y[0], y[1], c);
362                 *c = -*c;
363                 break;
364         default:
365                 *c = __k_sincos(y[0], y[1], s);
366                 *s = -*s;
367         }
368 }
```

```
**********************************************************
    5547 Sat May 10 12:08:56 2014
new/usr/src/lib/libm/common/C/sincospi.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak sincospi = __sincospi

/* INDENT OFF */
/*
 * void sincospi(double x, double *s, double *c)
 * *s = sin(pi*x); *c = cos(pi*x);
 *
 * Algorithm, 10/17/2002, K.C. Ng
 * ----------------------------
 * Let y = |4x|, z = floor(y), and n = (int)(z mod 8.0) (displayed in binary).
 *      1. If y==z, then x is a multiple of pi/4. Return the following values:
 *              ------------------------------------------------
 *                n  x mod 2    sin(x*pi)    cos(x*pi)   tan(x*pi)
 *              ------------------------------------------------
 *               000  0.00       +0 ___       +1 ___       +0
 *               001  0.25       +\/0.5       +\/0.5       +1
 *               010  0.50       +1 ___       +0 ___       +inf
 *               011  0.75       +\/0.5       -\/0.5       -1
 *               100  1.00       -0 ___       -1 ___       +0
 *               101  1.25       -\/0.5       -\/0.5       +1
 *               110  1.50       -1 ___       -0 ___       +inf
 *               111  1.75       -\/0.5       +\/0.5       -1
 *              ------------------------------------------------
 *      2. Otherwise,
 *              ------------------------------------------------
 *                n     t        sin(x*pi)    cos(x*pi)   tan(x*pi)
 *              ------------------------------------------------
 *               000  (y-z)/4     sinpi(t)     cospi(t)    tanpi(t)
 *               001  (z+1-y)/4   cospi(t)     sinpi(t)    1/tanpi(t)
 *               010  (y-z)/4     cospi(t)    -sinpi(t)   -1/tanpi(t)
 *               011  (z+1-y)/4   sinpi(t)    -cospi(t)   -tanpi(t)
 *               100  (y-z)/4    -sinpi(t)    -cospi(t)    tanpi(t)
```



```
 *               101  (z+1-y)/4  -cospi(t)    -sinpi(t)    1/tanpi(t)
 *               110  (y-z)/4    -cospi(t)     sinpi(t)   -1/tanpi(t)
 *               111  (z+1-y)/4  -sinpi(t)     cospi(t)   -tanpi(t)
 *              ------------------------------------------------
 *
 * NOTE. This program compute sinpi/cospi(t<0.25) by __k_sin/cos(pi*t, 0.0).
 * This will return a result with error slightly more than one ulp (but less
 * than 2 ulp). If one wants accurate result,  one may break up pi*t in
 * high (tpi_h) and low (tpi_l) parts and call __k_sin/cos(tip_h, tip_lo)
 * instead.
 */

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"
#include "libm_macros.h"
#include <math.h>
#if defined(__SUNPRO_C)
#include <sunmath.h>
#endif

static const double
        pi      = 3.14159265358979323846,       /* 400921FB,54442D18 */
        sqrth_h = 0.70710678118654757273731092936941422522068023681640625,
        sqrth_l = -4.83364665672645651859358442991279322134116601310004e-17;
/* INDENT ON */

void
sincospi(double x, double *s, double *c) {
        double y, z, t;
        int n, ix, k;
        int hx = ((int *) &x)[HIWORD];
        unsigned h, lx = ((unsigned *) &x)[LOWORD];

        ix = hx & ~0x80000000;
        n = (ix >> 20) - 0x3ff;
        if (n >= 51) {                  /* |x| >= 2**51 */
                if (n >= 1024)
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                        *s = *c = ix >= 0x7ff80000 ? x : x - x;
                        /* assumes sparc-like QNaN */
#else
                        *s = *c = x - x;
#endif
                else {
                        if (n >= 53)  {
                                *s = 0.0;
                                *c = 1.0;
                        }
                        else if (n == 52)  {
                                if ((lx & 1) == 0) {
                                        *s = 0.0;
                                        *c = 1.0;
                                }
                                else {
                                        *s = -0.0;
                                        *c = -1.0;
                                }
                        }
                        else {  /* n == 51 */
                                if ((lx & 1) == 0) {
                                        *s = 0.0;
                                        *c = 1.0;
                                }
                                else {
                                        *s = 1.0;
```

```
128                                     *c = 0.0;
129                             }
130                             if ((lx & 2) != 0) {
131                                     *s = -*s;
132                                     *c = -*c;
133                             }
134                     }
135             }
136         }
137         else if (n < -2)        /* |x| < 0.25 */
138                 *s = __k_sincos(pi * fabs(x), 0.0, c);
139         else {
140                 /* y = |4x|, z = floor(y), and n = (int)(z mod 8.0) */
141                 if (ix < 0x41C00000) {          /* |x| < 2**29 */
142                         y = 4.0 * fabs(x);
143                         n = (int) y;            /* exact */
144                         z = (double) n;
145                         k = z == y;
146                         t = (y - z) * 0.25;
147                 }
148                 else {                          /* 2**29 <= |x| < 2**51 */
149                         y = fabs(x);
150                         k = 50 - n;
151                         n = lx >> k;
152                         h = n << k;
153                         ((unsigned *) &z)[LOWORD] = h;
154                         ((int *) &z)[HIWORD] = ix;
155                         k = h == lx;
156                         t = y - z;
157                 }
158                 if (k) {                        /* x = N/4 */
159                         if ((n & 1) != 0)
160                                 *s = *c = sqrth_h + sqrth_l;
161                         else
162                                 if ((n & 2) == 0) {
163                                         *s = 0.0;
164                                         *c = 1.0;
165                                 }
166                                 else {
167                                         *s = 1.0;
168                                         *c = 0.0;
169                                 }
170                                 y = (n & 2) == 0 ? 0.0 : 1.0;
171                                 if ((n & 4) != 0)
172                                         *s = -*s;
173                                 if (((n + 1) & 4) != 0)
174                                         *c = -*c;
175                 }
176                 else {
177                         if ((n & 1) != 0)
178                                 t = 0.25 - t;
179                         if (((n + (n & 1)) & 2) == 0)
180                                 *s = __k_sincos(pi * t, 0.0, c);
181                         else
182                                 *c = __k_sincos(pi * t, 0.0, s);
183                                 if ((n & 4) != 0)
184                                         *s = -*s;
185                                 if (((n + 2) & 4) != 0)
186                                         *c = -*c;
187                 }
188         }
189         if (hx < 0)
190                 *s = -*s;
191 }
```

```
**********************************************************
    2109 Sat May 10 12:08:56 2014
new/usr/src/lib/libm/common/C/sinh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak sinh = __sinh

/* INDENT OFF */
/*
 * sinh(x)
 * Code originated from 4.3bsd.
 * Modified by K.C. Ng for SUN 4.0 libm.
 * Method :
 *      1. reduce x to non-negative by sinh(-x) = - sinh(x).
 *      2.
 *                                                    expm1(x) + expm1(x)/(expm1(x)+1)
 *          0 <= x <= lnovft     : sinh(x) := --------------------------------
 *                                                           2
 *     lnovft <= x <  INF        : sinh(x) := exp(x-1024*ln2)*2**1023
 *
 *
 * Special cases:
 *      sinh(x) is x if x is +INF, -INF, or NaN.
 *      only sinh(0)=0 is exact for finite argument.
 *
 */
/* INDENT ON */

#include "libm.h"

static const double
        ln2hi = 6.93147180369123816490e-01,
        ln2lo = 1.90821492927058770002e-10,
        lnovft = 7.09782712893383973096e+02;

double
sinh(double x) {
```



```
        double  ox, r, t;

        ox = x;
        r = fabs(x);
        if (!finite(x))
                return (x * r);
        if (r < lnovft) {
                t = expm1(r);
                r = copysign((t + t / (1.0 + t)) * 0.5, x);
        } else {
                if (r < 1000.0)
                        x = copysign(exp((r - 1024 * ln2hi) - 1024 * ln2lo), x);
                r = scalbn(x, 1023);
        }
        if (!finite(r))
                r = _SVID_libm_err(ox, ox, 25);
        return (r);
}
```

```
**********************************************************
    3198 Sat May 10 12:08:56 2014
new/usr/src/lib/libm/common/C/sqrt.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak sqrt = __sqrt

#include "libm.h"

#ifdef __INLINE

extern double __inline_sqrt(double);

double
sqrt(double x) {
        double  z = __inline_sqrt(x);

        if (isnan(x))
                return (z);
        return ((x < 0.0)? _SVID_libm_err(x, x, 26) : z);
}

#else   /* defined(__INLINE) */

/*
 * Warning: This correctly rounded sqrt is extremely slow because it computes
 * the sqrt bit by bit using integer arithmetic.
 */

static const double big = 1.0e30, small = 1.0e-30;

double
sqrt(double x)
{
        double          z;
        unsigned        r, t1, s1, ix1, q1;
        int             ix0, s0, j, q, m, n, t;
        int              *px = (int *)&x, *pz = (int *)&z;
```



```
        ix0 = px[HIWORD];
        ix1 = px[LOWORD];
        if ((ix0 & 0x7ff00000) == 0x7ff00000) { /* x is inf or NaN */
                if (ix0 == 0xfff00000 && ix1 == 0)
                        return (_SVID_libm_err(x, x, 26));
                return (x + x);
        }
        if (((ix0 & 0x7fffffff) | ix1) == 0)    /* x is zero */
                return (x);

        /* extract exponent and significand */
        m = ilogb(x);
        z = scalbn(x, -m);
        ix0 = (pz[HIWORD] & 0x000fffff) | 0x00100000;
        ix1 = pz[LOWORD];
        n = m >> 1;
        if (n + n != m) {
                ix0 = (ix0 << 1) | (ix1 >> 31);
                ix1 <<= 1;
                m -= 1;
        }

        /* generate sqrt(x) bit by bit */
        ix0 = (ix0 << 1) | (ix1 >> 31);
        ix1 <<= 1;
        q = q1 = s0 = s1 = 0;
        r = 0x00200000;

        for (j = 1; j <= 22; j++) {
                t = s0 + r;
                if (t <= ix0) {
                        s0 = t + r;
                        ix0 -= t;
                        q += r;
                }
                ix0 = (ix0 << 1) | (ix1 >> 31);
                ix1 <<= 1;
                r >>= 1;
        }

        r = 0x80000000;
        for (j = 1; j <= 32; j++) {
                t1 = s1 + r;
                t = s0;
                if (t < ix0 || (t == ix0 && t1 <= ix1)) {
                        s1 = t1 + r;
                        if ((t1 & 0x80000000) == 0x80000000 &&
                            (s1 & 0x80000000) == 0)
                                s0 += 1;
                        ix0 -= t;
                        if (ix1 < t1)
                                ix0 -= 1;
                        ix1 -= t1;
                        q1 += r;
                }
                ix0 = (ix0 << 1) | (ix1 >> 31);
                ix1 <<= 1;
                r >>= 1;
        }

        /* round */
        if ((ix0 | ix1) == 0)
                goto done;
        z = big - small;        /* trigger inexact flag */
        if (z < big)
```

```
128                 goto done;
129         if (q1 == 0xffffffff) {
130                 q1 = 0;
131                 q += 1;
132                 goto done;
133         }
134         z = big + small;
135         if (z > big) {
136                 if (q1 == 0xfffffffe)
137                         q += 1;
138                 q1 += 2;
139                 goto done;
140         }
141         q1 += (q1 & 1);
142 done:
143         pz[HIWORD] = (q >> 1) + 0x3fe00000;
144         pz[LOWORD] = q1 >> 1;
145         if ((q & 1) == 1)
146                 pz[LOWORD] |= 0x80000000;
147         return (scalbn(z, n));
148 }

150 #endif  /* defined(__INLINE) */
```

```
**********************************************************
    1879 Sat May 10 12:08:56 2014
new/usr/src/lib/libm/common/C/tan.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak tan = __tan

/* INDENT OFF */
/*
 * tan(x)
 * Table look-up algorithm by K.C. Ng, November, 1989.
 *
 * kernel function:
 *      __k_tan         ... tangent function on [-pi/4,pi/4]
 *      __rem_pio2      ... argument reduction routine
 */
/* INDENT ON */

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"
#include <math.h>

double
tan(double x) {
        double y[2], z = 0.0;
        int n, ix;

        /* high word of x */
        ix = ((int *) &x)[HIWORD];

        /* |x| ~< pi/4 */
        ix &= 0x7fffffff;
        if (ix <= 0x3fe921fb)
                return (__k_tan(x, z, 0));

        /* tan(Inf or NaN) is NaN */
```



```
        else if (ix >= 0x7ff00000) {
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return (ix >= 0x7ff80000 ? x : x - x);  /* NaN */
                /* assumes sparc-like QNaN */
#else
                return (x - x);                         /* NaN */
#endif
        }

        /* argument reduction needed */
        else {
                n = __rem_pio2(x, y);
                return (__k_tan(y[0], y[1], n & 1));
        }
}
```

```
**********************************************************
    2509 Sat May 10 12:08:56 2014
new/usr/src/lib/libm/common/C/tanh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak tanh = __tanh

/* INDENT OFF */
/* TANH(X)
 * RETURN THE HYPERBOLIC TANGENT OF X
 * code based on 4.3bsd
 * Modified by K.C. Ng for sun 4.0, Jan 31, 1987
 *
 * Method :
 *      1. reduce x to non-negative by tanh(-x) = - tanh(x).
 *      2.
 *          0      <  x <=  1.e-10 :  tanh(x) := x
 *                                                -expm1(-2x)
 *          1.e-10 <  x <=  1      :  tanh(x) := --------------
 *                                               expm1(-2x) + 2
 *                                                     2
 *          1      <= x <=  22.0   :  tanh(x) := 1 -  ---------------
 *                                                    expm1(2x) + 2
 *          22.0   <  x <= INF     :  tanh(x) := 1.
 *
 *      Note: 22 was chosen so that fl(1.0+2/(expm1(2*22)+2)) == 1.
 *
 * Special cases:
 *      tanh(NaN) is NaN;
 *      only tanh(0)=0 is exact for finite argument.
 */

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"
#include <math.h>
```



```
static const double
        one = 1.0,
        two = 2.0,
        small = 1.0e-10,
        big = 1.0e10;
/* INDENT ON */

double
tanh(double x) {
        double t, y, z;
        int signx;
        volatile double dummy;

        if (isnan(x))
                return x * x;   /* + -> * for Cheetah */
        signx = signbit(x);
        t = fabs(x);
        z = one;
        if (t <= 22.0) {
                if (t > one)
                        z = one - two / (expm1(t + t) + two);
                else if (t > small) {
                        y = expm1(-t - t);
                        z = -y / (y + two);
                }
                else {          /* raise the INEXACT flag for non-zero t */
                        dummy = t + big;
#ifdef lint
                        dummy = dummy;
#endif
                        return x;
                }
        }
        else if (!finite(t))
                return copysign(1.0, x);
        else
                return signx == 1 ? -z + small * small : z - small * small;

        return signx == 1 ? -z : z;
}
```

```
**********************************************************
    2197 Sat May 10 12:08:56 2014
new/usr/src/lib/libm/common/C/xpg6.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */
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 */

#ifndef _XPG6_H
#define _XPG6_H

/*
 * The bits in lib/libc/inc/xpg6.h fpgroup may use as per PSARC/2003/486.
 */

/*
 * If set, math library entry points present in SUSv2 deal with exceptional
 * cases as per SUSv3 spec where math_errhandling is set to MATH_ERREXCEPT;
 * otherwise they behave as per SUSv2 spec.
 */
#define _C99SUSv3_math_errexcept                0x00000400
/*
 * If set, pow(+/-1,+/-Inf) & pow(1,NaN) return 1; otherwise NaN is returned.
 * Analogous comment applies to powf and powl.
 */
#define _C99SUSv3_pow_treats_Inf_as_an_even_int 0x00000080
/*
 * If set, logb(subnormal) returns (double) ilogb(subnormal); otherwise
 * logb(subnormal) returns logb(DBL_MIN).  Analogous comment applies to
 * logbf and logbl.
 */
#define _C99SUSv3_logb_subnormal_is_like_ilogb  0x00000040
/*
 * If set, ilogb(0/+Inf/-Inf/NaN) raises FE_INVALID as per SUSv3; otherwise
 * no exception is raised.  Analogous comment applies to ilogbf and ilogbl.
 */
#define _C99SUSv3_ilogb_0InfNaN_raises_invalid  0x00000020

/*
 * __xpg6 = _C99SUSv3_mode_OFF disables C99/SUSv3 standards conformance mode.
 */
```



```
#define _C99SUSv3_mode_OFF      0xFFFF0000

#if !defined(_ASM)
extern unsigned int __xpg6;
#endif

#endif /* _XPG6_H */
```

```
**********************************************************
    6893 Sat May 10 12:08:57 2014
new/usr/src/lib/libm/common/LD/_TBL_cosl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
 * For i = 0L, ..., 75 let x(i) be the extended precision number
 * whose exponent is given by 0x3ffc + ((i + 8) >> 5) and whose
 * five most significant fraction bits are given by (i + 8) & 0x1f.
 * (The remaining fraction bits are zero and the integer bit is 1.)
 * Then _TBL_cosl_hi[i] := cos(x(i)) rounded to extended precisionL,
 * and _TBL_cosl_lo[i] ~ cos(x(i)) - _TBL_cosl_hi[i].
 */

#include "libm.h"

const long double _TBL_cosl_hi[] = {
        9.87817783816471944077341 33e-01L,
        9.87202377854830490414538 01e-01L,
        9.86571908399497588730651 25e-01L,
        9.85926385070661435755697 00e-01L,
        9.85265817718213816184518 60e-01L,
        9.84590216421599806017987 69e-01L,
        9.83899591489663972196464 54e-01L,
        9.83193953460493072537065 84e-01L,
        9.82473313101255257492622 90e-01L,
        9.81737681408035776334415 62e-01L,
        9.80987069605669190469187 52e-01L,
        9.80221489147568096221476 57e-01L,
        9.79440951715548360008607 72e-01L,
        9.78645469219650867859910 95e-01L,
        9.77835053797959793345923 04e-01L,
        9.77009717816417384784934 84e-01L,
        9.76169473868635276714213 89e-01L,
        9.75314334775702326493264 37e-01L,
        9.74444313585988980375932 75e-01L,
        9.73559423574948171436604 23e-01L,
```



```
        9.72659678244912752657306 42e-01L,
        9.71745091324889467615175 12e-01L,
        9.70815676770349462944460 77e-01L,
        9.69871448763015345012530 18e-01L,
        9.68912421710644784170890 50e-01L,
        9.67950029230677822022609 75e-01L,
        9.64928619104771009579862 85e-01L,
        9.62848314709379699883641 52e-01L,
        9.60709243015561903064093 72e-01L,
        9.58511534581228627298864 21e-01L,
        9.56255323543175296964035 52e-01L,
        9.53940747608894739712929 8e-01L,
        9.51567948048172202162725 55e-01L,
        9.49137069684463027645100 06e-01L,
        9.46648260886053321823234 43e-01L,
        9.44101673557004345655688 93e-01L,
        9.41497463127881068617984 48e-01L,
        9.38835788546265488652142 75e-01L,
        9.36116812267055290277574 52e-01L,
        9.33340700242548435656628 20e-01L,
        9.30507621912314291160155 80e-01L,
        9.27617750192851909650949 14e-01L,
        9.24671261467036098514928 75e-01L,
        9.21668335573351918160907 30e-01L,
        9.18609155794918267852813 83e-01L,
        9.15493908848301228586060 58e-01L,
        9.12322784872117846489102 12e-01L,
        9.09095977415431051669569 15e-01L,
        9.05813683425936420760046 09e-01L,
        9.02476103237941504916878 88e-01L,
        8.99083440560138456192681 29e-01L,
        8.95635902463170698918366 18e-01L,
        8.92133699366994404710961 42e-01L,
        8.88577045028035543330208 19e-01L,
        8.84966156526143291690018 89e-01L,
        8.81301254251340599160224 19e-01L,
        8.77582561890372716130286 07e-01L,
        8.69984718058417388843357 73e-01L,
        8.62174479934880504344938 55e-01L,
        8.54153754277385385143897 54e-01L,
        8.45924499231067954468747 67e-01L,
        8.37488723850523685292204 10e-01L,
        8.28848487609325734813518 76e-01L,
        8.20005899897234008240169 69e-01L,
        8.10963119505217902203107 75e-01L,
        8.01722354098418450588439 68e-01L,
        7.92285859671785431346624 1e-01L,
        7.82655940026272796926354 31e-01L,
        7.72834946152471544784587 35e-01L,
        7.62825275710576250530817 19e-01L,
        7.52629372418066476069318 38e-01L,
        7.42249725458501306970746 09e-01L,
        7.31688868873820886325112 10e-01L,
        7.20949380945696418059465 83e-01L,
        7.10033883566079674991809 72e-01L,
};

const long double _TBL_cosl_lo[] = {
        2.31617015504752229139149 87e-20L,
       -1.84494799100967321845792 31e-20L,
        2.66861589611214360325431 57e-20L,
       -8.63774676935093239994125 76e-21L,
        1.97761100206283328064976 27e-20L,
       -3.59258050707048005893222 74e-21L,
       -1.81551905584600649432414 66e-20L,
       -9.19007823448604611083461 51e-21L,
```

```
128         -5.29521884989285724186628 89e-21L,
129          1.80524903502944474033581 75e-22L,
130          1.42378091124512193889074 61e-22L,
131          2.63752984029374781190126 48e-20L,
132         -1.00767655478452301972280 52e-20L,
133          2.43567320995773892760482 53e-20L,
134         -1.39514678304373764373621 52e-20L,
135          1.71108548856367465620439 92e-20L,
136          9.77514123487945515265704 26e-21L,
137         -1.59845157320247794140753 99e-20L,
138         -2.62216937435242560980984 90e-20L,
139          2.17082816453447028131438 92e-20L,
140          1.36066431847933429310473 12e-20L,
141          4.09137372510264491911793 88e-21L,
142          3.02977358929219524715100 43e-21L,
143         -2.01861369163572208928896 11e-20L,
144         -2.62950482822512977418569 03e-20L,
145         -1.42681283846165712930991 77e-20L,
146          1.21181485754992584427245 15e-21L,
147          1.60595699634281048402442 96e-20L,
148          2.56563220727436661741024 25e-21L,
149          3.10519930497093774356782 79e-21L,
150          1.15644222876172451782147 69e-20L,
151          1.00318119448780868193392 64e-20L,
152         -1.72373351901632477561435 91e-20L,
153          2.07473634239044581945043 23e-20L,
154          2.28650773851898088273923 39e-20L,
155         -2.56712403846585417017939 51e-20L,
156          2.65267525050600210727176 63e-20L,
157         -1.95644439854405762612072 64e-20L,
158          1.66628913666496689573643 66e-20L,
159         -1.32897345772491558958098 88e-21L,
160         -1.06790124867696704653188 10e-20L,
161         -2.29183449263892408496313 03e-20L,
162         -1.28157345989865023458561 55e-20L,
163          1.45040647682423457675907 46e-20L,
164         -1.49888535571324401480499 46e-20L,
165         -2.21428472705231207022129 66e-20L,
166          2.92742001557490219942720 15e-21L,
167         -1.91874100722343522458549 03e-20L,
168         -1.55294309964866840561980 58e-20L,
169          8.30439617928509375259877 74e-21L,
170          2.38636348216540976166460 90e-20L,
171         -1.77961800058544374678366 89e-20L,
172          1.29388288146449617640530 94e-20L,
173         -1.25991671109055059197381 34e-20L,
174          7.27764865972459249694928 3e-21L,
175         -2.00622846002828080928320 87e-20L,
176         -1.40044855996735394066950 80e-20L,
177         -1.44421316189897037821379 18e-20L,
178          2.22239592442876500220105 83e-20L,
179         -4.45759752235584325055050 15e-22L,
180         -9.02459303942571217877449 34e-21L,
181          2.31492531524952692641914 63e-20L,
182         -3.34696998325213509747457 77e-21L,
183          1.53809446354279993565024 68e-20L,
184         -1.35729453849135558116515 06e-20L,
185          1.90529291233468413424869 20e-20L,
186          6.83890977694422698621546 25e-21L,
187          4.43313368799061556755817 69e-21L,
188          2.62644919755593891594511 70e-20L,
189         -2.37184347301402901896434 72e-20L,
190         -1.47770519487482145721306 03e-20L,
191          2.06011614652293890318488 78e-20L,
192         -1.32733420276494277789134 02e-20L,
193         -1.56530478693592385849735 15e-20L,
```



```
194         -1.76880786356028566536551 25e-20L,
195 };
```

```
**********************************************************
   29209 Sat May 10 12:08:57 2014
new/usr/src/lib/libm/common/LD/_TBL_ipio2l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
 * Table of constants for 2/pi, used in __rem_pio2l (trigl) function.
 * By K.C. Ng, April 25, 1989
 */

#include "libm.h"

const int _TBL_ipio2l_inf[] = { /* by DHBailey MP package */
        0xA2F983, 0x6E4E44, 0x1529FC, 0x2757D1, 0xF534DD, 0xC0DB62,
        0x95993C, 0x439041, 0xFE5163, 0xABDEBB, 0xC561B7, 0x246E3A,
        0x424DD2, 0xE00649, 0x2EEA09, 0xD1921C, 0xFE1DEB, 0x1CB129,
        0xA73EE8, 0x8235F5, 0x2EBB44, 0x84E99C, 0x7026B4, 0x5F7E41,
        0x3991D6, 0x398353, 0x39F49C, 0x845F8B, 0xBDF928, 0x3B1FF8,
        0x97FFDE, 0x05980F, 0xEF2F11, 0x8B5A0A, 0x6D1F6D, 0x367ECF,
        0x27CB09, 0xB74F46, 0x3F669E, 0x5FEA2D, 0x7527BA, 0xC7EBE5,
        0xF17B3D, 0x0739F7, 0x8A5292, 0xEA6BFB, 0x5FB11F, 0x8D5D08,
        0x560330, 0x46FC7B, 0x6BABF0, 0xCFBC20, 0x9AF436, 0x1DA9E3,
        0x91615E, 0xE61B08, 0x659985, 0x5F14A0, 0x68408D, 0xFFD880,
        0x4D7327, 0x310606, 0x1556CA, 0x73A8C9, 0x60E27B, 0xC08C6B,
        0x47C419, 0xC367CD, 0xDCE809, 0x2A8359, 0xC4768B, 0x961CA6,
        0xDDAF44, 0xD15719, 0x053EA5, 0xFF0705, 0x3F7E33, 0xE832C2,
        0xDE4F98, 0x327DBB, 0xC33D26, 0xEF6B1E, 0x5EF89F, 0x3A1F35,
        0xCAF27F, 0x1D87F1, 0x21907C, 0x7C246A, 0xFA6ED5, 0x772D30,
        0x433B15, 0xC614B5, 0x9D19C3, 0xC2C4AD, 0x414D2C, 0x5D000C,
        0x467D86, 0x2D71E3, 0x9AC69B, 0x006233, 0x7CD2B4, 0x97A7B4,
        0xD55537, 0xF63ED7, 0x1810A3, 0xFC764D, 0x2A9D64, 0xABD770,
        0xF87C63, 0x57B07A, 0xE71517, 0x5649C0, 0xD9D63B, 0x3884A7,
        0xCB2324, 0x778AD6, 0x23545A, 0xB91F00, 0x1B0AF1, 0xDFCE19,
        0xFF319F, 0x6A1E66, 0x615799, 0x47FBAC, 0xD87F7E, 0xB76522,
        0x89E832, 0x60BFE6, 0xCDC4EF, 0x09366C, 0xD43F5D, 0xD7DE16,
        0xDE3B58, 0x929BDE, 0x2822D2, 0xE88628, 0x4D58E2, 0x32CAC6,
        0x16E308, 0xCB7DE0, 0x50C017, 0xA71DF3, 0x5BE018, 0x34132E,
```



```
        0x621283, 0x014883, 0x5B8EF5, 0x7FB0AD, 0xF2E91E, 0x434A48,
        0xD36710, 0xD8DDAA, 0x425FAE, 0xCE616A, 0xA4280A, 0xB499D3,
        0xF2A606, 0x7F775C, 0x83C2A3, 0x883C61, 0x78738A, 0x5A8CAF,
        0xBDD76F, 0x63A62D, 0xCBBFF4, 0xEF818D, 0x67C126, 0x45CA55,
        0x36D9CA, 0xD2A828, 0x8D61C2, 0x77C912, 0x142604, 0x9B4612,
        0xC459C4, 0x44C5C8, 0x91B24D, 0xF31700, 0xAD43D4, 0xE54929,
        0x10D5FD, 0xFCBE00, 0xCC941E, 0xEECE70, 0xF53E13, 0x80F1EC,
        0xC3E7B3, 0x28F8C7, 0x940593, 0x3E71C1, 0xB3092E, 0xF3450B,
        0x9C1288, 0x7B20AB, 0x9FB52E, 0xC29247, 0x2F327B, 0x6D550C,
        0x90A772, 0x1FE76B, 0x96CB31, 0x4A1679, 0xE27941, 0x89DFF4,
        0x9794E8, 0x84E6E2, 0x973199, 0x6BED88, 0x365F5F, 0x0EFDBB,
        0xB49A48, 0x6CA467, 0x427271, 0x325D8D, 0xB8159F, 0x09E5BC,
        0x25318D, 0x3974F7, 0x1C0530, 0x010C0D, 0x68084B, 0x58EE2C,
        0x90AA47, 0x02E774, 0x24D6BD, 0xA67DF7, 0x72486E, 0xEF169F,
        0xA6948E, 0xF691B4, 0x5153D1, 0xF20ACF, 0x339820, 0x7E4BF5,
        0x6863B2, 0x5F3EDD, 0x035D40, 0x7F8985, 0x295255, 0xC06437,
        0x10D86D, 0x324832, 0x754C5B, 0xD4714E, 0x6E5445, 0xC1090B,
        0x69F52A, 0xD56614, 0x9D0727, 0x50045D, 0xDB3BB4, 0xC576EA,
        0x17F987, 0x7D6B49, 0xBA271D, 0x296996, 0xACCCC6, 0x5414AD,
        0x6AE290, 0x89D988, 0x50722C, 0xBEA404, 0x940777, 0x7030F3,
        0x27FC00, 0xA871EA, 0x49C266, 0x3DE064, 0x83DD97, 0x973FA3,
        0xFD9443, 0x8C860D, 0xDE4131, 0x9D3992, 0x8C70DD, 0xE7B717,
        0x3BDF08, 0x2B3715, 0xA0805C, 0x93805A, 0x921110, 0xD8E80F,
        0xAF806C, 0x4BFFDB, 0x0F9038, 0x761859, 0x15A562, 0xBBCB61,
        0xB989C7, 0xBD4010, 0x04F2D2, 0x277549, 0xF6B6EB, 0xBB22DB,
        0xAA140A, 0x2F2689, 0x768364, 0x333B09, 0x1A940E, 0xAA3A51,
        0xC2A31D, 0xAEEDAF, 0x12265C, 0x4DC26D, 0x9C7A2D, 0x9756C0,
        0x833F03, 0xF6F009, 0x8C402B, 0x99316D, 0x07B439, 0x15200C,
        0x5BC3D8, 0xC492F5, 0x4BADC6, 0xA5CA4E, 0xCD37A7, 0x36A9E6,
        0x9492AB, 0x6842DD, 0xDE6319, 0xEF8C76, 0x528B68, 0x37DBFC,
        0xABA1AE, 0x3115DF, 0xA1AE00, 0xDAFB0C, 0x664D64, 0xB705ED,
        0x306529, 0xBF5657, 0x3AFF47, 0xB9F96A, 0xF3BE75, 0xDF9328,
        0x3080AB, 0xF68C66, 0x15CB04, 0x0622FA, 0x1DE4D9, 0xA4B33D,
        0x8F1B57, 0x09CD36, 0xE9424E, 0xA4BE13, 0xB52333, 0x1AAAF0,
        0xA8654F, 0xA5C1D2, 0x0F3F0B, 0xCD785B, 0x76F923, 0x048B7B,
        0x721789, 0x53A6C6, 0xE26E6F, 0x00EBEF, 0x584A9B, 0xB7DAC4,
        0xBA66AA, 0xCFCF76, 0x1D02D1, 0x2DF1B1, 0xC1998C, 0x77ADC3,
        0xDA4886, 0xA05DF7, 0xF480C6, 0x2FF0AC, 0x9AECDD, 0xBC5C3F,
        0x6DDED0, 0x1FC790, 0xB6DB2A, 0x3A25A3, 0x9AAF00, 0x9353AD,
        0x0457B6, 0xB42D29, 0x7E804B, 0xA707DA, 0x0EAA76, 0xA1597B,
        0x2A1216, 0x2DB7DC, 0xFDE5FA, 0xFEDB89, 0xFDBE89, 0x6C76E4,
        0xFCA906, 0x70803E, 0x156E85, 0xFF87FD, 0x073E28, 0x336761,
        0x86182A, 0xEABD4D, 0xAFE7B3, 0x6E6D8F, 0x396795, 0x5BBF31,
        0x48D784, 0x16DF30, 0x432DC7, 0x356125, 0xCE70C9, 0xB8CB30,
        0xFD6CBF, 0xA200A4, 0xE46C05, 0xA0DD5A, 0x476F21, 0xD21262,
        0x845CB9, 0x496170, 0xE0566B, 0x015299, 0x375550, 0xB7D51E,
        0xC4F133, 0x5F6E13, 0xE4305D, 0xA92E85, 0xC3B21D, 0x3632A1,
        0xA4B708, 0xD4B1EA, 0x21F716, 0xE4698F, 0x77FF27, 0x80030C,
        0x2D408D, 0xA0CD4F, 0x99A520, 0xD3A2B3, 0x0A5D2F, 0x42F9B4,
        0xCBDA11, 0xD0BE7D, 0xC1DB9B, 0xBD17AB, 0x81A2CA, 0x5C6A08,
        0x17552E, 0x550027, 0xF0147F, 0x8607E1, 0x640B14, 0x8D4196,
        0xDEBE87, 0x2AFDDA, 0xB6256B, 0x34897B, 0xFEF305, 0x9EBFB9,
        0x4F6A68, 0xA82A4A, 0x5AC44F, 0xBCF82D, 0x985AD7, 0x95C7F4,
        0x8D4D0D, 0xA63A20, 0x5F57A4, 0xB13F14, 0x953880, 0x0120CC,
        0x86DD71, 0xB6DEC9, 0xF560BF, 0x11654D, 0x6B0701, 0xACB08C,
        0xD0C0B2, 0x485551, 0x0EFB1E, 0xC37295, 0x3B06A3, 0x3540C0,
        0x7BDC06, 0xCC45E0, 0xFA294E, 0xC8CAD6, 0x41F3E8, 0xDE647C,
        0xD8649B, 0x31BED9, 0xC397A4, 0xD45877, 0xC5E369, 0x13DAF0,
        0x3C3ABA, 0x461846, 0x5F7555, 0xF5BDD2, 0xC6926E, 0x5D2EAC,
        0xED440E, 0x423E1C, 0x87C461, 0xE9FD29, 0xF3D6E7, 0xCA7C22,
        0x35916F, 0xC5E008, 0x8DD7FF, 0xE26A6E, 0xC6FDB0, 0xC10893,
        0x745D7C, 0xB2AD6B, 0x9D6ECD, 0x7B723E, 0x6A11C6, 0xA9CFF7,
        0xDF7329, 0xBAC9B5, 0x5100B7, 0x0DB2E2, 0x24BA74, 0x607DE5,
        0x8AD874, 0x2C150D, 0x0C1881, 0x94667E, 0x162901, 0x767A9F,
        0xBEFDFD, 0xEF4556, 0x367ED9, 0x13D9EC, 0xB9BA8B, 0xFC97C4,
        0x27A831, 0xC36EF1, 0x36C594, 0x56A8D8, 0xB5A8B4, 0x0ECCCF,
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128         0x2D8912, 0x34576F, 0x89562C, 0xE3CE99, 0xB920D6, 0xAA5E6B,
129         0x9C2A3E, 0xCC5F11, 0x4A0BFD, 0xFBF4E1, 0x6D3B8E, 0x2C86E2,
130         0x84D4E9, 0xA9B4FC, 0xD1EEEF, 0xC9352E, 0x61392F, 0x442138,
131         0xC8D91B, 0x0AFC81, 0x6A4AFB, 0xD81C2F, 0x84B453, 0x8C994E,
132         0xCC2254, 0xDC552A, 0xD6C6C0, 0x96190B, 0xB8701A, 0x649569,
133         0x605A26, 0xEE523F, 0x0F117F, 0x11B5F4, 0xF5CBFC, 0x2DBC34,
134         0xEEBC34, 0xCC5DE8, 0x605EDD, 0x9B8E67, 0xEF3392, 0xB817C9,
135         0x9B5861, 0xBC57E1, 0xC68351, 0x103ED8, 0x4871DD, 0xDD1C2D,
136         0xA118AF, 0x462C21, 0xD7F359, 0x987AD9, 0xC0549E, 0xFA864F,
137         0xFC0656, 0xAE79E5, 0x362289, 0x22AD38, 0xDC9367, 0xAAE855,
138         0x382682, 0x9BE7CA, 0xA40D51, 0xB13399, 0x0ED7A9, 0x480569,
139         0xF0B265, 0xA7887F, 0x974C88, 0x36D1F9, 0xB39221, 0x4A827B,
140         0x21CF98, 0xDC9F40, 0x5547DC, 0x3A74E1, 0x42EB67, 0xDF9DFE,
141         0x5FD45E, 0xA4677B, 0x7AACBA, 0xA2F655, 0x23882B, 0x55BA41,
142         0x086E59, 0x862A21, 0x834739, 0xE6E389, 0xD49EE5, 0x40FB49,
143         0xE956FF, 0xCA0F1C, 0x8A59C5, 0x2BFA94, 0xC5C1D3, 0xCFC50F,
144         0xAE5ADB, 0x86C547, 0x624385, 0x3B8621, 0x94792C, 0x876110,
145         0x7B4C2A, 0x1A2C80, 0x12BF43, 0x902688, 0x893C78, 0xE4C4A8,
146         0x7BDBE5, 0xC23AC4, 0xEAF426, 0x8A67F7, 0xBF920D, 0x2BA365,
147         0xB1933D, 0x0B7CBD, 0xDC51A4, 0x63DD27, 0xDDE169, 0x19949A,
148         0x9529A8, 0x28CE68, 0xB4ED09, 0x209F44, 0xCA984E, 0x638270,
149         0x237C7E, 0x32B90F, 0x8EF5A7, 0xE75614, 0x08F121, 0x2A9DB5,
150         0x4D7E6F, 0x5119A5, 0xABF9B5, 0xD6DF82, 0x61DD96, 0x023616,
151         0x9F3AC4, 0xA1A283, 0x6DED72, 0x7A8D39, 0xA9B882, 0x5C326B,
152         0x5B2746, 0xED3400, 0x7700D2, 0x55F4FC, 0x4D5901, 0x8071E0,
153         0xE13F89, 0xB295F3, 0x64A8F1, 0xAEA74B, 0x38FC4C, 0xEAB2BB,
154         0x47270B, 0xABC3A7, 0x34BA60, 0x52DD34, 0xF8563A, 0xEB7E8A,
155         0x31BB36, 0x5895B7, 0x47F7A9, 0x94C3AA, 0xD39225, 0x1E7F3E,
156         0xD8974E, 0xBBA94F, 0xD8AE01, 0xE661B4, 0x393D8E, 0xA523AA,
157         0x33068E, 0x1633B5, 0x3BB188, 0x1D3A9D, 0x4013D0, 0xCC1BE5,
158         0xF862E7, 0x3BF28F, 0x39B5BF, 0x0BC235, 0x22747E, 0xA247C0,
159         0xD52D1F, 0x19ADD3, 0x9094DF, 0x9311D0, 0xB42B25, 0x496DB2,
160         0xE264B2, 0x5EF135, 0x3BC6A4, 0x1A4AD0, 0xAAC92E, 0x64E886,
161         0x573091, 0x982CFB, 0x311B1A, 0x08728B, 0xBDCEE1, 0x60E142,
162         0xEB641D, 0xD0BBA3, 0xE559D4, 0x597B8C, 0x2A4483, 0xF332BA,
163         0xF84867, 0x2C8D1B, 0x2FA9B0, 0x50F3DD, 0xF9F573, 0xDB61B4,
164         0xFE233E, 0x6C41A6, 0xEEA318, 0x775A26, 0xBC5E5C, 0xCEA708,
165         0x94DC57, 0xE20196, 0xF1E839, 0xBE4851, 0x5D2D2F, 0x4E9555,
166         0xD96EC2, 0xE7D755, 0x6304E0, 0xC02E0E, 0xFC40A0, 0xBBF9B3,
167         0x7125A7, 0x222DFB, 0xF619D8, 0x838C1C, 0x6619E6, 0xB20D55,
168         0xBB5137, 0x79E809, 0xAF9149, 0x0D73DE, 0x0B0DA5, 0xCE7F58,
169         0xAC1934, 0x724667, 0x7A1A13, 0x9E26BC, 0x4555E7, 0x585CB5,
170         0x711D14, 0x486991, 0x480D60, 0x56ADAB, 0xD62F64, 0x96EE0C,
171         0x212FF3, 0x5D6D88, 0xA67684, 0x95651E, 0xAB9E0A, 0x4DDEFE,
172         0x571010, 0x836A39, 0xF8EA31, 0x9E381D, 0xEAC8B1, 0xCAC96B,
173         0x37F21E, 0xD505E9, 0x984743, 0x9FC56C, 0x0331B7, 0x3B8BF8,
174         0x86E56A, 0x8DC343, 0x6230E7, 0x93CFD5, 0x6A8F2D, 0x733005,
175         0x1AF021, 0xA09FCB, 0x7415A1, 0xD56B23, 0x6FF725, 0x2F4BC7,
176         0xB8A591, 0x7FAC59, 0x5C55DE, 0x212C38, 0xB13296, 0x5CFF50,
177         0x366262, 0xFA7B16, 0xF4D9A6, 0x2ACFE7, 0xF07403, 0xD4D604,
178         0x6FD916, 0x31B1BF, 0xCBB450, 0x5BD7C8, 0x0CE194, 0x6BD643,
179         0x4FD91C, 0xDF4543, 0x5F3453, 0xE2B5AA, 0xC9AEC8, 0x131485,
180         0xF9D2BF, 0xBADB9E, 0x76F5B9, 0xAF15CF, 0xCA3182, 0x14B56D,
181         0xE9FE4D, 0x50FC35, 0xF5AED5, 0xA2D0C1, 0xC96057, 0x192EB6,
182         0xE91D92, 0x07D144, 0xAEA3C6, 0x343566, 0x26D5B4, 0x3161E2,
183         0x37F1A2, 0x209EFF, 0x958E23, 0x493798, 0x35F4A6, 0x4BDC02,
184         0xC2BE13, 0xBE80A0, 0x0B72A3, 0x115C5F, 0x1E1BD1, 0x0DB4D3,
185         0x869E85, 0x96976B, 0x2AC91F, 0x8A26C2, 0x3070F0, 0x041412,
186         0xFC9FA5, 0xF72A38, 0x9C6878, 0xE2AA76, 0x50CFE1, 0x559274,
187         0x934E38, 0x0A92F7, 0x5533F0, 0xA63DB4, 0x399971, 0xE2B755,
188         0xA98A7C, 0x008F19, 0xAC54D2, 0x2EA0B4, 0xF5F3E0, 0x60C849,
189         0xFFD269, 0xAE52CE, 0x7A5FDD, 0xE9CE06, 0xFB0AE8, 0xA50CCE,
190         0xEA9D3E, 0x3766DD, 0xB834F5, 0x0DA090,
191 };

193 #if 0
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194 const int _TBL_ipio2l_66[] = {
195         0xA2F983, 0x6E4E44, 0x152A00, 0x062BC4, 0x0DA276, 0xBED4C1,
196         0xFDF905, 0x5CD5BA, 0x767CEC, 0x1F80D6, 0xC26053, 0x3A0070,
197         0x107C2A, 0xF68EE9, 0x687B7A, 0xB990AA, 0x38DE4B, 0x96CFF3,
198         0x92735E, 0x8B34F6, 0x195BFC, 0x27F88E, 0xA93EC5, 0x3958A5,
199         0x3E5D13, 0x1C55A8, 0x5B4A8B, 0xA42E04, 0x12D105, 0x35580D,
200         0xF62347, 0x450900, 0xB98BCA, 0xF7E8A4, 0xA2E5D5, 0x69BC52,
201         0xF0381D, 0x1A0A88, 0xFE8714, 0x7F6735, 0xBB7D4D, 0xC6F642,
202         0xB27E80, 0x6191BF, 0xB6B750, 0x52776E, 0xD60FD0, 0x607DCC,
203         0x68BFAF, 0xED69FC, 0x6EB305, 0xD2557D, 0x25BDFB, 0x3E4AA1,
204         0x84472D, 0x8B0376, 0xF77740, 0xD290DF, 0x15EC8C, 0x45A5C3,
205         0x6181EF, 0xC5E7E8, 0xD8909C, 0xF62144, 0x298428, 0x6E5D9D,
206         0xF9A9B4, 0xCDBD2F, 0xC083E7, 0x0D3957, 0xECA3B2, 0x96223C,
207         0xC1080D, 0x087D47, 0x7D7576, 0xA614B1, 0x42A4B6, 0xAA173C,
208         0xE217E5, 0xFDCD34, 0x279D5F, 0x39AACA, 0x1CA8DF, 0x8B6633,
209         0x5C49E4, 0xB56803, 0x1E7938, 0x741FDC, 0x4CB19B, 0xCECC3B,
210         0x921EB7, 0x7C0FC3, 0x361F23, 0xF9EE22, 0xBA4235, 0xA5FCA3,
211         0xBD4680, 0xFCDF65, 0xFC96AD, 0x31C90C, 0x919EEB, 0xFE0FB7,
212         0x75B4B0, 0x693961, 0x75BCAA, 0xEB6F39, 0xA343C0, 0xD16FF2,
213         0x33DAD0, 0xC1E095, 0x053182, 0x11E4A1, 0x40F943, 0x32D314,
214         0xAF1B98, 0xE1B05A, 0xE5F3AD, 0x6E633F, 0x363D14, 0xA3777C,
215         0xC8C6EE, 0x001E18, 0x0D180C, 0xAA1369, 0xEDFBA2, 0x998A9D,
216         0x16E799, 0x693B75, 0x90EF50, 0x938DD4, 0xFB7ACD, 0x67CEEB,
217         0x249DE3, 0x9B9B52, 0xD8CDAC, 0xC31A54, 0x855FBF, 0x848591,
218         0x0954B0, 0x946B8C, 0xA4C7B4, 0x9A9E51, 0xF20425, 0xAA2637,
219         0xFC6657, 0x7D8625, 0x620B74, 0x8B578D, 0xEC9A05, 0xDEF24F,
220         0x7F19B0, 0xFC2544, 0x1DA0F1, 0x23790C, 0xC4294D, 0x6D3C32,
221         0x66FE56, 0xD45562, 0x66264F, 0xA24162, 0x13E930, 0xB0E7C0,
222         0xFA0E97, 0xBFC62C, 0x0E663F, 0x90F33B, 0x55E73C, 0xD791F7,
223         0xD3F00D, 0xAB01C7, 0x40CF8F, 0xA593BA, 0xE627D5, 0x4A8308,
224         0x32DC06, 0x80C876, 0x1C3DB5, 0xB5489F, 0x632CDF, 0xB02517,
225         0xD17EFA, 0x92570F, 0xFAED44, 0x8F8536, 0x27069B, 0xC014DC,
226         0x997D48, 0x961D61, 0x7A960B, 0x31B622, 0xD3C425, 0xA69520,
227         0x98D29E, 0xF1C973, 0x5483D7, 0x99611E, 0xEAFF5F, 0x7DEFF1,
228         0x98475C, 0x91C787, 0x537E17, 0x068C65, 0xF05E52, 0x942F04,
229         0x37CF92, 0xEF4223, 0xC4C52F, 0x521DAA, 0xBAAF97, 0x972236,
230         0xA2B3D3, 0x62C921, 0x8D3A8B, 0x2B3302, 0x6061B9, 0x0CBE94,
231         0x75F451, 0xBD06DE, 0x86042D, 0xFB61ED, 0x4C8869, 0x590232,
232         0x479963, 0x23518D, 0xAF5D28, 0x60C9DE, 0x473DB0, 0x9DE009,
233         0xD8FC4C, 0xE96991, 0x9CA455, 0x800BC8, 0x977CE0, 0xDCBFA6,
234         0x19D249, 0xA0F76D, 0x5F9B2F, 0x452BB3, 0x77E091, 0xB6383A,
235         0x7BE9C2, 0x4BF7C1, 0x8A5EBF, 0xEB0D55, 0x9AF4DC, 0x275CA0,
236         0xED09D0, 0xE50A7F, 0xBEF42C, 0x4803AF, 0x56139F, 0xD58848,
237         0x797D96, 0xB8352E, 0x49D90D, 0x7607E0, 0xC99256, 0x75F530,
238         0xB72237, 0x1AF080, 0xC2E813, 0x06CFA9, 0xB9DF8E, 0x919C38,
239         0x89D97E, 0x0464D5, 0xB12EEF, 0xD14165, 0x365A72, 0x550D35,
240         0x3772D8, 0xF41B58, 0x0378A7, 0x2D5D7D, 0xD6E433, 0xDD2018,
241         0x139FD7, 0x1B5621, 0x94E046, 0x97A323, 0x693176, 0x28DF59,
242         0xD24273, 0x0E4E26, 0xA9A8F6, 0xF15B41, 0x450EE3, 0x57EA61,
243         0x7DADA6, 0xF21086, 0x394BEE, 0x8F4813, 0x3FDEE9, 0xF3A53D,
244         0xAB2F40, 0x8B1E2B, 0xA07FD4, 0x992CC4, 0x63532D, 0x9F35A2,
245         0x6FA290, 0x0094DE, 0xD2A24D, 0x755B81, 0x79F9E1, 0xFE1D35,
246         0xFEE8CC, 0x9224C5, 0x54E2CE, 0x41F31C, 0xF45138, 0xED6D10,
247         0x6B439D, 0xD2BE46, 0xC327D4, 0x68BFB0, 0x46D5A5, 0x79B285,
248         0x776D7C, 0xE18647, 0x00E32F, 0xEBB7F2, 0x5DE307, 0x5A8EA0,
249         0x06CEFE, 0x20923C, 0x354CE1, 0xAD09C5, 0x56996D, 0xCFB124,
250         0xEF7BC1, 0x76BF72, 0xF20753, 0x5BBAFA, 0xB8A2B2, 0x5914F2,
251         0x5D834F, 0xE64A08, 0x14C3AB, 0x07796B, 0xF2212D, 0xC74049,
252         0xB61C6A, 0x282CFC, 0x25070C, 0x315BF1, 0x6FEAD3, 0x2CD2E5,
253         0xD10F9C, 0x1972BB, 0x908073, 0x0F368C, 0x69BE97, 0xA242B0,
254         0x722DFE, 0xAFE6A2, 0x143D8B, 0x5C5699, 0x48232B, 0xFF49AC,
255         0xB5FA62, 0x6AD778, 0x7A844D, 0x258AA0, 0x8EDE3D, 0x9A9496,
256         0x49924E, 0xA33E97, 0x4F43FA, 0xC40741, 0x2F764A, 0x8EB2B1,
257         0x8E67D3, 0x9FF324, 0x51B11B, 0x5D6E09, 0xE9AD3E, 0xFFA902,
258         0xF48653, 0x0845D3, 0xDED33E, 0x32D30E, 0x6247CA, 0x7C586D,
259         0x2EAF9E, 0x323A35, 0xAD11FB, 0x0F420C, 0x0E0685, 0x401B60,
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260         0xBB3D43, 0xF4D489, 0xBCDC4C, 0x40FFBA, 0x18AB08, 0x7AC72D,
261         0x5E76DB, 0xE8344E, 0x3975A2, 0xF9611B, 0x1121F3, 0x3A429C,
262         0x9B18EC, 0xF298B1, 0x8AEC78, 0x1C248B, 0x69108F, 0xDB2D37,
263         0xA1A613, 0x910359, 0x521451, 0xD4441F, 0x0BB3B6, 0x50D9DB,
264         0xBD589F, 0x62A62E, 0xA9B903, 0x935F63, 0x058BEC, 0x78BCB5,
265         0x2CB460, 0x3A9037, 0x0291C4, 0x1FABC1, 0xBE7D05, 0xF948E7,
266         0x6BA5CD, 0xF62A0A, 0x9AEA19, 0x2257AB, 0x2E0D7D, 0x9EB93F,
267         0x5E3F77, 0xD4A13F, 0x08E3DB, 0xDFD689, 0x2B9B4E, 0xB58427,
268         0x25424B, 0x1197FD, 0xCF298A, 0x314008, 0xD5687F, 0x0F0EAC,
269         0x13C485, 0xF684B2, 0xED7EC7, 0x6E636D, 0x28C933, 0xE19058,
270         0x688B6A, 0xC88905, 0xFB2F31, 0x61304C, 0xC19765, 0x60D81A,
271         0x57F276, 0xC6EFC4, 0x048954, 0x303470, 0xDA6F6F, 0x93901A,
272         0x911439, 0x363D12, 0x59E72B, 0x6F9F1E, 0x57C584, 0xDF0D23,
273         0xBB743F, 0xADE99C, 0x546097, 0xFCC820, 0xCBB968, 0xDA9B5F,
274         0x0DC271, 0x563337, 0x9ED662, 0xE7C44F, 0x3129F8, 0xF5EAF9,
275         0xDAF7F2, 0xCD09FF, 0xA92535, 0x441C29, 0x7DF436, 0xE2B00A,
276         0x36746F, 0xF1DC61, 0x9D3C9C, 0x63AB71, 0xB8F3BB, 0x1C80F6,
277         0x62FF65, 0x5FFE5F, 0x3B2814, 0xBADE27, 0x1B384B, 0x268AA9,
278         0xBD91EF, 0xCA436B, 0xABE107, 0x88DCA6, 0xC3AFC0, 0x85D155,
279         0x464A48, 0xBFDAEB, 0xC6F389, 0x907C11, 0x0D3E41, 0xCD2197,
280         0x549008, 0x817E4E, 0x8C7154, 0x1DC37F, 0x5E897E, 0xA9A2FE,
281         0xEC6060, 0xCC0728, 0x430D3B, 0x62471C, 0xD3A4D3, 0x2BA57B,
282         0xE5D15A, 0xD632F3, 0xF2B76F, 0xEC8498, 0xAE41C2, 0xAAF413,
283         0xEAF5C0, 0xDD1B07, 0xB9A2A0, 0x59F230, 0xA3F61B, 0x8F8643,
284         0x05DE6B, 0x1B5B8E, 0x63ECC5, 0xBFF01D, 0x8F1440, 0x3F8ADF,
285         0x2E6539, 0xF3DB7A, 0x293FE5, 0x7EE714, 0x88E6D8, 0x2B2A6A,
286         0xDF6E34, 0x8D4604, 0x4F6594, 0x639063, 0x6B51CC, 0x0D05CD,
287         0x009607, 0xE7BF70, 0xC9A0EA, 0x0D80DD, 0xA1A065, 0x0DCB8F,
288         0xA48430, 0x715934, 0x6FC8E4, 0x6FFC52, 0xEF8B05, 0xDE506A,
289         0xE62BBC, 0x31480F, 0xEA64EA, 0x51E6FB, 0x9AE773, 0x21C54D,
290         0xBFA080, 0x273D1E, 0x9FFD4E, 0x0C2CA8, 0x0690A5, 0xF8773B,
291         0x4B2680, 0x6E3F56, 0xC8B89F, 0x0B7BD0, 0x71C8BF, 0x5AABD3,
292         0x2BA93E, 0x9D2EE1, 0xCDF2FA, 0xEE57BE, 0x84A116, 0xDA756D,
293         0x8FD6C0, 0x927153, 0xFF5EF3, 0x9F8331, 0x713411, 0xF945F3,
294         0x0382B2, 0x8BAE30, 0xBC45A4, 0x630101, 0x5C9C3A, 0x643CFD,
295         0x48115C, 0x17F03E, 0xB5F55E, 0x288DAF, 0x725660, 0xFB58E0,
296         0xFC189E, 0x1ECA69, 0xFB19A6, 0xFA7A92, 0x7CC48E, 0x869372,
297         0x58089A, 0x16DB5C, 0xADC0CD, 0x09D3D4, 0xD1108E, 0xDC64ED,
298         0x3A999C, 0xAA8716, 0x5A3D8E, 0x7037FB, 0x1976AD, 0xE477D7,
299         0x23782B, 0xC51F39, 0x4A5E9A, 0xDAD9DA, 0xE5B559, 0x08EF06,
300         0x76E24F, 0x7361AD, 0x5F42A3, 0x9B70E5, 0xCE96C4, 0x552E99,
301         0x6D7A6F, 0x804474, 0x4FA45B, 0x1D115B, 0x6D109E, 0x0A1A63,
302         0x1084A6, 0xE18E5D, 0x2D8589, 0x203345, 0x4851AF, 0xA71EDC,
303         0x03B6B1, 0x267970, 0xDEC908, 0x795BED, 0x7099B9, 0x209321,
304         0x7FC2E7, 0x0F3E5E, 0xC7A4F4, 0x088129, 0x59AE63, 0x4E3251,
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306         0xCA3BA3, 0x422489, 0xA2239C, 0x38724D, 0x2AC767, 0x601E9D,
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491         0x6CD8F9, 0xD02E1F, 0x1C3F2F, 0xFCF8F0, 0x4C2C6D, 0x0B2169,
492         0x48B9CE, 0x42737D, 0xA8E974, 0x64062D, 0xA86C59, 0xEEC419,
493         0x047C83, 0x996A23, 0xF2A4C8, 0x4BE1B8, 0x348286, 0xE84240,
494         0x8337CB, 0xE55A2F, 0xC17750, 0xA4DA06, 0x64347F, 0x59A5A1,
495         0xDFF53D, 0x62A571, 0xEECF3A, 0x886700, 0xC06DAF, 0x4E161F,
496         0x12670E, 0xBDFE1A, 0xA72B38, 0x5BA22C, 0xFED227, 0x3FC814,
497         0x150E5A, 0xE99B3A, 0x8EE9FC, 0xBC1845, 0x32373A, 0xBDA476,
498         0xCEB88F, 0x7FAED3, 0xDB9116, 0x31CF72, 0x1A5136, 0xC4F362,
499         0xDE4799, 0x768043, 0x386207, 0x8E5497, 0xB0EF6D, 0x6C57FB,
500         0xF56664, 0xD24F05, 0xE0F702, 0x8A41EF, 0xA2EC53, 0x09731C,
501         0x6157FE, 0xC5731C, 0xEF1A2E, 0x60EC10, 0xA67EFE, 0x486A73,
502         0x8004F6, 0xC3F482, 0x63BA28, 0x107282,
503 };
504 #endif
```

```
**********************************************************
    6893 Sat May 10 12:08:57 2014
new/usr/src/lib/libm/common/LD/_TBL_sinl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
 * For i = 0L, ..., 75 let x(i) be the extended precision number
 * whose exponent is given by 0x3ffc + ((i + 8) >> 5) and whose
 * five most significant fraction bits are given by (i + 8) & 0x1f.
 * (The remaining fraction bits are zero and the integer bit is 1.)
 * Then _TBL_sinl_hi[i] := sin(x(i)) rounded to extended precisionL,
 * and _TBL_sinl_lo[i] ~ sin(x(i)) - _TBL_sinl_hi[i].
 */

#include "libm.h"

const long double _TBL_sinl_hi[] = {
        1.55614992773556041214325 09e-01L,
        1.59472458931843419943532 97e-01L,
        1.63327491736612850852070 24e-01L,
        1.67180032364806734375005 55e-01L,
        1.71030022031395019275015 24e-01L,
        1.74877401990272189893026 70e-01L,
        1.78722113535153659378044 12e-01L,
        1.82564098000471555397839 29e-01L,
        1.86403296762269884547587 49e-01L,
        1.90239651239099061768396 06e-01L,
        1.94073102892909791155435 71e-01L,
        1.97903593229946284657357 75e-01L,
        2.01731063801638804721446 52e-01L,
        2.05555456205495517657240 79e-01L,
        2.09376712085993643705310 84e-01L,
        2.13194773135469890611029 89e-01L,
        2.17009581095010156757789 40e-01L,
        2.20821077755338490551076 55e-01L,
        2.24629204957705292351809 01e-01L,
        2.28433904594774747541995 223e-01L,
        2.32235118611511462410760 06e-01L,
        2.36032789006066333735585 87e-01L,
        2.39826857830661564438025 36e-01L,
        2.43617267192474886005758 47e-01L,
        2.47403959254522929592668 56e-01L,
        2.51186527192474886005758 47e-01L,
        2.54965960415878467490132 31e-01L,
        2.62512399769153281461247 02e-01L,
        2.70042816718585031540060 88e-01L,
        2.77556751646336325920448 60e-01L,
        2.85053745940547424589459 75e-01L,
        2.92533342023327543615857 44e-01L,
        2.99995083378683051174382 75e-01L,
        3.07438514580380850668879 51e-01L,
        3.14863181319745250871062 69e-01L,
        3.22268630433386625675114 27e-01L,
        3.29654409930860171922982 14e-01L,
        3.37020069022253076248922 53e-01L,
        3.44365158145698408207304 24e-01L,
        3.51689228994814059224517 31e-01L,
        3.58991834546065053664987 49e-01L,
        3.66272529086047561364168 98e-01L,
        3.73530868238692946429503 62e-01L,
        3.80766408992390192070559 91e-01L,
        3.87978709727025046044264 84e-01L,
        3.95167330240934236234261 19e-01L,
        4.02331831777773111223119 04e-01L,
        4.09471777053295066110035 62e-01L,
        4.16586730282041119247668 85e-01L,
        4.23676257203938010360344 28e-01L,
        4.30739925110803197218613 61e-01L,
        4.37777302872755132861787 99e-01L,
        4.44787960964527211420605 63e-01L,
        4.51771471491683776575826 18e-01L,
        4.58727408216736592369610 14e-01L,
        4.65655346585160182692119 88e-01L,
        4.72554863751304451150369 80e-01L,
        4.79425538604203000281507 59e-01L,
        4.93078685753923057270798 82e-01L,
        5.06611454814257367647734 74e-01L,
        5.20020541953727004748451 32e-01L,
        5.33302673536020173318712 71e-01L,
        5.46454606919203564406161 55e-01L,
        5.59473131247366877404330 47e-01L,
        5.72355068234507240372034 58e-01L,
        5.85097272940462154828741 85e-01L,
        5.97696634538701531216570 86e-01L,
        6.10150077075791371272656 5e-01L,
        6.22454560223436830194303 0e-01L,
        6.34607080015269296832843 00e-01L,
        6.46604669591152370500958 26e-01L,
        6.58444399910567541595735 05e-01L,
        6.70123380473162894650947 24e-01L,
        6.81638760023334166755597 24e-01L,
        6.92987727246317910265518 97e-01L,
        7.04167511454533672778880 60e-01L,
};

const long double _TBL_sinl_lo[] = {
       -4.40444203884857086043520 42e-21L,
       -9.36585057794667946638577 79e-22L,
       -5.20406786070713935084108 17e-21L,
       -4.03952674819400782560076 50e-21L,
        6.33273325764964683154697 78e-21L,
        2.65867078221420938379843 64e-21L,
       -2.68787874500507442373452 82e-21L,
        1.70636356623055952506542 37e-21L,
```

```
128          4.79249212825385555045455343e-21L,
129         -4.41016910669393021830104 70e-21L,
130          6.19486009154478228309804 96e-22L,
131         -4.96384136497495022516189 71e-21L,
132          3.59162715976515462279264 73e-21L,
133         -4.07771503236737127977565 69e-22L,
134          6.57991365997798986036476 60e-21L,
135          5.04314418022362712795965 47e-21L,
136          2.78869676368043837024120 94e-21L,
137          1.77979419155070946645641 19e-21L,
138         -1.38045543929396355838292 51e-21L,
139          4.78559811876154662515263 1e-21L,
140          3.17082113904069975030049 00e-21L,
141         -1.51578340447256525698732 63e-22L,
142          3.34389467316840192046319 03e-21L,
143          6.47247980568558771111754 01e-21L,
144          4.18014286719533146978397 00e-21L,
145         -2.57573653670122274820160 23e-21L,
146         -1.02973945157718102950740 32e-20L,
147          1.26941796377356567224645 28e-20L,
148          1.57485127810111795653086 73e-21L,
149         -1.69671848592029057927055 21e-21L,
150          8.84488586523313362517317 37e-21L,
151         -1.11344689690403402932418 25e-20L,
152          1.62344717910253214204718 04e-21L,
153         -6.02637381960544846517512 91e-21L,
154          1.26316522958226468434141 72e-20L,
155         -8.66441016875827628536949 06e-21L,
156          1.23592221749238593972713 58e-20L,
157         -1.32198215872418315080279 81e-22L,
158         -1.93241109989952969221012 91e-21L,
159          1.27228088300892142409153 85e-20L,
160          8.74037044797859402992124 66e-21L,
161         -1.26638636293427510159662 19e-20L,
162         -1.33592060652005256342084 87e-20L,
163          6.81485478221876523827273 19e-21L,
164          1.05714505734028921915822 57e-20L,
165         -6.01344135520230631291300 24e-21L,
166          1.26584054576324074472119 37e-20L,
167          1.14435982751372847976089 12e-20L,
168         -7.66029225036476932463300 11e-21L,
169         -2.29208763946240806245126 78e-21L,
170         -1.69016402576717882852143 36e-22L,
171          1.24503834409269736982850 13e-20L,
172          5.86256879093106433612527 82e-21L,
173          7.68488912075400148915394 34e-21L,
174         -1.09203637279124669245317 05e-20L,
175         -3.81848027624352422804389 06e-21L,
176         -8.21964987414168683994337 03e-21L,
177         -5.66226874073050650560151 30e-21L,
178         -5.43873574372091021178779 30e-21L,
179          1.17623818577417093830975 97e-20L,
180          1.04183917560805762188647 00e-20L,
181         -2.81199583315247283698946 97e-21L,
182         -1.94864647768084335759642 76e-20L,
183          1.29191313204581227753523 22e-20L,
184         -2.33425333952787374948364 57e-20L,
185          2.20767631472538020202277 87e-20L,
186          1.08974683725426216341266 22e-21L,
187          2.24964002091179940206517 30e-20L,
188          1.74669096626243469323943 83e-20L,
189          2.30839024451270913360674 92e-20L,
190         -6.15109781116215965198329 19e-21L,
191          3.58434240758437154363949 53e-21L,
192         -2.23552881810015977966619 94e-20L,
193          1.62965218744645211409457 41e-20L,
```



```
194          1.17891136558968995614775 59e-21L,
195 };
```

```
**********************************************************
    6893 Sat May 10 12:08:57 2014
new/usr/src/lib/libm/common/LD/_TBL_tanl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
 * For i = 0L, ..., 75 let x(i) be the extended precision number
 * whose exponent is given by 0x3ffc + ((i + 8) >> 5) and whose
 * five most significant fraction bits are given by (i + 8) & 0x1f.
 * (The remaining fraction bits are zero and the integer bit is 1.)
 * Then _TBL_tanl_hi[i] := tan(x(i)) rounded to extended precisionL,
 * and _TBL_tanl_lo[i] ~ tan(x(i)) - _TBL_tanl_hi[i].
 */

#include "libm.h"

const long double _TBL_tanl_hi[] = {
        1.57534107325271610687902 89e-01L,
        1.61539784049521476313885 16e-01L,
        1.65550519273933976208612 25e-01L,
        1.69566445219766510148456 77e-01L,
        1.73587694767981520849804 87e-01L,
        1.77614401477446727634058 01e-01L,
        1.81646699603321427657527 66e-01L,
        1.85684724115634411620062 89e-01L,
        1.89728610718059132887909 62e-01L,
        1.93778495866891863522282 93e-01L,
        1.97834516790238668811877 27e-01L,
        2.01896811507417132887419 81e-01L,
        2.05965518848578721068853 5e-01L,
        2.10040778474558980845870 31e-01L,
        2.14122730896958664889139 64e-01L,
        2.18211517498467432504133 39e-01L,
        2.22307280553431330872497 62e-01L,
        2.26410163248673837474238 79e-01L,
        2.30520309704576141461291 99e-01L,
        2.34637864996423678996036 87e-01L,
```



```
        2.38762975176025920266633 00e-01L,
        2.42895787293616542405652 43e-01L,
        2.47036449420041264663839 60e-01L,
        2.51185110669240767392604 64e-01L,
        2.55341921221036266510199 39e-01L,
        2.63680596419996799844058 17e-01L,
        2.72053698658770883435451 68e-01L,
        2.80462470145251403173250 12e-01L,
        2.88908172440514725997804 88e-01L,
        2.97392087269024589475186 27e-01L,
        3.05915517353059264118878 35e-01L,
        3.14479787272571516162618 72e-01L,
        3.23086244351745520105630 84e-01L,
        3.31736259573572767343817 64e-01L,
        3.40431228523830387434467 17e-01L,
        3.49172572365910352244463 07e-01L,
        3.57961738848016998383507 61e-01L,
        3.66800203344323422731529 04e-01L,
        3.75689469931754840419406 08e-01L,
        3.84631072504149223035673 64e-01L,
        3.93626575925632758219023 87e-01L,
        4.02677577225140211785760 21e-01L,
        4.11785706834108475776550 99e-01L,
        4.20952629869475822087894 13e-01L,
        4.30180047464230049013636 51e-01L,
        4.39469698147866240470508 71e-01L,
        4.48823359279239708847283 19e-01L,
        4.58242848534432366968847 59e-01L,
        4.67730025452391799933036 03e-01L,
        4.77286793041252261710289 19e-01L,
        4.86915099448406324503550 38e-01L,
        4.96616939697565625699707 61e-01L,
        5.06394357496229812051410 92e-01L,
        5.16249447117175144512501 30e-01L,
        5.26184355357779144174812 55e-01L,
        5.36201283581216031366017 96e-01L,
        5.46302489843790513269431 58e-01L,
        5.56676706558058644568054 29e-01L,
        5.87597367591443221421232 40e-01L,
        6.08813740324380721390725 57e-01L,
        6.30437673835884766857656 78e-01L,
        6.52491897928807992705635 41e-01L,
        6.75000485144242907660852 57e-01L,
        6.97988963623599255152452 07e-01L,
        7.21484440990904419961839 6e-01L,
        7.45515740559391995123748 18e-01L,
        7.70113551344208705016613 35e-01L,
        7.95310593568674185623122 02e-01L,
        8.21141801589894121892430 90e-01L,
        8.47644526446552654108928 39e-01L,
        8.74858760554482349524642 32e-01L,
        9.02827387452673502175708 18e-01L,
        9.31596459944072461160057 00e-01L,
        9.61215510494370416162083 35e-01L,
        9.91737898363268680264077 24e-01L,
};

const long double _TBL_tanl_lo[] = {
       -2.67711594091057317014055 10e-21L,
       -4.60992267897412629002106 06e-21L,
        5.31866441403753228208024 58e-21L,
        2.51384058309386337356868 39e-21L,
       -5.13146170578064327069996 94e-21L,
       -2.31508184585243207719363 17e-21L,
        7.48231506884095898578783 46e-22L,
        6.59833849517770573309624 51e-21L,
```

```
128          3.17374650703092386796379 04e-21L,
129         -6.26053304130097421079924 04e-21L,
130         -3.47089688954215125742482 88e-21L,
131         -3.35081777228555471630471 03e-21L,
132          1.85397612559471622824428 45e-21L,
133         -4.35278638153589945740712 38e-21L,
134         -3.07295823737469580790803 08e-21L,
135          1.74865837946171760807779 95e-21L,
136         -2.08804276436885599272616 66e-22L,
137          3.43261563416333174840640 51e-21L,
138         -5.84447125155430059935106 67e-21L,
139          3.33083935838645834034001 80e-21L,
140          1.51806095450161674940140 88e-21L,
141         -4.56648649922301183958709 71e-21L,
142         -3.44866353828876072536713 56e-22L,
143          6.49924715100185869501695 90e-21L,
144         -5.71715526443579216030797 72e-21L,
145          1.07678203127491428405427 96e-20L,
146         -8.88730948642649449291186 78e-21L,
147         -3.64583454957368339332534 27e-21L,
148          3.78356919682851012890241 50e-21L,
149         -7.99225772129919200079266 65e-21L,
150         -1.16394260619635123117971 96e-20L,
151          1.08194963814584826970461 45e-20L,
152          1.26698123519328485853619 42e-20L,
153         -4.38793526421653876655579 42e-21L,
154         -6.23972322949703613769810 25e-21L,
155          1.02498946241815634253183 69e-20L,
156          4.88835455185099907805829 76e-21L,
157         -1.09242172247198885613668 11e-20L,
158         -1.01603044665988138822097 81e-20L,
159          5.18264150914714117114480 75e-21L,
160          1.03899186833329723490772 36e-20L,
161         -7.16647765747142621638623 63e-21L,
162          1.22988842203337480716254 66e-20L,
163         -1.30999903781373834976510 40e-20L,
164          6.69309113715368444771086 05e-21L,
165          1.31544371444686994859993 17e-20L,
166         -6.72766727081351255039501 30e-21L,
167         -9.65839487997809331327037 13e-21L,
168         -1.16933275913537624222871 58e-20L,
169          1.21150720303963403149450 14e-20L,
170         -4.83287340144306982890250 15e-21L,
171          1.08529730614452936266932 28e-20L,
172          1.94118312835882552567126 79e-20L,
173         -2.07259623165755066680838 50e-20L,
174         -9.19910918195899189683513 50e-21L,
175         -1.84390307854973710793889 71e-20L,
176         -1.42521143986177350968217 30e-20L,
177         -3.66349999030390535479356 23e-22L,
178         -2.70735381113102198121854 87e-20L,
179          2.17684006357718338660200 06e-20L,
180         -5.04535090368082736707692 39e-21L,
181          1.82623264049572499861026 13e-20L,
182          2.32537882728912245295277 26e-21L,
183         -2.68634656017266410178258 74e-21L,
184          2.03339194451698365524740 35e-20L,
185          1.23819833267383547353380 55e-20L,
186         -1.06296932252589099831654 05e-20L,
187          2.24796668455862390754664 63e-20L,
188          1.89930649190611566302263 62e-20L,
189         -1.81400785921385873419537 39e-20L,
190          1.50295928681841227594946 25e-20L,
191          2.04661896440068681464967 69e-20L,
192          5.14575947576975254714065 75e-21L,
193          2.32172722407931191681287 89e-20L,
```



```
194         -7.21985283981341196622309 07e-21L,
195 };
```

```
**********************************************************
    4615 Sat May 10 12:08:57 2014
new/usr/src/lib/libm/common/LD/__cosl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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/* INDENT OFF */
/*
 * __k_cosl( long double x;  long double y )
 * kernel cos function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 *
 * Table look up algorithm
 *      1. by cos(-x) = cos(x), we may replace x by |x|
 *      2. if x < 25/128 = [0x3ffc4000, 0] = 0.15625 , then
 *           if x < 2^-57 (hx < 0x3fc60000 0), return 1.0 with inexact if x!= 0
 *           z = x*x;
 *           if x <= 1/128 = 2**-7 = 0.0078125
 *              cos(x)=1.0+z*(qq1+z*(qq2+z*(qq3+z*(qq4+z*qq5))))
 *           else
 *              cos(x)=1.0+z*(q1+ ... z*q8)
 *      3. else
 *              ht = (hx + 0x400)&0x7ffff800    (round x to a break point t)
 *              lt = 0
 *              i  = (hy-0x3ffc4000)>>11;       (i<=64)
 *              x' = (x - t)+y                  (|x'| ~<= 2^-7
 *         By
 *              cos(t+x')
 *                = cos(t)cos(x')-sin(t)sin(x')
 *                = cos(t)(1+z*(qq1+z*qq2))-[sin(t)]*x*(1+z*(pp1+z*pp2))
 *                = cos(t) + [cos(t)]*(z*(qq1+z*qq2))-
 *                           [sin(t)]*x*(1+z*(pp1+z*pp2))
 *
 *         Thus,
 *              let a= _TBL_cos_hi[i], b = _TBL_cos_lo[i], c= _TBL_sin_hi[i],
 *              x = (x-t)+y
```



```
 *              z = x*x;
 *              cos(t+x) = a+(b+ (-c*x*(1+z*(pp1+z*pp2))+a*(z*(qq1+z*qq2)))
 */

#include "libm.h"

#include <sys/isa_defs.h>

extern const long double _TBL_cosl_hi[], _TBL_cosl_lo[], _TBL_sinl_hi[];
static const long double
one     = 1.0,
/*
 * |sin(x) - (x+pp1*x^3+...+ pp5*x^11 )| <= 2^-122.32 for |x|<1/64
 */
pp1     = -1.66666666666666666666666666586782940810e-0001L,
pp2     =  8.33333333333333333333003723660929317540e-0003L,
pp3     = -1.98412698412698407604590348377833780447 0e-0004L,
pp4     =  2.75573192236190664131972310621090094941 3e-0006L,
pp5     = -2.50519839857094701909399846913501205767 3e-0008L,
/*
 *
 * |cos(x) - (1+q1*x^2+...+q8*x^16)| <= 2^-117.11 for |x|<= 0.15625
 */
q1      =  -4.99999999999999999999999999999756416975e-0001L,
q2      =   4.16666666666666666666666664006066577258e-0002L,
q3      =  -1.38888888888888888888877700363937169637e-0003L,
q4      =   2.48015873015873015849446846303181408355 9e-0005L,
q5      =  -2.75573192239858627632281925035600554287 1e-0007L,
q6      =   2.08767569876742426144195976072985401785 5e-0009L,
q7      =  -1.14707448123966208907245212901079077476 1e-0011L,
q8      =   4.77776164739965159973066342226353103478 2e-0014L,
/*
 *
 * |cos(x) - (1+qq1*x^2+...+ qq5*x^10)| <= 2^-123.84 for |x|<=1/128
 */
qq1     =  -4.99999999999999999999999999999378373641e-0001L,
qq2     =   4.16666666666666666666665478399327703130e-0002L,
qq3     =  -1.38888888888888888805821123061805161349 4e-0003L,
qq4     =   2.48015873015610537771585658905303111866e-0005L,
qq5     =  -2.75572809976252632573648837669515700873 6e-0007L;
/* INDENT ON */
long double
__k_cosl(long double x, long double y) {
        long double a, t, z, w;
        int *pt = (int *) &t, *px = (int *) &x;
        int i, j, hx, ix;

        t = 1.0;
#if defined(__i386) || defined(__amd64)
        XTOI(px, hx);
#else
        hx = px[0];
#endif
        ix = hx & 0x7fffffff;
        if (ix < 0x3ffc4000) {
                if (ix < 0x3fc60000)
                        if ((i = (int) x) == 0)
                                return (one);   /* generate inexact */
                z = x * x;

                if (ix < 0x3ff80000)    /* 0.0078125 */
                        return (one + z * (qq1 + z * (qq2 + z * (qq3 + z *
                                (qq4 + z * qq5)))));
                else
                        return (one + z * (q1 + z * (q2 + z * (q3 + z * (q4 +
                                z * (q5 + z * (q6 + z * (q7 + z * q8)))))))));
```

```
127         }
128         j = (ix + 0x400) & 0x7ffff800;
129         i = (j - 0x3ffc4000) >> 11;
130 #if defined(__i386) || defined(__amd64)
131         ITOX(j, pt);
132 #else
133         pt[0] = j;
134 #endif
135         if (hx > 0)
136                 x = y - (t - x);
137         else
138                 x = (-y) - (t + x);
139         a = _TBL_cosl_hi[i];
140         z = x * x;
141         t = z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5))));
142         w = x * (one + z * (pp1 + z * (pp2 + z * (pp3 + z * (pp4 + z *
143                 pp5)))));
144         t = _TBL_cosl_lo[i] - (_TBL_sinl_hi[i] * w - a * t);
145         return (a + t);
146 }
```

```
**********************************************************
   14618 Sat May 10 12:08:57 2014
new/usr/src/lib/libm/common/LD/__lgammal.c
patch01 - 693 import Sun Devpro Math Library
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```

```
/*
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/* long double __k_lgammal(long double x, int *signgamlp);
 * K.C. Ng, August, 1989.
 *
 * We choose [1.5,2.5] to be the primary interval. Our algorithms
 * are mainly derived from
 *
 *
 *                              zeta(2)-1    2    zeta(3)-1    3
 * lgamma(2+s) = s*(1-euler) + --------- * s  -  --------- * s  + ...
 *                                 2                 3
 *
 *
 * Note 1. Since gamma(1+s)=s*gamma(s), hence
 *              lgamma(1+s) = log(s) + lgamma(s), or
 *              lgamma(s) = lgamma(1+s) - log(s).
 *         When s is really tiny (like roundoff), lgamma(1+s) ~ s(1-enler)
 *         Hence lgamma(s) ~ -log(s) for tiny s
 *
 */

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

static long double neg(long double, int *);
static long double poly(long double, const long double *, int);
static long double polytail(long double);
static long double primary(long double);

static const long double
c0 =     0.0L,
ch =     0.5L,
```



```
c1 =     1.0L,
c2 =     2.0L,
c3 =     3.0L,
c4 =     4.0L,
c5 =     5.0L,
c6 =     6.0L,
pi =     3.14159265358979323846264338327950288419 71L,
tiny =   1.0e-40L;

long double
__k_lgammal(long double x, int *signgamlp) {
        long double t,y;
        int i;

    /* purge off +-inf, NaN and negative arguments */
        if(!finitel(x)) return x*x;
        *signgamlp = 1;
        if(signbitl(x)) return(neg(x,signgamlp));

    /* for x < 8.0 */
        if(x<8.0L) {
            y = anintl(x);
            i = (int) y;
            switch(i) {
            case 0:
                if(x<1.0e-40L) return -logl(x); else
                return (primary(x)-log1pl(x))-logl(x);
            case 1:
                return primary(x-y)-logl(x);
            case 2:
                return primary(x-y);
            case 3:
                return primary(x-y)+logl(x-c1);
            case 4:
                return primary(x-y)+logl((x-c1)*(x-c2));
            case 5:
                return primary(x-y)+logl((x-c1)*(x-c2)*(x-c3));
            case 6:
                return primary(x-y)+logl((x-c1)*(x-c2)*(x-c3)*(x-c4));
            case 7:
                return primary(x-y)+logl((x-c1)*(x-c2)*(x-c3)*(x-c4)*(x-c5));
            case 8:
                return primary(x-y)+
                        logl((x-c1)*(x-c2)*(x-c3)*(x-c4)*(x-c5)*(x-c6));
            }
        }

    /* 8.0 <= x < 1.0e40 */
        if (x < 1.0e40L) {
            t = logl(x);
            return x*(t-c1)-(ch*t-polytail(c1/x));
        }

    /* 1.0e40 <= x <= inf */
        return x*(logl(x)-c1);
}

static const long double an1[] = {              /* 20 terms */
  -0.07721566490153286060651209008240243097 41L,
   3.22467033424113218236207583230130289059e-0001L,
  -6.73523010531980951332460538366829964120e-0002L,
   2.05808084277845478790009243292891022629 7e-0002L,
  -7.38555102867398526627305408608110212570 4e-0003L,
   2.89051033074152328575886730440962864872 7e-0003L,
  -1.19275391170326097658141433809626749855 5e-0003L,
   5.09669524743042456283195666285569782403 5e-0004L,
```

```
  -2.23154758453577797892679850208430012 3638e-0004L,
   9.94575127818638467027826803432215794 7635e-0005L,
  -4.49262367366554772664783847412514763 1082e-0005L,
   2.05072128061779681009699315428156116 8706e-0005L,
  -9.43948778561739655209239323404476731 3568e-0006L,
   4.37487290351605151068923417313979315 9340e-0006L,
  -2.03915667641364309104045982577602932 7487e-0006L,
   9.55577718131862147046656354380621152 3634e-0007L,
  -4.46834491970963063755853831348239898 9638e-0007L,
   2.21673808609004578177300447783105944 4178e-0007L,
  -7.47278340341838845586044584254384348 5916e-0008L,
   8.77731793092714992205678213270623892 1648e-0008L,
};

static const long double an2[] = {              /* 20 terms */
  -.07721566490153286060626927236981276 07018L,
   3.22467033424113218263555234906027911 8047e-0001L,
  -6.73523010531980936755564288313399481 8325e-0002L,
   2.05808084277845967688082220276214367 1813e-0002L,
  -7.38555102867282821601134315007784691 8930e-0003L,
   2.89051033076206060739956153690572785 3178e-0003L,
  -1.19275391141962326232818753275975636 8041e-0003L,
   5.09669527863645667825809113453225861 8614e-0004L,
  -2.23154730681753574305297519402289336 9135e-0004L,
   9.94577146163331328274426485398664387 7087e-0005L,
  -4.49250327945897203792687606125748948 1619e-0005L,
   2.05131141681208287549267865136939459 5613e-0005L,
  -9.41577822365955203915850761537462941 165e-0006L,
   4.45242882904514709872293981088650055 919e-0006L,
  -1.83502472798763257988695176065072269 5781e-0006L,
   1.37978308065854500957906071494638146 2565e-0006L,
   2.28263753210977515676973676874840217 5238e-0007L,
   1.00257737551590019136211971812814988 0168e-0006L,
   5.17702879426263831193999110643232200 02463e-0007L,
   3.12794724517484710412242644593783055 5755e-0007L,
};

static const long double an3[] = {              /* 20 terms */
  -.07721566490153282278706464177292206 90875L,
   3.22467033424115669988178895595991525 0365e-0001L,
  -6.73523010531227357137543105974497556 3170e-0002L,
   2.05808084292446458766284607133708380 9005e-0002L,
  -7.38555100867727165472360465395613179 1619e-0003L,
   2.89051053647978208619711027258383317 6602e-0003L,
  -1.19275226207685769274057156780825913 8697e-0003L,
   5.09680077114980528937113515512838070 7889e-0004L,
  -2.23100083668283133550505849240986012 3647e-0004L,
   9.96891217107393680387180396636059527 5047e-0005L,
  -4.41202779327746243544387946167256187 258e-0005L,
   2.28137411354145415106701663299863020 9049e-0005L,
  -4.02836129142862949182469655287954266 830e-0006L,
   1.47069492061951892459895684922653075 0139e-0005L,
   1.38168613761798719797528954558237771 3772e-0005L,
   2.01249353926577772894475998205497044 1601e-0005L,
   1.72391786420896549025156064468193367 5799e-0005L,
   1.20295403524378830013860876542512371 3395e-0005L,
   5.07985188755862309277629657703085093 8146e-0006L,
   1.22065794582415375155513859200660402 6282e-0006L,
};

static const long double an4[] = {              /* 21 terms */
  -.07721566490157322853502618166975403 92371L,
   3.22467033422175206069175134036521222 6097e-0001L,
  -6.73523010744009693977755991488196368 279e-0002L,
   2.05808077891303762690995414161158078 3216e-0002L,
  -7.38555756793150562117048370895055750 6819e-0003L,
```



```
   2.89045983841625432634084428978525488 3436e-0003L,
  -1.19305903620713676287735159696671845 5737e-0003L,
   5.08191470810037283661337135652956893 7869e-0004L,
  -2.28985501613360031313155300598254204 5338e-0004L,
   8.05345453798058587962033105383349851 1491e-0005L,
  -9.57462053210484582124349340585567243 8998e-0005L,
  -9.26908562820710715560144500119631771 5686e-0005L,
  -2.18327677985949046171619634477620822 0180e-0004L,
  -3.13483430559757109645245499973726966 8868e-0004L,
  -3.97387889495193743701830598690139288 8619e-0004L,
  -3.95335241489922279916127556438648805 7119e-0004L,
  -3.13674093220403877936266090062121281 6511e-0004L,
  -1.88450225381963407394613082519607862 7664e-0004L,
  -8.19265579995892685358533254212363137 9301e-0005L,
  -2.29218375001057106289160507428174485 4436e-0005L,
  -3.22398062872971686492772426578140661 4294e-0006L,
};

static const long double ap1[] = {                      /* 19 terms */
  -0.07721566490153286060651209008240242 96961L,
   3.22467033424113218236207583323004795 6465e-0001L,
  -6.73523010531980951332460538296394377 3301e-0002L,
   2.05808084277845478790009212660625237 5465e-0002L,
  -7.38555102867398526627251823136502006 3941e-0003L,
   2.89051033074152328568170457079770736 423e-0003L,
  -1.19275391170326097128530422116599024 4515e-0003L,
   5.09669524743042087869601818883088697 2245e-0004L,
  -2.23154758453565400464763973784152602 5095e-0004L,
   9.94575127813720196063609880585231598 2919e-0005L,
  -4.49262367277760605358791946392904422 6280e-0005L,
   2.05072125870328948760370267075305376 5201e-0005L,
  -9.43948562656561698935275067249900802 1041e-0006L,
   4.37483816240399464513820041935684457 4219e-0006L,
  -2.03897949286255534857706944451002161 496e-0006L,
   9.53676315238226354808698119137888510 2802e-0007L,
  -4.42611121433243404986359523191656401 4913e-0007L,
   1.91114884751294746423463384627028754 6882e-0007L,
  -5.78867394486192303815783908027230351 9671e-0008L,
};

static const long double ap2[] = {                      /* 19 terms */
  -0.07721566490153286060642862444935483 6087L,
   3.22467033424113218227194874426585544 0139e-0001L,
  -6.73523010531980946735612659900505167 6203e-0002L,
   2.05808084277845331571638981521349600 2588e-0002L,
  -7.38555102867365332306411842258009622 2959e-0003L,
   2.89051033073592357208800342484928900 6039e-0003L,
  -1.19275391162995236860618554394579068 8144e-0003L,
   5.09669523980671887536454758704322098 7666e-0004L,
  -2.23154752060061610899186712739208914 4886e-0004L,
   9.94574691389815112061232283305941600 8973e-0005L,
  -4.49259930746197700357022494305458572 9684e-0005L,
   2.05060989188916545359204650565175999 0090e-0005L,
  -9.43532986673419379654051524791716598 8579e-0006L,
   4.36226713852222323624101613658556514 4581e-0006L,
  -2.00855635665324657930049160149751023 0557e-0006L,
   8.96149810338720716110534711804284435 4395e-0007L,
  -3.61418722833021628223569280648834115 7741e-0007L,
   1.13697898824781686050042091501477775 3153e-0007L,
  -2.00053278638719666401928651489978269 1776e-0008L,
};

static const long double ap3[] = {                      /* 19 terms */
  -0.07721566490153285988852147079534885 6446L,
   3.22467033424113173336404861448422844 3077e-0001L,
  -6.73523010531967654166049514525903815 1576e-0002L,
```

```
   2.05808084277597546183776883901544427383 0e-0002L,
  -7.38555102834761572972861806666356660690 6e-0003L,
   2.89051032751795408337903200864308025667 6e-0003L,
  -1.19275388691947072800182113743943088260 3e-0003L,
   5.09669372889893223481490376914657748291 2e-0004L,
  -2.23154005504882766252859401096187425803 7e-0004L,
   9.94544621001864931149161999943883384372 3e-0005L,
  -4.49160820659806451919023624575386769775 0e-0005L,
   2.04793907132227101649806505285374646666 9e-0005L,
  -9.37682404652278600667754103663153679076 2e-0006L,
   4.25932982949814911158227720918915012734 7e-0006L,
  -1.86606477042159426670217628976421287342 8e-0006L,
   7.46206672113757959292812810453495713566 9e-0007L,
  -2.48354621752907773507400713845767872737 1e-0007L,
   5.91516657637816147329932467364914429757 4e-0008L,
  -7.33413964170698896696625233375960470190 5e-0009L,
};

static const long double ap4[] = {                      /* 19 terms */
  -0.07721566490153267855693132526372386736 75L,
   3.22467033424105143500884268572246834482 2e-0001L,
  -6.73523010530283200747943177216094849925 4e-0002L,
   2.05808084255348118364852936096744188991 2e-0002L,
  -7.38555100760290924202470680465987919924 4e-0003L,
   2.89051018247390725393982131224830347120 6e-0003L,
  -1.19275309842785677084789449758682561445 0e-0003L,
   5.09665963641881156806333921420369355080 4e-0004L,
  -2.23142114400435569116619425967500448363 9e-0004L,
   9.94207384234383213275433288188338762513 6e-0005L,
  -4.48380926197320453126325265505070120539 7e-0005L,
   2.03326014261028488831911665493199444717 3e-0005L,
  -9.15353954402664669987052819141044058579 6e-0006L,
   3.98846046992548272589414468869958499797 1e-0006L,
  -1.60969298008702917256795722185082597762 1e-0006L,
   5.63491637724997582539970669449668880348 8e-0007L,
  -1.56006546592951856354908320848259143769 6e-0007L,
   2.96135019386893532552696220901938782158 4e-0008L,
  -2.83460221519536813010464923450503315984 2e-0009L,
};

static long double
primary(long double s) {        /* assume |s|<=0.5 */
        int i;

        i = (int) (8.0L * (s + 0.5L));
        switch(i) {
        case 0: return ch*s+s*poly(s,an4,21);
        case 1: return ch*s+s*poly(s,an3,20);
        case 2: return ch*s+s*poly(s,an2,20);
        case 3: return ch*s+s*poly(s,an1,20);
        case 4: return ch*s+s*poly(s,ap1,19);
        case 5: return ch*s+s*poly(s,ap2,19);
        case 6: return ch*s+s*poly(s,ap3,19);
        case 7: return ch*s+s*poly(s,ap4,19);
        }
        /* NOTREACHED */
    return 0.0L;
}

static long double
poly(long double s, const long double *p, int n) {
        long double y;
        int i;
        y = p[n-1];
        for (i=n-2;i>=0;i--) y = p[i]+s*y;
        return y;
```



```
}

static const long double pt[] = {
   9.18938533204672741780329736405617680466 3e-0001L,
   8.33333333333333333333333333331286969123 e-0002L,
  -2.77777777777777777777777755319479603640 2e-0003L,
   7.93650793650793650792728307143358424817 6e-0004L,
  -5.95238095238095236235104216319263410829 7e-0004L,
   8.41758417508395661774286645578379460131 e-0004L,
  -1.91752691752526365118606641793468567564 9e-0003L,
   6.41025640939520316465929297314229319908 3e-0003L,
  -2.95506532724830330176359451401241843818 8e-0002L,
   1.79644283009906754294599861541189382288 6e-0001L,
  -1.39241346582972374248997431041111866291 9e+0000L,
   1.33998423803726765835265659796049202926 1e+0001L,
  -1.56470765760537366242578590427864572781 3e+0002L,
   2.15632380749921135612781396222306707930 0e+0003L,
  -3.33048642762622318464729983413704130756 9e+0004L,
   5.23553507201188921361136925414012351869 9e+0005L,
  -7.25816098460222071049198857343021259308 0e+0006L,
   7.31652693456968645964143888234032267335 7e+0007L,
  -3.80645027906490054883657178928489671147 3e+0008L,
};

static long double
polytail(long double s) {
        long double t,z;
        int i;
        z = s*s;
        t = pt[18];
        for (i=17;i>=1;i--) t = pt[i]+z*t;
        return pt[0]+s*t;
}

static long double
neg(long double z, int *signgamlp) {
        long double t,p;

     /*
      * written by K.C. Ng,  Feb 2, 1989.
      *
      * Since
      *         -z*G(-z)*G(z) = pi/sin(pi*z),
      * we have
      *         G(-z) = -pi/(sin(pi*z)*G(z)*z)
      *               =  pi/(sin(pi*(-z))*G(z)*z)
      * Algorithm
      *         z = |z|
      *         t = sinpi(z); ...note that when z>2**112, z is an int
      *         and hence t=0.
      *
      *         if(t==0.0) return 1.0/0.0;
      *         if(t< 0.0) *signgamlp = -1; else t= -t;
      *         if(z<1.0e-40)   ...tiny z
      *             return -log(z);
      *         else
      *             return log(pi/(t*z))-lgamma(z);
      *
      */

        t = sinpil(z);                  /* t := sin(pi*z) */
        if (t==c0)                      /* return   1.0/0.0 =  +INF */
            return c1/c0;

        z = -z;
        if(z<=tiny)
```

```
392             p = -logl(z);
393         else
394             p = logl(pi/(fabsl(t)*z))-__k_lgammal(z,signgamlp);
395         if(t<c0) *signgamlp = -1;
396         return p;
397 }
```

****
1189 Sat May 10 12:08:57 2014
new/usr/src/lib/libm/common/LD/__poly_libmq.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#include "libm.h"
#include "libm_synonyms.h"

long double __poly_libmq(x,n,p)
long double x,p[];
int n;
{
        long double t; int i;
        t = p[n-1];
        for(i=n-2;i>=0;i--) t = p[i] + x*t;
        return t;
}
```

```
**********************************************************
    1935 Sat May 10 12:08:57 2014
new/usr/src/lib/libm/common/LD/__rem_pio2l.c
minor changes
patch06 - libm: fixed compilation issues after updates
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/* __rem_pio2l(x,y)
 *
 * return the remainder of x rem pi/2 in y[0]+y[1]
 * by calling __rem_pio2m
 */

#include "libm.h"
#include "longdouble.h"

extern const int _TBL_ipio2l_inf[];

static const long double
    two24l = 16777216.0L,
    pio4   = 0.7853981633974483096156608458198757210495L;

int
__rem_pio2l(long double x, long double *y)
{
        long double     z, w;
        double          t[3], v[5];
        int             e0, i, nx, n, sign;

        sign = signbitl(x);
        z = fabsl(x);
        if (z <= pio4) {
                y[0] = x;
                y[1] = 0;
                return (0);
        }
```



```
        e0 = ilogbl(z) - 23;
        z = scalbnl(z, -e0);
        for (i = 0; i < 3; i++) {
                t[i] = (double)((int)(z));
                z = (z - (long double)t[i]) * two24l;
        }
        nx = 3;
        while (t[nx-1] == 0.0)
                nx--;   /* omit trailing zeros */
        n = __rem_pio2m(t, v, e0, nx, 2, _TBL_ipio2l_inf);
        z = (long double)v[1];
        w = (long double)v[0];
        y[0] = z + w;
        y[1] = z - (y[0] - w);
        if (sign == 1) {
                y[0] = -y[0];
                y[1] = -y[1];
                return (-n);
        }
        return (n);
}
```

```
**********************************************************
    4822 Sat May 10 12:08:58 2014
new/usr/src/lib/libm/common/LD/__sincosl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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 */

/* INDENT OFF */
/*
 * long double __k_sincos( long double x, long double y, long double *c )
 * kernel sincosl function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 * return sinl(x) with *c = cosl(x)
 *
 * Table look up algorithm
 *      see __k_sinl() and __k_cosl()
 */

#include "libm.h"

#include <sys/isa_defs.h>

extern const long double _TBL_sinl_hi[], _TBL_sinl_lo[], _TBL_cosl_hi[],
        _TBL_cosl_lo[];
static const long double
one     = 1.0,
/*
 * |sin(x) - (x+pp1*x^3+...+pp5*x^11)| <= 2^-122.32 for |x|<1/64
 */
pp1     = -1.6666666666666666666666666586782940810e-0001L,
pp2     =  8.3333333333333333333330037236609293175 40e-0003L,
pp3     = -1.9841269841269840760459034837783378 04470e-0004L,
pp4     =  2.7557319223619066413197231062109009 49413e-0006L,
pp5     = -2.5051983985709470190939984691350120 57673e-0008L,
/*
 * |(sin(x) - (x+p1*x^3+...+p8*x^17)|
 * |------------------------------ | <= 2^-116.17 for |x|<0.1953125
```



```
 * |                x             |
 */
p1      =  -1.66666666666666666666666666666211262297e-0001L,
p2      =   8.33333333333333333333333330149787690854 1e-0003L,
p3      =  -1.98412698412698412698404130288118062192 2e-0004L,
p4      =   2.75573192239858906410058735130726962109 3e-0006L,
p5      =  -2.50521083854416312937890695376559539387 3e-0008L,
p6      =   1.60590438364324437505099824377853407427 3e-0010L,
p7      =  -7.64716272280068551690145611427082462269 9e-0013L,
p8      =   2.81004642866190296172542884106884446260 3e-0015L,
/*
 *
 * |cos(x) - (1+qq1*x^2+...+ qq5*x^10)| <= 2^-123.84 for |x|<=1/128
 */
qq1     =  -4.99999999999999999999999999378373641e-0001L,
qq2     =   4.16666666666666666666654783993277031 30e-0002L,
qq3     =  -1.38888888888888888805821123061805161 3494e-0003L,
qq4     =   2.48015873015610537777158565890530311 1866e-0005L,
qq5     =  -2.75572809976252632573648837669515700 8736e-0007L,
/*
 *
 * |cos(x) - (1+q1*x^2+...+ q8*x^16)| <= 2^-117.11 for |x|<= 0.15625
 */
q1      =  -4.99999999999999999999999999999756416975e-0001L,
q2      =   4.16666666666666666666666664006066577258e-0002L,
q3      =  -1.38888888888888888888887770036393716963 7e-0003L,
q4      =   2.48015873015873015849446846303181408355 9e-0005L,
q5      =  -2.75573192239858627632281925035600554287 1e-0007L,
q6      =   2.08767569876742426144195976072985401785 5e-0009L,
q7      =  -1.14707448123966208907245212901079077476 1e-0011L,
q8      =   4.77776164739965159973066342226353103478 2e-0014L;
/* INDENT ON */
long double
__k_sincosl(long double x, long double y, long double *c) {
        long double a1, a2, t, t1, t2, z, w;
        int *pt = (int *) &t, *px = (int *) &x;
        int i, j, hx, ix;

        t = 1.0;
#if defined(__i386) || defined(__amd64)
        XTOI(px, hx);
#else
        hx = px[0];
#endif
        ix = hx & 0x7fffffff;
        if (ix < 0x3ffc4000) {
                if (ix < 0x3fc60000)
                        if (((int) x) == 0) {
                                *c = one;
                                return (x);
                        }       /* generate inexact */
                z = x * x;

                if (ix < 0x3ff80000) {
                        *c = one + z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 +
                                z * qq5))));
                        t = z * (p1 + z * (p2 + z * (p3 + z * (p4 + z * (p5 +
                                z * p6)))));
                } else {
                        *c = one + z * (q1 + z * (q2 + z * (q3 + z * (q4 + z *
                                (q5 + z * (q6 + z * (q7 + z * q8)))))));
                        t = z * (p1 + z * (p2 + z * (p3 + z * (p4 + z * (p5 +
                                z * (p6 + z * (p7 + z * p8)))))));
                }

                t = y + x * t;
```

```
127                 return (x + t);
128         }
129         j = (ix + 0x400) & 0x7ffff800;
130         i = (j - 0x3ffc4000) >> 11;
131 #if defined(__i386) || defined(__amd64)
132         ITOX(j, pt);
133 #else
134         pt[0] = j;
135 #endif
136         if (hx > 0)
137                 x = y - (t - x);
138         else
139                 x = (-y) - (t + x);
140         a1 = _TBL_sinl_hi[i];
141         z = x * x;
142         t = z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5))));
143         w = x * (one + z * (pp1 + z * (pp2 + z * (pp3 + z * (pp4 + z *
144                 pp5)))));
145         a2 = _TBL_cosl_hi[i];
146         t2 = _TBL_cosl_lo[i] - (a1 * w - a2 * t);
147         *c = a2 + t2;
148         t1 = a2 * w + a1 * t;
149         t1 += _TBL_sinl_lo[i];
150         if (hx < 0)
151                 return (-a1 - t1);
152         else
153                 return (a1 + t1);
154 }
```

```
**********************************************************
    4646 Sat May 10 12:08:58 2014
new/usr/src/lib/libm/common/LD/__sinl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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/* INDENT OFF */
/*
 * __k_sinl( long double x;  long double y )
 * kernel sin function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 *
 * Table look up algorithm
 *      1. by sin(-x) = -sin(x), need only to consider positive x
 *      2. if x < 25/128 = [0x3ffc9000,0,0,0] = 0.1953125 , then
 *           if x < 2^-57 (hx < 0x3fc60000,0,0,0), return x (inexact if x!= 0)
 *           z = x*x;
 *           if x <= 1/64 = 2**-6
 *              sin(x) = x + (y+(x*z)*(p1 + z*p2))
 *           else
 *              sin(x) = x + (y+(x*z)*(p1 + z*(p2 + z*(p3 + z*p4))))
 *      3. else
 *              ht = (hx + 0x400)&0x7ffff800    (round x to a break point t)
 *              lt = 0
 *              i  = (hy-0x3ffc4000)>>11;       (i<=64)
 *              x' = (x - t)+y                  (|x'| ~<= 2^-7
 *         By
 *              sin(t+x')
 *                = sin(t)cos(x')+cos(t)sin(x')
 *                = sin(t)(1+z*(qq1+z*qq2))+[cos(t)]*x*(1+z*(pp1+z*pp2))
 *                = sin(t) + [sin(t)]*(z*(qq1+z*qq2))+
 *                                [cos(t)]*x*(1+z*(pp1+z*pp2))
 *
 *         Thus,
 *              let a= _TBL_sin_hi[i], b = _TBL_sin_lo[i], c= _TBL_cos_hi[i],
 *              x = (x-t)+y
```



```
 *              z = x*x;
 *              sin(t+x) = a+(b+ ((c*x)*(1+z*(pp1+z*pp2))+a*(z*(qq1+z*qq2)))
 */

#include "libm.h"

#include <sys/isa_defs.h>

extern const long double _TBL_sinl_hi[], _TBL_sinl_lo[], _TBL_cosl_hi[];
static const long double
one     = 1.0,
/*
 * |sin(x) - (x+pp1*x^3+...+ pp5*x^11)| <= 2^-122.32 for |x|<1/64
 */
pp1     = -1.66666666666666666666666666586782940810e-0001L,
pp2     =  8.33333333333333333333300372360929317540e-0003L,
pp3     = -1.98412698412698407604590348377837804470e-0004L,
pp4     =  2.75573192236190664131972310621090094941 3e-0006L,
pp5     = -2.50519839857094701909399846913501205767 3e-0008L,
/*
 * |(sin(x) - (x+p1*x^3+...+p8*x^17)|
 * |------------------------------- | <= 2^-116.17 for |x|<0.1953125
 * |                x               |
 */
p1      = -1.66666666666666666666666666666211262297e-0001L,
p2      =  8.33333333333333333333333330149787690854 1e-0003L,
p3      = -1.98412698412698412698404130288118062192 2e-0004L,
p4      =  2.75573192239858906410058735130726962109 3e-0006L,
p5      = -2.50521083854416312937890695376559539387 3e-0008L,
p6      =  1.60590438364324437505099824377853407427 3e-0010L,
p7      = -7.64716272280068551690145611427082462269 9e-0013L,
p8      =  2.81004642866190296172542884106884446260 3e-0015L,
/*
 *                    2           10        -123.84
 * |cos(x) - (1+qq1*x +...+ qq5*x  )| <= 2         for |x|<=1/128
 */
qq1     = -4.99999999999999999999999999999378373641e-0001L,
qq2     =  4.16666666666666666666665478399327703130e-0002L,
qq3     = -1.38888888888888888805821123061805161349 4e-0003L,
qq4     =  2.48015873015610537777158565890530311186 6e-0005L,
qq5     = -2.75572809976252632573648837669515700873 6e-0007L;
/* INDENT ON */
long double
__k_sinl(long double x, long double y) {
        long double a, t, z, w;
        int *pt = (int *) &t, *px = (int *) &x;
        int i, j, hx, ix;

        t = 1.0L;
#if defined(__i386) || defined(__amd64)
        XTOI(px, hx);
#else
        hx = px[0];
#endif
        ix = hx & 0x7fffffff;
        if (ix < 0x3ffc9000) {
                if (ix < 0x3fc60000)
                        if (((int) x) == 0)
                                return (x);     /* generate inexact */
                z = x * x;
                t = z * (p1 + z * (p2 + z * (p3 + z * (p4 + z * (p5 + z *
                        (p6 + z * (p7 + z * p8)))))));
                t = y + x * t;
                return (x + t);
        }
        j = (ix + 0x400) & 0x7ffff800;
```

```
127         i = (j - 0x3ffc4000) >> 11;
128 #if defined(__i386) || defined(__amd64)
129         ITOX(j, pt);
130 #else
131         pt[0] = j;
132 #endif
133         if (hx > 0)
134                 x = y - (t - x);
135         else
136                 x = (-y) - (t + x);
137         a = _TBL_sinl_hi[i];
138         z = x * x;
139         t = z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5))));
140         w = x * (one + z * (pp1 + z * (pp2 + z * (pp3 + z * (pp4 + z *
141                 pp5)))));
142         t = _TBL_cosl_hi[i] * w + a * t;
143         t += _TBL_sinl_lo[i];
144         if (hx < 0)
145                 return (-a - t);
146         else
147                 return (a + t);
148 }
```

```
**********************************************************
    5472 Sat May 10 12:08:58 2014
new/usr/src/lib/libm/common/LD/__tanl.c
patch06 - libm: fixed compilation issues after updates
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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/* INDENT OFF */
/*
 * __k_tanl( long double x;  long double y; int k )
 * kernel tan/cotan function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 * Input k indicate -- tan if k=0; else -1/tan
 *
 * Table look up algorithm
 *      1. by tan(-x) = -tan(x), need only to consider positive x
 *      2. if x < 5/32 = [0x3ffc4000, 0] = 0.15625 , then
 *           if x < 2^-57 (hx < 0x3fc40000 0), set w=x with inexact if x!= 0
 *           else
 *              z = x*x;
 *              w = x + (y+(x*z)*(t1+z*(t2+z*(t3+z*(t4+z*(t5+z*t6))))))
 *         return (k == 0 ? w : 1/w);
 *      3. else
 *              ht = (hx + 0x400)&0x7ffff800    (round x to a break point t)
 *              lt = 0
 *              i  = (hy-0x3ffc4000)>>11;       (i<=64)
 *              x' = (x - t)+y                  (|x'| ~<= 2^-7)
 *         By
 *              tan(t+x')
 *                = (tan(t)+tan(x'))/(1-tan(x')tan(t))
 *         We have
 *                              sin(x')+tan(t)*(tan(t)*sin(x'))
 *                = tan(t) + ------------------------------    for k=0
 *                                 cos(x') - tan(t)*sin(x')
 *
 *                             cos(x') - tan(t)*sin(x')
```



```
 *                = - ------------------------------------    for k=1
 *                       tan(t) + tan(t)*(cos(x')-1) + sin(x')
 *
 *
 *         where        tan(t) is from the table,
 *                      sin(x') = x + pp1*x^3 + ...+ pp5*x^11
 *                      cos(x') = 1 + qq1*x^2 + ...+ qq5*x^10
 */

#include "libm.h"

#include <sys/isa_defs.h>

extern const long double _TBL_tanl_hi[], _TBL_tanl_lo[];
static const long double
one     = 1.0,
/*
 * |sin(x) - (x+pp1*x^3+...+ pp5*x^11)| <= 2^-122.32 for |x|<1/64
 */
pp1     = -1.66666666666666666666666666586782940810e-0001L,
pp2     =  8.33333333333333333333003723660929317540e-0003L,
pp3     = -1.98412698412698407604590348377833804470e-0004L,
pp4     =  2.75573192236190664131972310621090094941 3e-0006L,
pp5     = -2.50519839857094701909399846913501205767 3e-0008L,
/*
 *                    2           10         -123.84
 * |cos(x) - (1+qq1*x +...+ qq5*x  )| <= 2         for |x|<=1/128
 */
qq1     = -4.99999999999999999999999999999378373641e-0001L,
qq2     =  4.16666666666666666666666547839932770313 0e-0002L,
qq3     = -1.38888888888888888880582112306180516134 94e-0003L,
qq4     =  2.48015873015610537771585658905303111866e-0005L,
qq5     = -2.75572809976252632573648837669515700873 6e-0007L,
/*
 * |tan(x) - (x+t1*x^3+...+t6*x^13)|
 * |------------------------------ | <= 2^-59.73 for |x|<0.15625
 * |                x              |
 */
t1      =  3.33333333333333333333333333333423342490e-0001L,
t2      =  1.33333333333333333333333309383744537e-0001L,
t3      =  5.39682539682539682539682790631868266225 0e-0002L,
t4      =  2.18694885361552028218557697699441848691 1e-0002L,
t5      =  8.86323552990219657335455451999115293624 6e-0003L,
t6      =  3.59212803657248006465219142754399487879 0e-0003L,
t7      =  1.45583438705145525785683380758190130547 4e-0003L,
t8      =  5.90027440931859985782998325620172558747 7e-0004L,
t9      =  2.39129115211726518150111696190112236293 7e-0004L,
t10     =  9.69153316938272974239402417319498188237 5e-0005L,
t11     =  3.92799473318641560322817818422578085995 1e-0005L,
t12     =  1.58830001884832382422764006488334101288e-0005L,
t13     =  6.91627122339680831116620228513172223172 3e-0006L;
/* INDENT ON */
long double
__k_tanl(long double x, long double y, int k) {
        long double a, t, z, w = 0.0, s, c;
        int *pt = (int *) &t, *px = (int *) &x;
        int i, j, hx, ix;

        t = 1.0;
#if defined(__i386) || defined(__amd64)
        XTOI(px, hx);
#else
        hx = px[0];
#endif
        ix = hx & 0x7fffffff;
        if (ix < 0x3ffc4000) {
```

```
126                 if (ix < 0x3fc60000) {
127                         if ((i = (int) x) == 0) /* generate inexact */
128                                 w = x;
129                 } else {
130                         z = x * x;
131                         if (ix < 0x3ff30000)    /* 2**-12 */
132                                 t = z * (t1 + z * (t2 + z * (t3 + z * t4)));
133                         else
134                                 t = z * (t1 + z * (t2 + z * (t3 + z * (t4 +
135                                         z * (t5 + z * (t6 + z * (t7 + z *
136                                         (t8 + z * (t9 + z * (t10 + z * (t11 +
137                                         z * (t12 + z * t13))))))))))));
138                         t = y + x * t;
139                         w = x + t;
140                 }
141                 return (k == 0 ? w : -one / w);
142         }
143         j = (ix + 0x400) & 0x7ffff800;
144         i = (j - 0x3ffc4000) >> 11;
145 #if defined(__i386) || defined(__amd64)
146         ITOX(j, pt);
147 #else
148         pt[0] = j;
149 #endif
150         if (hx > 0)
151                 x = y - (t - x);
152         else
153                 x = (-y) - (t + x);
154         a = _TBL_tanl_hi[i];
155         z = x * x;
156         /* cos(x)-1 */
157         t = z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5))));
158         /* sin(x) */
159         s = x * (one + z * (pp1 + z * (pp2 + z * (pp3 + z * (pp4 + z *
160                 pp5)))));
161         if (k == 0) {
162                 w = a * s;
163                 t = _TBL_tanl_lo[i] + (s + a * w) / (one - (w - t));
164                 return (hx < 0 ? -a - t : a + t);
165         } else {
166                 w = s + a * t;
167                 c = w + _TBL_tanl_lo[i];
168                 z = (one - (a * s - t));
169                 return (hx >= 0 ? z / (-a - c) : z / (a + c));
170         }
171 }
```

```
**********************************************************
    1498 Sat May 10 12:08:58 2014
new/usr/src/lib/libm/common/LD/acoshl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak acoshl = __acoshl
#endif

#include "libm.h"

static const long double
        zero    = 0.0L,
        ln2     = 6.93147180559945309417232121458176568075e-0001L,
        one     = 1.0L,
        big     = 1.e+20L;

long double
acoshl(long double x) {
        long double t;

        if (isnanl(x))
                return (x + x);
        else if (x > big)
                return (logl(x) + ln2);
        else if (x > one) {
                t = sqrtl(x - one);
                return (log1pl(t * (t + sqrtl(x + one))));
        } else if (x == one)
                return (zero);
        else
                return ((x - x) / (x - x));
}
```

```
**********************************************************
    1617 Sat May 10 12:08:58 2014
new/usr/src/lib/libm/common/LD/asinhl.c
asinhl.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak asinhl = __asinhl
#endif

#include "libm.h"

static const long double
        ln2     = 6.93147180559945309417232121458176568075e-0001L,
        one     = 1.0L,
        big     = 1.0e+20L,
        tiny    = 1.0e-20L;

long double
asinhl(long double x) {
        long double t, w;
        volatile long double dummy;

        w = fabsl(x);
        if (isnanl(x))
                return (x + x); /* x is NaN */
        if (w < tiny) {
#ifndef lint
                dummy = x + big;        /* inexact if x != 0 */
#endif
                return (x);     /* tiny x */
        } else if (w < big) {
                t = one / w;
                return (copysignl(log1pl(w + w / (t + sqrtl(one + t * t))), x));
        } else
                return (copysignl(logl(w) + ln2, x));
```



```
}
```

```
**********************************************************
    1384 Sat May 10 12:08:58 2014
new/usr/src/lib/libm/common/LD/atan2pil.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atan2pil = __atan2pil

#include "libm.h"
#include "libm_synonyms.h"

#define GENERIC long double
#define ATAN2PI atan2pil
#define ATAN2   atan2l

/* ATAN2PI(y,x)
 *
 *      ATAN2PI(y,x) = ATAN2(y,x)/pi
 */

extern GENERIC  ATAN2();

static GENERIC
invpi = (GENERIC) 3.183098861837906715377675267450287240689e-0001L;

GENERIC ATAN2PI(y,x)
GENERIC y,x;
{
        return ATAN2(y,x)*invpi;
}
```

```
**********************************************************
    2006 Sat May 10 12:08:58 2014
new/usr/src/lib/libm/common/LD/atanhl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atanhl = __atanhl

#include "libm.h"
#include "libm_synonyms.h"

#define GENERIC long double
#define ATANH   atanhl

/* ATANH(x)
 *                    1             2x                          x
 *      ATANH(x) = --- * LOG(1 + -------) = 0.5 * LOG1P(2 * --------)
 *                    2           1 - x                       1 - x
 * Note: to guarantee ATANH(-x) = -ATANH(x), we use
 *                  sign(x)              |x|
 *      ATANH(x) = ------- * LOG1P(2*-------).
 *                    2               1 - |x|
 *
 * Special cases:
 *      ATANH(x) is NaN if |x| > 1 with signal;
 *      ATANH(NaN) is that NaN with no signal;
 *      ATANH(+-1) is +-INF with signal.
 *
 */

#define FABS    fabsl
#define LOG1P   log1pl
#define COPYSIGN        copysignl


extern GENERIC  FABS(),LOG1P(),COPYSIGN();

static GENERIC
```



```
zero    = (GENERIC) 0.0,
half    = (GENERIC) 0.5,
one     = (GENERIC) 1.0;

GENERIC ATANH(x)
GENERIC x;
{
        GENERIC t;
        t = FABS(x);
        if(t==one) return x/zero;
        t = t/(one-t);
        return COPYSIGN(half,x)*LOG1P(t+t);
}
```

```
**********************************************************
    1779 Sat May 10 12:08:58 2014
new/usr/src/lib/libm/common/LD/cbrtl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak cbrtl = __cbrtl
#endif

#include "libm.h"
#include "longdouble.h"

static const double d_one = 1.0;

long double
cbrtl(long double x) {
        long double s, t, r, w, y;
        double dx, dy;
        int *py = (int *) &dy;
        int n, m, m3, n0, sx;

        if (!finitel(x))
                return (x + x);
        if (iszerol(x))
                return (x);
        n0 = 0;
        if (*((int *) &d_one) == 0)
                n0 = 1;
        sx = signbitl(x);
        x = fabsl(x);
        n = ilogbl(x);
        m = n / 3;
        m3 = m + m + m;
        y = scalbnl(x, -m3);
        dx = (double) y;
        dy = cbrt(dx);
```



```
        py[1 - n0] += 2;
        if (py[1 - n0] == 0)
                py[n0] += 1;

        /* one step newton iteration to 113 bits with error < 0.667ulps */
        t = (long double) dy;
        t = scalbnl(t, m);
        s = t * t;
        r = x / s;
        w = t + t;
        r = (r - t) / (w + r);
        t += t * r;

        return (sx == 0 ? t : -t);
}
```

```
**********************************************************
    2815 Sat May 10 12:08:58 2014
new/usr/src/lib/libm/common/LD/coshl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak coshl = __coshl
#endif

#include "libm.h"
#include "longdouble.h"

/*
 * COSH(X)
 * RETURN THE HYPERBOLIC COSINE OF X
 *
 * Method :
 *      1. Replace x by |x| (COSH(x) = COSH(-x)).
 *      2.
 *                                                      [ EXP(x) - 1 ]^2
 *          0       <= x <= 0.3465  :  COSH(x) := 1 + -------------------
 *                                                         2*EXP(x)
 *
 *                                                EXP(x) +  1/EXP(x)
 *          0.3465  <= x <= thresh  :  COSH(x) := ------------------
 *                                                    2
 *          thresh  <= x <= lnovft  :  COSH(x) := EXP(x)/2
 *          lnovft  <= x <  INF     :  COSH(x) := SCALBN(EXP(x-MEP1*ln2),ME)
 *
 *
 * here
 *      0.3465          a number that is near one half of ln2.
 *      thresh          a number such that
 *                              EXP(thresh)+EXP(-thresh)=EXP(thresh)
 *      lnovft          logarithm of the overflow threshold
 *                      = MEP1*ln2 chopped to machine precision.
```



```
 *      ME              maximum exponent
 *      MEP1            maximum exponent plus 1
 *
 * Special cases:
 *      COSH(x) is |x| if x is +INF, -INF, or NaN.
 *      only COSH(0)=1 is exact for finite x.
 */

static const long double C[] = {
        0.5L,
        1.0L,
        0.3465L,
        45.0L,
        1.13565234062941439487914 9e+04L,
        7.00444768624254908785898 5e-16L,
        2.71050543121376108501863 2e-20L,               /* 2^-65 */
};

#define half    C[0]
#define one     C[1]
#define thr1    C[2]
#define thr2    C[3]
#define lnovft  C[4]
#define lnovlo  C[5]
#define tinyl   C[6]

long double
coshl(long double x) {
        long double w, t;

        w = fabsl(x);
        if (!finitel(w))
                return (w + w); /* x is INF or NaN */
        if (w < thr1) {
                if (w < tinyl)
                        return (one + w);       /* inexact+directed rounding */
                t = expm1l(w);
                w = one + t;
                w = one + (t * t) / (w + w);
                return (w);
        }
        if (w < thr2) {
                t = expl(w);
                return (half * (t + one / t));
        }
        if (w <= lnovft)
                return (half * expl(w));
        return (scalbnl(expl((w - lnovft) - lnovlo), 16383));
}
```

```
**********************************************************
    2816 Sat May 10 12:08:59 2014
new/usr/src/lib/libm/common/LD/cosl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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 */

#pragma weak cosl = __cosl

/* INDENT OFF */
/* cosl(x)
 * Table look-up algorithm by K.C. Ng, November, 1989.
 *
 * kernel function:
 *      __k_sinl        ... sin function on [-pi/4,pi/4]
 *      __k_cosl        ... cos function on [-pi/4,pi/4]
 *      __rem_pio2l     ... argument reduction routine
 *
 * Method.
 *      Let S and C denote the sin and cos respectively on [-PI/4, +PI/4].
 *      1. Assume the argument x is reduced to y1+y2 = x-k*pi/2 in
 *         [-pi/2 , +pi/2], and let n = k mod 4.
 *      2. Let S=S(y1+y2), C=C(y1+y2). Depending on n, we have
 *
 *          n        sin(x)      cos(x)        tan(x)
 *     ----------------------------------------------------------
 *          0          S           C             S/C
 *          1          C          -S            -C/S
 *          2         -S          -C             S/C
 *          3         -C           S            -C/S
 *     ----------------------------------------------------------
 *
 * Special cases:
 *      Let trig be any of sin, cos, or tan.
 *      trig(+-INF)  is NaN, with signals;
 *      trig(NaN)    is that NaN;
 *
 * Accuracy:
```



```
 *      computer TRIG(x) returns trig(x) nearly rounded.
 */
/* INDENT ON */

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

#include <sys/isa_defs.h>

long double
cosl(long double x) {
        long double y[2], z = 0.0L;
        int n, ix;
        int *px = (int *) &x;

        /* trig(Inf or NaN) is NaN */
        if (!finitel(x))
                return x - x;

        /* High word of x. */
#if defined(__i386) || defined(__amd64)
        XTOI(px, ix);
#else
        ix = px[0];
#endif

        /* |x| ~< pi/4 */
        ix &= 0x7fffffff;
        if (ix <= 0x3ffe9220)
                return __k_cosl(x, z);

        /* argument reduction needed */
        else {
                n = __rem_pio2l(x, y);
                switch (n & 3) {
                case 0:
                        return __k_cosl(y[0], y[1]);
                case 1:
                        return -__k_sinl(y[0], y[1]);
                case 2:
                        return -__k_cosl(y[0], y[1]);
                case 3:
                        return __k_sinl(y[0], y[1]);
                /* NOTREACHED */
                }
        }
    return 0.0L;
}
```

```
**********************************************************
   12821 Sat May 10 12:08:59 2014
new/usr/src/lib/libm/common/LD/erfl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/* long double function erf,erfc (long double x)
 * K.C. Ng, September, 1989.
 *                           x
 *                    2      |\
 *     erf(x)  =  ---------  | exp(-t*t)dt
 *                 sqrt(pi) \|
 *                           0
 *
 *     erfc(x) =  1-erf(x)
 *
 * method:
 *      Since erf(-x) = -erf(x), we assume x>=0.
 *      For x near 0, we have the expansion
 *
 *          erf(x) = (2/sqrt(pi))*(x - x^3/3 + x^5/10 - x^7/42 + ....).
 *
 *      Since 2/sqrt(pi) = 1.128379167095512573896158903121545171688,
 *      we use x + x*P(x^2) to approximate erf(x). This formula will
 *      guarantee the error less than one ulp where x is not too far
 *      away from 0. We note that erf(x)=x at x = 0.6174..... After
 *      some experiment, we choose the following approximation on
 *      interval [0,0.84375].
 *
 *      For x in [0,0.84375]
 *                 2               2        4              40
 *         P =  P(x ) = (p0 + p1 * x + p2 * x + ... + p20 * x  )
 *
 *         erf(x)  = x + x*P
 *         erfc(x) = 1 - erf(x)           if x<=0.25
 *                 = 0.5 + ((0.5-x)-x*P)  if x in [0.25,0.84375]
 *      precision: |P(x^2)-(erf(x)-x)/x| <= 2**-122.50
 *
```



```
 *      For x in [0.84375,1.25], let s = x - 1, and
 *      c = 0.84506291151 rounded to single (24 bits)
 *         erf(x)  = c  + P1(s)/Q1(s)
 *         erfc(x) = (1-c)  - P1(s)/Q1(s)
 *      precision: |P1/Q1 - (erf(x)-c)| <= 2**-118.41
 *
 *
 *      For x in [1.25,1.75], let s = x - 1.5, and
 *      c = 0.95478588343 rounded to single (24 bits)
 *         erf(x)  = c  + P2(s)/Q2(s)
 *         erfc(x) = (1-c)  - P2(s)/Q2(s)
 *      precision: |P1/Q1 - (erf(x)-c)| <= 2**-123.83
 *
 *
 *      For x in [1.75,16/3]
 *         erfc(x) = exp(-x*x)*(1/x)*R1(1/x)/S1(1/x)
 *         erf(x)  = 1 - erfc(x)
 *      precision: absolute error of R1/S1 is bounded by 2**-124.03
 *
 *      For x in [16/3,107]
 *         erfc(x) = exp(-x*x)*(1/x)*R2(1/x)/S2(1/x)
 *         erf(x)  = 1 - erfc(x) (if x>=9 simple return erf(x)=1 with inexact)
 *      precision: absolute error of R2/S2 is bounded by 2**-120.07
 *
 *      Else if inf > x >= 107
 *         erf(x)  = 1 with inexact
 *         erfc(x) = 0 with underflow
 *
 *      Special case:
 *         erf(inf)  = 1
 *         erfc(inf) = 0
 */

#pragma weak erfl = __erfl
#pragma weak erfcl = __erfcl

#include "libm.h"
#include "longdouble.h"

static long double
tiny        = 1e-40L,
nearunfl    = 1e-4000L,
half        = 0.5L,
one         = 1.0L,
onehalf     = 1.5L,
L16_3       = 16.0L/3.0L;
/*
 * Coefficients for even polynomial P for erf(x)=x+x*P(x^2) on [0,0.84375]
 */
static long double P[] = {      /* 21 coeffs */
   1.28379167095512573896158903121545171556e-0001L,
  -3.76126389031837524632052967707181559460 3e-0001L,
   1.12837916709551257389615890312120589913 5e-0001L,
  -2.68661706451312517594323548334462504609 2e-0002L,
   5.22397762544218784211184665298045456838 9e-0003L,
  -8.54832702345085283254662627108386272435 8e-0004L,
   1.20553329817896642510216471590223197667 2e-0004L,
  -1.49256035840625097674944905027897838996 e-0005L,
   1.64621143658892473360464884917293669202 4e-0006L,
  -1.63658446912349197681583470479973351498 7e-0007L,
   1.48071928158789744530252900714477073930 5e-0008L,
  -1.22905553017078284304646798646472204717 5e-0009L,
   9.42275906432030735755395494576065434163 3e-0011L,
  -6.71136684665343903616210510499143338092 6e-0012L,
   4.46322409034189316510027538069384311624 0e-0013L,
  -2.78351345258265824542263566255977916231 2e-0014L,
```

```
   1.6342274125869601952513468788863754661546e-0015L,
  -9.0607826728895777227657114556231178027795e-0017L,
   4.7413418012662468734121592138936136023354e-0018L,
  -2.2724175964978261883748466365343173812203e-0019L,
   8.6690887337160684624968356589285669209330e-0021L,
};

/*
 * Rational erf(x) = ((float)0.84506291151) + P1(x-1)/Q1(x-1) on [0.84375,1.25]
 */
static long double C1   = (long double)((float)0.84506291151);
static long double P1[] = {     /*  12 top coeffs */
  -2.362118560752659955654364917390741930316e-0003L,
   4.129623379624420034078926610650759979146e-0001L,
  -3.973857505403547283109417923182669976904e-0002L,
   4.357503184084022439763567513078036755183e-0002L,
   8.015593623388421371247676683754171456950e-0002L,
  -1.034459310403352486685467221776778474602e-0002L,
   5.671850295381046679675355719017720821383e-0003L,
   1.219262563232763998351452194968781174318e-0003L,
   5.390833481581033423020320732401065475098e-0004L,
  -1.978853912815115495053119023517805528300e-0004L,
   6.184234513953600118335017885706420552487e-0005L,
  -5.331802711697810861017518515816271808286e-0006L,
};
static long double Q1[] = {     /*  12 bottom coeffs with leading 1.0 hidden */
   9.081506296064882195280178373107623196655e-0001L,
   6.821049531968204097604392183650687642520e-0001L,
   4.067869178233539502315055970743271822838e-0001L,
   1.702332233546316765818144723063881095577e-0001L,
   7.498098377690553934266423088708614219356e-0002L,
   2.050154396918178697056927234366372760310e-0002L,
   7.012988534031999899054782333851905939379e-0003L,
   1.149904787014400354649843451234570731076e-0003L,
   3.185620255011299476196039491205159718620e-0004L,
   1.273405072153008775426376193374105840517e-0005L,
   4.753866999959432971956781228148402971454e-0006L,
  -1.002287602111660026053981728549540200683e-0006L,
};
/*
 * Rational erf(x) = ((float)0.95478588343) + P2(x-1.5)/Q2(x-1.5)
 * on [1.25,1.75]
 */
static long double C2   = (long double)((float)0.95478588343);
static long double P2[] = {     /*  12 top coeffs */
   1.131926304864446730135126164594785863512e-0002L,
   1.273617996967754151544330055186210322832e-0001L,
  -8.169980734667512519897816907190281143423e-0002L,
   9.512267486090321197833634271787944271746e-0002L,
  -2.394251569804872160005274999735914368170e-0002L,
   1.108768660227528667525252333184520222905e-0002L,
   3.527435492933902414662043314373277494221e-0004L,
   4.946116273341953463584319006669474625971e-0004L,
  -4.289851942513144714600285769022420962418e-0005L,
   8.304719841341952705874781636002085119978e-0005L,
  -1.040460226177309338781902252282849903189e-0005L,
   2.122913331584921470381327583672044434087e-0006L,
};
static long double Q2[] = {     /*  13 bottom coeffs with leading 1.0 hidden */
   7.448815737306992749168727691042003832150e-0001L,
   7.161813850236008294484744312430122188043e-0001L,
   3.603134756584225766144922727405641236121e-0001L,
   1.955811609133766478080550795194535852653e-0001L,
   7.253059963716225972479693813787810711233e-0002L,
   2.752391253757421424212770221541238324978e-0002L,
   7.677654852085240257439050673446546828005e-0003L,
```



```
   2.141102244555509687346497060326630061069e-0003L,
   4.342123013830957093949563339130674364271e-0004L,
   8.664587895570043348530991997272212150316e-0005L,
   1.109201582511752087060167429397033701988e-0005L,
   1.357834375781831062713347000030984364311e-0006L,
   4.957746280594384997273090385060680016451e-0008L,
};
/*
 * erfc(x) = exp(-x*x)/x * R1(1/x)/S1(1/x) on [1.75, 16/3]
 */
static long double R1[] = {     /*  14 top coeffs */
   4.630195122654315016370705767621550602948e+0006L,
   1.257949521746494830700654204488675713628e+0007L,
   1.704153822720260272814743497376181625707e+0007L,
   1.502600568706061872381577539537315739943e+0007L,
   9.543710793431995284827024445387333922861e+0006L,
   4.589344808584091011652238164935949522427e+0006L,
   1.714660662941745791190907071920671844289e+0006L,
   5.034802147768798894307672256192466283867e+0005L,
   1.162286400443554670553152110447126850725e+0005L,
   2.086643834548901681362757308058660399137e+0004L,
   2.839793161868140305907004392890348777338e+0003L,
   2.786687241658423601778258694498655680778e+0002L,
   1.779177837102695602425897452623985786464e+0001L,
   5.641895835477470769043614623819144434731e-0001L,
};
static long double S1[] = {     /* 15 bottom coeffs with leading 1.0 hidden */
   4.630195122654331529595606896287596843110e+0006L,
   1.780411093345512024324781084220509055058e+0007L,
   3.250113097051800703707108623715776848283e+0007L,
   3.737857099176755050912193712123489115755e+0007L,
   3.029787497516578821459174055870781168593e+0007L,
   1.833850619965384765005769632103205777227e+0007L,
   8.562719999736915722210391222639186586498e+0006L,
   3.139684562074658971315545539760008136973e+0006L,
   9.106421313731384880027703627454366930945e+0005L,
   2.085108342384266508613267136003194920001e+0005L,
   3.723126272693120340730491416449539290600e+0004L,
   5.049169878567344046145695360784436929802e+0003L,
   4.944274532748010767670150730035392093899e+0002L,
   3.153510608818213929982940249162268971412e+0001L,
   1.0e00L,
};

/*
 * erfc(x) = exp(-x*x)/x * R2(1/x)/S2(1/x) on [16/3, 107]
 */
static long double R2[] = {     /*  15 top coeffs in reverse order!!*/
   2.447288012254302966796326587537136931669e+0005L,
   8.768592567189861896653699127165387390l6e+0005L,
   1.552293152581780065761497908005779524953e+0006L,
   1.792075924835942935864231657504259926729e+0006L,
   1.504001463155897344947500222052694835875e+0006L,
   9.699485556326891411801230186016013019935e+0005L,
   4.961449933661807969863435013364796037700e+0005L,
   2.048726544693474028061176764716228273791e+0005L,
   6.891532964330949722479061090551896886635e+0004L,
   1.888014709010307507771964047905823237985e+0004L,
   4.189692064988957745054734809642495644502e+0003L,
   7.362346487427048068212968889642741734621e+0002L,
   9.980359714211411423007641056580813116207e+0001L,
   9.426910895135379181107191962193485174159e+0000L,
   5.641895835477562869480794515623601280429e-0001L,
};
static long double S2[] = {     /* 16 coefficients */
   2.447282203601902971246004716790604686880e+0005L,
```

```
   1.153009852759385309367759460934808489833e+0006L,
   2.608580649612639131548966265078663384849e+0006L,
   3.766673917346623308850202792390569025740e+0006L,
   3.890566255138383910789924920541335370691e+0006L,
   3.052882073900746207613166259994150527732e+0006L,
   1.885574519970380988460241047248519418407e+0006L,
   9.369722034759943185851450846811445012922e+0005L,
   3.792278350536686111444869752624492443659e+0005L,
   1.257750606950115799965366001773094058720e+0005L,
   3.410830600242369370645608634643620355058e+0004L,
   7.513984469742343134851326863175067271240e+0003L,
   1.313296320593190002554779998138695507840e+0003L,
   1.773972700887629157006326333696896516769e+0002L,
   1.670876451822586800422009013880457094162e+0001L,
   1.000L,
};

long double erfl(x)
long double x;
{
        long double erfcl(long double),s,y,t;

        if(!finitel(x)) {
            if(x!=x) return x+x;        /* NaN */
            return copysignl(one,x);    /* return +-1.0 is x=Inf */
        }

        y = fabsl(x);
        if(y <= 0.84375L) {
            if(y<=tiny) return x+P[0]*x;
            s = y*y;
            t = __poly_libmq(s,21,P);
            return  x+x*t;
        }
        if(y<=1.25L) {
            s = y-one;
            t = C1+__poly_libmq(s,12,P1)/(one+s*__poly_libmq(s,12,Q1));
            return (signbitl(x))? -t: t;
        } else if(y<=1.75L) {
            s = y-onehalf;
            t = C2+__poly_libmq(s,12,P2)/(one+s*__poly_libmq(s,13,Q2));
            return (signbitl(x))? -t: t;
        }
        if(y<=9.0L) t = erfcl(y); else t = tiny;
        return (signbitl(x))? t-one: one-t;
}

long double erfcl(x)
long double x;
{
        long double erfl(long double),s,y,t;

        if(!finitel(x)) {
            if(x!=x) return x+x;        /* NaN */
                                        /* return 2.0 if x= -inf
                                                  0.0 if x= +inf */
            if(x<0.0L) return 2.0L; else return 0.0L;
        }

        if(x <= 0.84375L) {
            if(x<=0.25) return one-erfl(x);
            s = x*x;
            t = half-x;
            t = t - x*__poly_libmq(s,21,P);
            return  half+t;
        }
```



```
        if(x<=1.25L) {
            s = x-one;
            t = one-C1;
            return t - __poly_libmq(s,12,P1)/(one+s*__poly_libmq(s,12,Q1));
        } else if(x<=1.75L) {
            s = x-onehalf;
            t = one-C2;
            return t - __poly_libmq(s,12,P2)/(one+s*__poly_libmq(s,13,Q2));
        }
        if(x>=107.0L) return nearunfl*nearunfl;         /* underflow */
        else if(x >= L16_3) {
            y = __poly_libmq(x,15,R2);
            t = y/__poly_libmq(x,16,S2);
        } else {
            y = __poly_libmq(x,14,R1);
            t = y/__poly_libmq(x,15,S1);
        }
        /* see comment in ../Q/erfl.c */
        y = x;
        *(int*)&y = 0;
        t *= expl(-y*y)*expl(-(x-y)*(x+y));
        return  t;
}
```

```
**********************************************************
    1473 Sat May 10 12:08:59 2014
new/usr/src/lib/libm/common/LD/finitel.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak finitel = __finitel
#endif

#include "libm.h"

#if defined(__sparc)
int
finitel(long double x) {
        int *px = (int *) &x;
        return ((px[0] & ~0x80000000) < 0x7fff0000);
}
#elif defined(__x86)
int
finitel(long double x) {
        int *px = (int *) &x, t = px[2] & 0x7fff;
#if defined(HANDLE_UNSUPPORTED)
        return (t != 0x7fff && ((px[1] & 0x80000000) != 0 || t == 0));
#else
        return (t != 0x7fff);
#endif
}
#endif  /* defined(__sparc) || defined(__x86) */
```

```
**********************************************************
    1346 Sat May 10 12:08:59 2014
new/usr/src/lib/libm/common/LD/gammal.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak gammal = __gammal

/*
 * long double gammal(long double x);
 */

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

extern int signgam;
extern int signgaml;

long double
gammal(long double x) {
        long double y = __k_lgammal(x, &signgaml);

        signgam = signgaml;     /* SUSv3 requires the setting of signgam */
        return y;
}
```

```
**********************************************************
    1231 Sat May 10 12:08:59 2014
new/usr/src/lib/libm/common/LD/gammal_r.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
 * long double gammal_r(long double x, int *signgamlp);
 */

#pragma weak gammal_r = __gammal_r

#include "libm.h"
#include "longdouble.h"

long double
gammal_r(long double x, int *signgamlp) {
        return __k_lgammal(x, signgamlp);
}
```

```
**********************************************************
    3769 Sat May 10 12:08:59 2014
new/usr/src/lib/libm/common/LD/hypotl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#if defined(ELFOBJ)
#pragma weak hypotl = __hypotl
#endif

/*
 * hypotl(x,y)
 * Method :
 *      If z=x*x+y*y has error less than sqrt(2)/2 ulp than sqrt(z) has
 *      error less than 1 ulp.
 *      So, compute sqrt(x*x+y*y) with some care as follows:
 *      Assume x>y>0;
 *      1. save and set rounding to round-to-nearest
 *      2. if x > 2y  use
 *              x1*x1+(y*y+(x2*(x+x2))) for x*x+y*y
 *      where x1 = x with lower 32 bits cleared, x2 = x-x1; else
 *      3. if x <= 2y use
 *              t1*y1+((x-y)*(x-y)+(t1*y2+t2*y))
 *      where t1 = 2x with lower 64 bits cleared, t2 = 2x-t1, y1= y with
 *      lower 32 bits cleared, y2 = y-y1.
 *
 *      NOTE: DO NOT remove parenthsis!
 *
 * Special cases:
 *      hypot(x,y) is INF if x or y is +INF or -INF; else
 *      hypot(x,y) is NAN if x or y is NAN.
 *
 * Accuracy:
 *      hypot(x,y) returns sqrt(x^2+y^2) with error less than 1 ulps (units
 *      in the last place)
 */

#include "libm.h"
```



```
#if defined(__x86)
extern enum fp_direction_type __swap87RD(enum fp_direction_type);

#define k       0x7fff

long double
hypotl(long double x, long double y) {
        long double t1, t2, y1, y2, w;
        int *px = (int *) &x, *py = (int *) &y;
        int *pt1 = (int *) &t1, *py1 = (int *) &y1;
        enum fp_direction_type rd;
        int j, nx, ny, nz;

        px[2] &= 0x7fff;        /* clear sign bit and padding bits of x and y */
        py[2] &= 0x7fff;
        nx = px[2];             /* biased exponent of x and y */
        ny = py[2];
        if (ny > nx) {
                w = x;
                x = y;
                y = w;
                nz = ny;
                ny = nx;
                nx = nz;
        }                       /* force nx >= ny */
        if (nx - ny >= 66)
                return (x + y); /* x / y >= 2**65 */
        if (nx < 0x5ff3 && ny > 0x205b) {       /* medium x,y */
                /* save and set RD to Rounding to nearest */
                rd = __swap87RD(fp_nearest);
                w = x - y;
                if (w > y) {
                        pt1[2] = px[2];
                        pt1[1] = px[1];
                        pt1[0] = 0;
                        t2 = x - t1;
                        x = sqrtl(t1 * t1 - (y * (-y) - t2 * (x + t1)));
                } else {
                        x += x;
                        py1[2] = py[2];
                        py1[1] = py[1];
                        py1[0] = 0;
                        y2 = y - y1;
                        pt1[2] = px[2];
                        pt1[1] = px[1];
                        pt1[0] = 0;
                        t2 = x - t1;
                        x = sqrtl(t1 * y1 - (w * (-w) - (t2 * y1 + y2 * x)));
                }
                if (rd != fp_nearest)
                        __swap87RD(rd); /* restore rounding mode */
                return (x);
        } else {
                if (nx == k || ny == k) {       /* x or y is INF or NaN */
                        /* since nx >= ny; nx is always k within this block */
                        if (px[1] == 0x80000000 && px[0] == 0)
                                return (x);
                        else if (ny == k && py[1] == 0x80000000 && py[0] == 0)
                                return (y);
                        else
                                return (x + y);
                }
                if (ny == 0) {
                        if (y == 0.L || x == 0.L)
                                return (x + y);
```

```
128                         pt1[2] = 0x3fff + 16381;
129                         pt1[1] = 0x80000000;
130                         pt1[0] = 0;
131                         py1[2] = 0x3fff - 16381;
132                         py1[1] = 0x80000000;
133                         py1[0] = 0;
134                         x *= t1;
135                         y *= t1;
136                         return (y1 * hypotl(x, y));
137                 }
138                 j = nx - 0x3fff;
139                 px[2] -= j;
140                 py[2] -= j;
141                 pt1[2] = nx;
142                 pt1[1] = 0x80000000;
143                 pt1[0] = 0;
144                 return (t1 * hypotl(x, y));
145         }
146 }
147 #endif
```

****
1612 Sat May 10 12:08:59 2014
new/usr/src/lib/libm/common/LD/isnanl.c
patch06 - libm: fixed compilation issues after updates
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
****

```
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#if defined(ELFOBJ)
#pragma weak isnanl = __isnanl
#endif

#include "libm.h"

#if defined(__sparc)
int
isnanl(long double x) {
        int *px = (int *) &x;
        return ((px[0] & ~0x80000000) >= 0x7fff0000 &&
                ((px[0] & ~0xffff0000) | px[1] | px[2] | px[3]) != 0);
}
#elif defined(__x86)
int
isnanl(long double x) {
        int *px = (int *) &x, t = px[2] & 0x7fff;
#if defined(HANDLE_UNSUPPORTED)
        return ((t == 0x7fff && ((px[1] & ~0x80000000) | px[0]) != 0) ||
                (t != 0 && (px[1] & 0x80000000) == 0));
#else
        return (t == 0x7fff && ((px[1] & ~0x80000000) | px[0]) != 0);
#endif
}
#endif  /* defined(__sparc) || defined(__x86) */
```

```
**********************************************************
   27705 Sat May 10 12:08:59 2014
new/usr/src/lib/libm/common/LD/j0l.c
minor changes
patch06 - libm: fixed compilation issues after updates
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
 * Floating point Bessel's function of the first and second kinds
 * of order zero: j0(x),y0(x);
 *
 * Special cases:
 *      y0(0)=y1(0)=yn(n,0) = -inf with division by zero signal;
 *      y0(-ve)=y1(-ve)=yn(n,-ve) are NaN with invalid signal.
 */

#pragma weak j0l = __j0l
#pragma weak y0l = __y0l

#include "libm.h"
#include "libm_synonyms.h"

#include "longdouble.h"

#include <math.h>
#if defined(__SUNPRO_C)
#include <sunmath.h>
#endif

#define GENERIC long double
static GENERIC
zero    = 0.0L,
small   = 1.0e-9L,
tiny    = 1.0e-38L,
one     = 1.0L,
five    = 5.0L,
```



```
eight   = 8.0L,
invsqrtpi= 5.64189583547756286948079451560772585844 1e-0001L,
tpi     = 0.63661977236758134307553505349005744 8L;

static GENERIC pzero(), qzero();
static GENERIC r0[7] = {
  -2.49999999999999999999999999999998934492e-0001L,
   1.27265792736004978632761845113376371488 0e-0002L,
  -2.69449976371296327690063669340065960089 8e-0004L,
   2.72487747505897757690323407091961644788 3e-0006L,
  -1.43261710321433023696747749539307632028 1e-0008L,
   3.82324880408007916870668354051379222447 1e-0011L,
  -4.18317427756798364733756850428631366506 5e-0014L,
};
static GENERIC s0[7] = {
   1.0e0L,
   1.15936829055980085468952619546288466639 5e-0002L,
   6.62939759739497338300974387616994677255 9e-0005L,
   2.42677998139405440630543114250173509434 0e-0007L,
   6.09766349124851106909440046963544974988 3e-0010L,
   1.01701913334092922023874741321605222403 6e-0012L,
   9.01259317930619757951837458196937127848 1e-0016L,
};

GENERIC
j0l(x) GENERIC x;{
        GENERIC z, s, c, ss, cc, r, u, v;
        int i;

        if(isnanl(x)) return x+x;
        x = fabsl(x);
        if(x > 1.28L){
                if(!finitel(x)) return zero;
                s = sinl(x);
                c = cosl(x);
        /* j0(x) = sqrt(2/(pi*x))*(p0(x)*cos(x0)-q0(x)*sin(x0))
         * where x0 = x-pi/4
         *      Better formula:
         *              cos(x0) = cos(x)cos(pi/4)+sin(x)sin(pi/4)
         *                      = 1/sqrt(2) * (cos(x) + sin(x))
         *              sin(x0) = sin(x)cos(pi/4)-cos(x)sin(pi/4)
         *                      = 1/sqrt(2) * (sin(x) - cos(x))
         * To avoid cancellation, use
         *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
         * to compute the worse one.
         */
                if(x>1.0e2450L) {       /* x+x may overflow */
                        ss = s-c;
                        cc = s+c;
                } else if(signbitl(s)!=signbitl(c)) {
                        ss = s - c;
                        cc = -cosl(x+x)/ss;
                } else {
                        cc = s + c;
                        ss = -cosl(x+x)/cc;
                }
        /*
         * j0(x) = 1/sqrt(pi) * (P(0,x)*cc - Q(0,x)*ss) / sqrt(x)
         * y0(x) = 1/sqrt(pi) * (P(0,x)*ss + Q(0,x)*cc) / sqrt(x)
         */
                if(x>1.0e120L) return (invsqrtpi*cc)/sqrtl(x);
                u = pzero(x); v = qzero(x);
                return invsqrtpi*(u*cc-v*ss)/sqrtl(x);
        }
        if(x<=small) {
            if(x<=tiny) return one-x;
```

```
125             else return one-x*x*0.25L;
126         }
127         z = x*x;
128         r = r0[6]; s = s0[6];
129         for(i=5;i>=0;i--) {
130             r = r*z + r0[i];
131             s = s*z + s0[i];
132         }
133         return(one+z*(r/s));
134 }

136 static GENERIC u0[8] = {
137   -7.38042951086872252743439279484830163122 0e-0002L,
138    1.76685555962594079185753694930198181651 3e-0001L,
139   -1.38647072270104792323555325124016283940 8e-0002L,
140    3.52014924272481157863697081163122486261 5e-0004L,
141   -3.97859966324379004985364227562495187002 5e-0006L,
142    2.22880115326395722454722255680691547976 3e-0008L,
143   -6.12124676429878501865859717949883731617 7e-0011L,
144    6.67710362972267883347596581052558739659 6e-0014L,
145 };
146 static GENERIC v0[8] = {
147    1.0e0L,
148    1.24716441653911131157167676612776712797 0e-0002L,
149    7.82914474963979150005290028148936744357 6e-0005L,
150    3.24712654042224533051121832101336033660 6e-0007L,
151    9.75051672478949967856706257254956844786 9e-0010L,
152    2.15671322317359121225054339025845809877 6e-0012L,
153    3.32216956159789000423148243123645275262 4e-0015L,
154    2.82121329531400092425222648630572680509 3e-0018L,
155 };

157 GENERIC
158 y0l(x) GENERIC x;{
159         GENERIC z, d, s, c, ss, cc, u, v;
160         int i;

162         if(isnanl(x)) return x+x;
163         if(x <= zero){
164                 if(x==zero)
165                     d= -one/(x-x);
166                 else
167                     d = zero/(x-x);
168         }
169         if(x > 1.28L){
170                 if(!finitel(x)) return zero;
171                 s = sinl(x);
172                 c = cosl(x);
173         /* j0(x) = sqrt(2/(pi*x))*(p0(x)*cos(x0)-q0(x)*sin(x0))
174          * where x0 = x-pi/4
175          *      Better formula:
176          *              cos(x0) = cos(x)cos(pi/4)+sin(x)sin(pi/4)
177          *                      = 1/sqrt(2) * (cos(x) + sin(x))
178          *              sin(x0) = sin(x)cos(pi/4)-cos(x)sin(pi/4)
179          *                      = 1/sqrt(2) * (sin(x) - cos(x))
180          * To avoid cancellation, use
181          *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
182          * to compute the worse one.
183          */
184                 if(x>1.0e2450L) {       /* x+x may overflow */
185                         ss = s-c;
186                         cc = s+c;
187                 } else if(signbitl(s)!=signbitl(c)) {
188                         ss = s - c;
189                         cc = -cosl(x+x)/ss;
190                 } else {
```



```
191                         cc = s + c;
192                         ss = -cosl(x+x)/cc;
193                 }
194         /*
195          * j0(x) = 1/sqrt(pi*x) * (P(0,x)*cc - Q(0,x)*ss)
196          * y0(x) = 1/sqrt(pi*x) * (P(0,x)*ss + Q(0,x)*cc)
197          */
198                 if(x>1.0e120L) return (invsqrtpi*ss)/sqrtl(x);
199                 return invsqrtpi*(pzero(x)*ss+qzero(x)*cc)/sqrtl(x);

201         }
202         if(x<=tiny) {
203             return(u0[0] + tpi*logl(x));
204         }
205         z = x*x;
206         u = u0[7]; v = v0[7];
207         for(i=6;i>=0;i--){
208             u = u*z + u0[i];
209             v = v*z + v0[i];
210         }
211         return(u/v + tpi*(j0l(x)*logl(x)));
212 }

214 static GENERIC pr0[12] = {      /* [16 -- inf] */
215    9.99999999999999999999999999999997515e-0001L,
216    1.06598161537727337642536582396755059835 8e-0003L,
217    4.39099120092758897830637471898424071913 0e-0005L,
218    9.07208621860798671184706940733932136310 3e-0007L,
219    1.02255288617737536740840850104646167152 8e-0010L,
220    6.42076691224365824157063585408959726903 1e-0011L,
221    2.20645172512693391359108021108124226690 8e-0013L,
222    3.92836959681689507736370547874334629836 8e-0014L,
223    3.25815992887412459728670111971214828765 96e-0015L,
224    1.02571580813418897886067913014068510134 8e-0016L,
225    7.53717087479572125579600168702403128068 5e-0015L,
226   -1.57941390145015733230774558600420768779 6e-0014L,
227 };
228 static GENERIC ps0[11] = {
229    1.0e0L,
230    1.06605192787727337642536582396755051268 7e-0003L,
231    4.39173964716838159239917380432926635303 8e-0005L,
232    9.07516226180134367180565829412388886788 4e-0007L,
233    1.02318611851990475181958191207598599505 8e-0010L,
234    6.42786186041422374634051537651273027506 1e-0011L,
235    2.21086150323782358973548130362799340623 5e-0013L,
236    3.94324733578429290591595684090181817798 9e-0014L,
237    3.28372097677754514215020011064727000448 1e-0015L,
238    1.04534691881275404890364564153872898675 9e-0016L,
239    8.04345546806561890075059958429119368046 3e-0015L,
240 };
241 static GENERIC pr1[12] = {      /* [8 -- 16] */
242    9.99999999999999999999978442270110868361 8e-0001L,
243    6.79609853294833420775548869277790706289 4e-0002L,
244    1.84003611260572216882453075879716983604 2e-0005L,
245    2.59849048319191663726489434063584759812 2e-0007L,
246    2.10577486324270702552573024947205457852 3e-0009L,
247    1.01582204423054242666631499779694497995 9e-0011L,
248    2.93155745700811043676407769994418907187 5e-0012L,
249    4.96288512112545763365525922417932280882 4e-0013L,
250    4.70542405514822326915543059856335156627 9e-0014L,
251    2.29443985491074722915205608091042700111 0e-0015L,
252    4.90553184313748669150095001932247545862 9e-0015L,
253    3.18754316971033921879344254284573599456 5e-0015L,
254 };
255 static GENERIC ps1[14] = {
256    1.0e0L,
```

```
257    6.7968016579483342077545715760667581808 88e+0002L,
258    1.8405128912013005673254210598266766366447e+0005L,
259    2.5997770283129189753062521671276950752 21e+0007L,
260    2.1075825727710476368468112846342448925 37e+0009L,
261    1.0172757946941561089757827638899799403 48e+0011L,
262    2.9384876451924638454280597554547623160 11e+0012L,
263    4.9825121647355570545210429161823179244 66e+0013L,
264    4.7376399001537032747926774682645643614 37e+0014L,
265    2.3233987191237427435242495282750971006 46e+0015L,
266    5.0334191070692105778689097978969844193 91e+0015L,
267    3.4090361059310686096013170767598047160 59e+0015L,
268    7.5056553643526797375857451477535216621 66e+0013L,
269   -9.9768371539836882507801982482971091183 13e+0012L,
270 };
271 static GENERIC pr2[12] = {      /* [5 -- 8 ] */
272    9.9999999999999999378572367892773663202 20e-0001L,
273    3.6928487652686495716516024203763588492 14e+0002L,
274    5.3730220675354765769267159000577609854 10e+0004L,
275    4.0387388911913149699715040350572194307 25e+0006L,
276    1.7282857063069405233973855666597626469 99e+0008L,
277    4.3754008196458899111586887372060547885 34e+0009L,
278    6.5989504182049124083755912177820885670 76e+0010L,
279    5.8271820391832384924802754015200727937 83e+0011L,
280    2.8842226429134923908875724149994909758 44e+0012L,
281    7.3732788737977677219328378306286886327 75e+0012L,
282    8.3382954575689737612050779643979692304 89e+0012L,
283    2.9113831834672883457723088172098069221 43e+0012L,
284 };
285 static GENERIC ps2[14] = {
286    1.0e0L,
287    3.6935518902686494772888962671719932131 02e+0002L,
288    5.3756078809983615024747151338280685142 97e+0004L,
289    4.0424777640241082497449988625727863673 28e+0006L,
290    1.7310698387370169566858395886701329395 13e+0008L,
291    4.3871476740498987787382265859354914177 28e+0009L,
292    6.6280586596206537653495569405677152581 65e+0010L,
293    5.8696599041641777404716858563673221606 64e+0011L,
294    2.9198394456228170170589775596389694363 83e+0012L,
295    7.5353148976966714026282037186123092539 07e+0012L,
296    8.6963555614529337757733098597486106589 35e+0012L,
297    3.2161551031415372211736015576970832162 57e+0012L,
298    4.7568570810689422482468801592137890863 63e+0010L,
299   -3.4963566196666080322310748664814728240 67e+0009L,
300 };
301 static GENERIC pr3[13] = {      /* [3.5 -- 5 ] */
302    9.9999999999999166931072856123981965882 47e-0001L,
303    2.2639759212829177211944253204849743369 45e+0002L,
304    1.9943583867442458488894927627814841999 66e+0004L,
305    8.9800674584305422435599624938316613231 68e+0005L,
306    2.2822137875213726637055677564200875535 08e+0007L,
307    3.4097843748890636182502886999083751359 23e+0008L,
308    3.0243808574014485892543435175898117111 08e+0009L,
309    1.5711103680467402468950717214430822863 79e+0010L,
310    4.6031870202436046321536853004631605937 68e+0010L,
311    7.0871964534097127194495492806640587934 03e+0010L,
312    5.0461960217763463568036874096442390650 41e+0010L,
313    1.2877584390801657657091542766188547999 32e+0010L,
314    5.9006797734150234337878466580968135907 84e+0008L,
315 };
316 static GENERIC ps3[13] = {
317    1.0e0L,
318    2.2646790462828550613286046192317747471 16e+0002L,
319    1.9959395239889445537556532553898121034 48e+0004L,
320    8.9938531447063487270383899674901832368 20e+0005L,
321    2.2883260996345888439069899837047954687 73e+0007L,
322    3.4249671002552408851692409568047901182 82e+0008L,
```



```
323    3.0463117979724639913680237596400289100 16e+0009L,
324    1.5896149619328268127902224797007972240 03e+0010L,
325    4.6924066245277448164970891393250739399 27e+0010L,
326    7.3204864959020089128664628490731083239 48e+0010L,
327    5.3459459728289782899353095977429813609 94e+0010L,
328    1.4440330919104237541213099150922471710 08e+0010L,
329    7.9877146851153146683789572738243836105 25e+0008L,
330 };
331 static GENERIC pr4[13] = {      /* [2.5 , 3.5] */
332    9.9999999999867366779611187227477577126 0e-0001L,
333    1.4538249807038005590378731235683788456 63e+0002L,
334    8.0973272164306822882676104470650866103 2e+0003L,
335    2.2738472520382643702311696863801926621 35e+0005L,
336    3.5610567280462111113547599989769854496 22e+0006L,
337    3.2449335888000963784346270293696803785 99e+0007L,
338    1.7401123928607179503762100389084767925 88e+0008L,
339    5.4261701874558932851978785638815792695 24e+0008L,
340    9.4901074864543623210043773360205262813 71e+0008L,
341    8.6888724394284700498017141210700053138 06e+0008L,
342    3.6733158531664372228119106569001232155 15e+0008L,
343    5.5777704703593033051648774463396932702 39e+0007L,
344    1.5404386420316896413081978801812918657 14e+0006L,
345 };
346 static GENERIC ps4[13] = {      /* [2.5 , 3.5] */
347    1.0e0L,
348    1.4545281056981594397730359519591317998 16e+0002L,
349    8.1074422152003923971721799004349878596 18e+0003L,
350    2.2793903937782428875741770966063289941 40e+0005L,
351    3.5762516255922520084247811117709341358 44e+0006L,
352    3.2679094990569326314059420586709338138 63e+0007L,
353    1.7600215153308055374997782380997046488 05e+0008L,
354    5.5255537876673539812420602225874657267 29e+0008L,
355    9.7698702959128204578893840826712693285 11e+0008L,
356    9.1105820710047742792269056296240180084 54e+0008L,
357    3.9818576786219555993719676803439184543 45e+0008L,
358    6.4824046862307693990731929616676970367 06e+0007L,
359    2.2100469430958784024435354603293917822 98e+0006L,
360 };
361 static GENERIC pr5[13] = {      /* [1.777..., 2.5] */
362    9.9999999991149861079518178711446558806 99e-0001L,
363    9.2525837360485883425683445703154359476 14e+0001L,
364    3.2187267578560787152146315024073862646 37e+0003L,
365    5.5540099646211116564795885058625770408 31e+0004L,
366    5.2699931156436643382531969445235102901 75e+0005L,
367    2.8746137737784306911929121906182205445 75e+0006L,
368    9.1335381511036583538741469196134424360 35e+0006L,
369    1.6730670414103389228251930130773542491 93e+0007L,
370    1.7069138738483980117447902892001518404 98e+0007L,
371    9.0677665838532885345516002355767476186 79e+0006L,
372    2.2167467334578845685326953550363386558 72e+0006L,
373    1.9457538808028725412357038127223445144 05e+0005L,
374    3.1323744129219480715391956388853309517 49e+0003L,
375 };
376 static GENERIC ps5[13] = {      /* [1.777..., 2.5] */
377    1.0e0L,
378    9.2596149838621811188838316709903400529 82e+0001L,
379    3.2251252754629033848421240751326092903 04e+0003L,
380    5.5757053628291015452927600559418552464 92e+0004L,
381    5.3060498630370878554961701219584484925 22e+0005L,
382    2.9070607588735095643097299031090185972 15e+0006L,
383    9.2980592065849958982982578271312085392 89e+0006L,
384    1.7203910710069631768361080265565470629 80e+0007L,
385    1.7826148129228651904793945094879419206 12e+0007L,
386    9.7080163896052731535364520328398795501 55e+0006L,
387    2.4764950846881700964802156409621751400 27e+0006L,
388    2.3632006603655857596680777901946049171 87e+0005L,
```

```
   4.80323956984819607712120357570435693673 1e+0003L,
};
static GENERIC pr6[13] = {      /* [1.28, 1.777...] */
   9.99999969777095495998606925524322559556e-0001L,
   5.82548671946619443050328382409687221921 6e+0001L,
   1.24815549163775728191518482496537990538 0e+0003L,
   1.30209319984235860932133841707171047761 5e+0004L,
   7.35383580418629278284096199981054301603 9e+0004L,
   2.35647166113686180549195092555751341757 e+0005L,
   4.35055326742900958163298706094278084710 1e+0005L,
   4.58876266187660063871915982665238941823 5e+0005L,
   2.67579639854852343654422104522529012861 1e+0005L,
   8.07764955710897138829829291998844994046 4e+0004L,
   1.11764045922130687351906874166405457377 6e+0004L,
   5.54440007239681469517578751155775788558 5e+0002L,
   5.07255054119148049843128908990582291071 8e+0000L,
};
static GENERIC ps6[13] = {      /* [1.28, 1.777...] */
   1.0e0L,
   5.83251792535716505063907584818361306329 1e+0001L,
   1.25214436474359212817125610436497646689 8e+0003L,
   1.31030023434221681357911802241558574077 2e+0004L,
   7.43466769709381219781729215403286363292 3e+0004L,
   2.39870659558771916572646900240400461471 1e+0005L,
   4.47273751762510315700486937242748060251 1e+0005L,
   4.78631352333776197529417142906703772361 1e+0005L,
   2.85116187287273122847253606186536537019 2e+0005L,
   8.89164826989914841233191802180138581558 6e+0004L,
   1.29709748953535151757297812358475104228 7e+0004L,
   7.09676164054597575620218414340046981261 8e+0002L,
   8.37804933859023332597770240173334082035 1e+0000L,
};
static GENERIC sixteen = 16.0L;
static GENERIC huge    = 1.0e30L;

static GENERIC pzero(x)
GENERIC x;
{
        GENERIC s,r,t,z;
        int i;
        if(x>huge) return one;
        t = one/x; z = t*t;
        if(x>sixteen) {
            r = z*pr0[11]+pr0[10]; s = ps0[10];
            for(i=9;i>=0;i--) {
                r = z*r + pr0[i];
                s = z*s + ps0[i];
            }
        } else if (x > eight){
            r = pr1[11]; s = ps1[11]+z*(ps1[12]+z*ps1[13]);
            for(i=10;i>=0;i--) {
                r = z*r + pr1[i];
                s = z*s + ps1[i];
            }
        } else if (x > five){   /* x > 5.0 */
            r = pr2[11]; s = ps2[11]+z*(ps2[12]+z*ps2[13]);
            for(i=10;i>=0;i--) {
                r = z*r + pr2[i];
                s = z*s + ps2[i];
            }
        } else if( x>3.5L) {
            r = pr3[12]; s = ps3[12];
            for(i=11;i>=0;i--) {
                r = z*r + pr3[i];
                s = z*s + ps3[i];
            }
```



```
        } else if( x>2.5L) {
            r = pr4[12]; s = ps4[12];
            for(i=11;i>=0;i--) {
                r = z*r + pr4[i];
                s = z*s + ps4[i];
            }
        } else if( x> (1.0L/0.5625L)){
            r = pr5[12]; s = ps5[12];
            for(i=11;i>=0;i--) {
                r = z*r + pr5[i];
                s = z*s + ps5[i];
            }
        } else {        /* assume x > 1.28 */
            r = pr6[12]; s = ps6[12];
            for(i=11;i>=0;i--) {
                r = z*r + pr6[i];
                s = z*s + ps6[i];
            }
        }
        return r/s;
}


static GENERIC qr0[12] = {      /* [16, inf] */
  -1.24999999999999999999999999999999972972e-0001L,
  -1.42517959554567057741439576250399159689 7e+0002L,
  -6.31249964562597084553446025793622240721 9e+0004L,
  -1.41137432645720838431512124369881446848 e+0007L,
  -1.73503421275887358141098475786078725284 2e+0009L,
  -1.19977764751278948942182634248505528068 0e+0011L,
  -4.59602533408165571449986040969910037364 4e+0012L,
  -9.26252562820128410779292447703165339918 7e+0013L,
  -8.85839472868503924534439884218066286763 9e+0014L,
  -3.26752795368753488762374062270950597211 3e+0015L,
  -2.66422297118631196758712934702945006201 9e+0015L,
   3.44246406072398786958518009534450410020 4e+0014L,
};
static GENERIC qs0[11] = {
   1.0e0L,
   1.14072961393653646193151661000318568788 1e+0003L,
   5.05666551044229935100919818649008580358 0e+0005L,
   1.13204176382564278794394165052271819911 5e+0008L,
   1.39457011187258160639262067821424647976 7e+0010L,
   9.67794521815226478953443107956374437842 1e+0011L,
   3.73114032785153682822514305889634850209 6e+0013L,
   7.61278595106486929172284668102088167641 0e+0014L,
   7.47607701640676489173019100481186397594 0e+0015L,
   2.95124648261359203542150342710039383170 9e+0016L,
   3.10836180369181171113685458707430203490 1e+0016L,
};
static GENERIC qr1[12] = {      /* [8, 16 ] */
  -1.24999999999999999999979490103834338181 57e-0001L,
  -9.05121516639382264063675224489512412693 4e+0001L,
  -2.62078270342814883767117903190420830394 7e+0004L,
  -3.97557126155350445776617797450878579088 4e+0006L,
  -3.47902933075931130627007221807407499409 0e+0008L,
  -1.82395500812426857303621674618623982908 9e+0010L,
  -5.76593269711180137576515602922156866443 5e+0011L,
  -1.07984368079874259295400219241793477911 4e+0013L,
  -1.14689363050459273908220576461158133289 7e+0014L,
  -6.36701605968389846493610444728288070418 2e+0014L,
  -1.58310904196121349046445911190348420909 8e+0015L,
  -1.23014955576424247310312865013579563941 2e+0015L,
};
static GENERIC qs1[14] = {
   1.0e0L,
```

```
   7.24683150811505811243857984777801445843 2e+0002L,
   2.10085418443916851839938378630692703761 1e+0005L,
   3.19263641883795150743018828594099423512 2e+0007L,
   2.80155844338335467453844346112443421615 2e+0009L,
   1.47502699766437373929348392725065346748 7e+0011L,
   4.69448682491395460855236382179992714531 8e+0012L,
   8.89035010091920025083843870960154733402 1e+0013L,
   9.62684442908290514487470106876046975206 7e+0014L,
   5.54111074460046077352826386268752164214 0e+0015L,
   1.48650049478945255672747032923212309656 3e+0016L,
   1.41584010484595940036543077373209389921 0e+0016L,
   1.78086609524151741808131256723968233648 3e+0015L,
  -2.35923091738488935788763154407990129494 e+0014L,
};
static GENERIC qr2[12] = {      /* [5, 8] */
  -1.24999999999999953193774436252777218164 e-0001L,
  -4.94437389735696977483937597723924157396 6e+0001L,
  -7.72844917543346528531426165007845047390 9e+0003L,
  -6.26257432961275234633690143465122070590 3e+0005L,
  -2.90094822022094330602723521742438067273 2e+0007L,
  -7.98871964763419277046391715756287411953 5e+0008L,
  -1.31822817192718138954776002662635701237 5e+0010L,
  -1.28243977398302924530926327194542492819 6e+0011L,
  -7.05092557082781804018614994025791884513 8e+0011L,
  -2.02175188257387199000420561687420268442 9e+0012L,
  -2.59293996240066855238433390057381263565 8e+0012L,
  -1.03826710951889126284060151493297285032 6e+0012L,
};
static GENERIC qs2[14] = {
   1.0e0L,
   3.96135849288557000320278402289424895211 6e+0002L,
   6.20578873886470188282875263458651092696 8e+0004L,
   5.04571560393267028655067381301176440674 9e+0006L,
   2.34924861136265832335334338943096875142 9e+0008L,
   6.52024452441582863591768355372188006391 1e+0009L,
   1.08911121122350771933706715988628188772 2e+0011L,
   1.08040600090535986795877940941490301861 0e+0012L,
   6.13564528089551470351415468062376956214 8e+0012L,
   1.86243304024662587424586715136864366821 5e+0013L,
   2.66778080578664888884077788702193708994 e+0013L,
   1.39440110728908774765300711809313112824 e+0013L,
   1.09324750061632037556289829715672244548 4e+0012L,
  -7.22887553037892872282660421649149378075 e+0010L,
};
static GENERIC qr3[13] = {      /* [3.5 5] */
  -1.24999999999947306774842037957848166107 5e-0001L,
  -3.04454904863528935191357432480325097799 8e+0001L,
  -2.89008114064976907849669300352468144086 9e+0003L,
  -1.40492245681720223587934327533052910768 4e+0005L,
  -3.86274661438557344351817740361734928186 9e+0006L,
  -6.25751730911024904920113370891115504768 9e+0007L,
  -6.03145133092083991698707978272732347752 0e+0008L,
  -3.41154240517383061145402576575585438234 6e+0009L,
  -1.08939247814972667213301449872302152609 9e+0010L,
  -1.82493407842021094129014090341595678272 6e+0010L,
  -1.40078027830435871042348107048693953113 9e+0010L,
  -3.71648413606491736392663571674377109209 3e+0009L,
  -1.39759107529642552997043489095490433158 0e+0008L,
};
static GENERIC qs3[13] = {
   1.0e0L,
   2.44149861390496204939100018701494585804 2e+0002L,
   2.32618888207237071150016422234151433704 3e+0004L,
   1.13713821312131338494977104659239578165 e+0006L,
   3.15291807073566272872299845260536425351 7e+0007L,
   5.17287799342650725931427048844401359510 8e+0008L,
```



```
   5.08308643973166980745596107885647077411 5e+0009L,
   2.96184273206643412311932552113947690994 1e+0010L,
   9.91218586686244073582978185608135315139 0e+0010L,
   1.79356056125162223443056418156729798359 8e+0011L,
   1.57709011934122812252526510849794040307 3e+0011L,
   5.50991030678016619433388999998546368163 6e+0010L,
   4.76169113407887449120232018151793675814 1e+0009L,
};
static GENERIC qr4[13] = {      /* [2.5 3.5] */
  -1.24999999992856773433974504349070534083 5e-0001L,
  -1.96720174873141906305160162443556552848 1e+0001L,
  -1.18632914671456223640709974061552817070 7e+0003L,
  -3.60773695922294181035630149115245793406 0e+0004L,
  -6.11920071797810490493282846857519426712 5e+0005L,
  -6.03784778115835822667030507865220558638 4e+0006L,
  -3.50355815333614035970053672039356598474 0e+0007L,
  -1.18019647826822571875721852374678730977 3e+0008L,
  -2.22186023208513491584142636350516968052 8e+0008L,
  -2.17337250545274758529617676170174623676 0e+0008L,
  -9.64936486506123755851773053950656801396 3e+0007L,
  -1.46542922784793303454603964009486265038 5e+0007L,
  -3.08300319792026208517058186624666338060 7e+0005L,
};
static GENERIC qs4[13] = {      /* [2.5 3.5] */
   1.0e0L,
   1.57962077373225914275261414213998685405 5e+0002L,
   9.58137222032913873320387950375368505496 8e+0003L,
   2.93959867237910809577611413101082588530 8e+0005L,
   5.05218304931454221863034181869258844816 8e+0006L,
   5.08349769559520663943383932633897198014 9e+0007L,
   3.03638536180055338804971901400509920651 6e+0008L,
   1.06782648145275340991056378516166149213 7e+0009L,
   2.14564412555711804472074177512531966927 2e+0009L,
   2.32411561595971994936394667349155221679 9e+0009L,
   1.22326296211207075796695985561984701114 6e+0009L,
   2.56976555331849542373847858594711027070 9e+0008L,
   1.35474474429922712789790578773236565504 e+0007L,
};
static GENERIC qr5[13] = {      /* [1.777.., 2.5] */
  -1.24999999593663969763768042817457606997 1e-0001L,
  -1.26084605537131145348589192342648906831 5e+0001L,
  -4.77239846754446748080117433029014157889 5e+0002L,
  -8.93985259999029848661376083399649059972 4e+0003L,
  -9.18407078714954205097954222644613424319 7e+0004L,
  -5.40603894501827445836263789773928043517 1e+0005L,
  -1.84589654470519026101865372867817108441 8e+0006L,
  -3.61361699068080950187866757065330807154 7e+0006L,
  -3.90878297813569325225255772041434862377 9e+0006L,
  -2.17371102251732392710913817058844276817 6e+0006L,
  -5.43125313067991848583640854900785624449 5e+0005L,
  -4.59109854645268451008259158727594076595 9e+0004L,
  -5.24471136416820780683552005779222964657 8e+0002L,
};
static GENERIC qs5[13] = {      /* [1.777.., 2.5] */
   1.0e0L,
   1.01453621085129087835089275097247486144 7e+0002L,
   3.87554751068713531406443416009613968107 6e+0003L,
   7.36191312267007981495525928199561773258 0e+0004L,
   7.72028894421877112658108653958529314636 e+0005L,
   4.68152955444675249640443143360830655803 8e+0006L,
   1.66788262194050392545503125230836774582 0e+0007L,
   3.46940315376139988188827262085530515624 1e+0007L,
   4.09699204796421071186708938471994786301 9e+0007L,
   2.59680475582921744931153073595956063055 4e+0007L,
   7.98393377469788923815446506401941076384 5e+0006L,
   9.81813381697990081908724242528075793815 2e+0005L,
```

```
653    3.06108393086869439601354153567074544356 0e+0004L,
654 };

656 static GENERIC qr6[13] = {      /* [1.28, 1.777..] */
657   -1.24999988157728900180713728282492908 2771e-0001L,
658   -7.99827351005311075961081059411953361 9282e+0000L,
659   -1.87248195533517254336908961777156563 2719e+0002L,
660   -2.12211678672630080507987400330379964 6812e+0003L,
661   -1.29385028583952928250317826348477347 8457e+0004L,
662   -4.44502474226631618103335419226252935 6093e+0004L,
663   -8.73016137833435776766834446735650534 7070e+0004L,
664   -9.70622289517207844280144497250531505 4736e+0004L,
665   -5.89632551825985827016553151361819532 1041e+0004L,
666   -1.82317203436810882227642082707466883 2233e+0004L,
667   -2.50930417863505592663883304033747238 7175e+0003L,
668   -1.15660896571577923731676982894172996 4099e+0002L,
669   -7.02800578965073139688734682639778521 0442e-0001L,
670 };
671 static GENERIC qs6[13] = {      /* [1.28, 1.777..] */
672    1.0e0L,
673    6.45721108505806484560126132127772107 5900e+0001L,
674    1.53400521658801121034282455513600868 2950e+0003L,
675    1.77721799917644178259335766046237909 7171e+0004L,
676    1.11837265264246946809108481026323119 9696e+0005L,
677    4.01524243385846181314236574838647360 5294e+0005L,
678    8.37708104551709864544861651438828049 7673e+0005L,
679    1.01149502000801035257539800960416428 7337e+0006L,
680    6.88672207529043056865222787520020895 5970e+0005L,
681    2.50473518994802147204715714861317195 6537e+0005L,
682    4.40813892017104484694100184435200981 7062e+0004L,
683    3.10557217807211514567305872285364085 4884e+0003L,
684    5.58829482111891611343739650457381703 3678e+0001L,
685 };
686 static GENERIC qzero(x)
687 GENERIC x;
688 {
689         GENERIC s,r,t,z;
690         int i;
691         if(x>huge) return -0.125L/x;
692         t = one/x; z = t*t;
693         if(x>sixteen) {
694             r = z*qr0[11]+qr0[10]; s = qs0[10];
695             for(i=9;i>=0;i--) {
696                 r = z*r + qr0[i];
697                 s = z*s + qs0[i];
698             }
699         } else if(x>eight) {
700             r = qr1[11]; s = qs1[11]+z*(qs1[12]+z*qs1[13]);
701             for(i=10;i>=0;i--) {
702                 r = z*r + qr1[i];
703                 s = z*s + qs1[i];
704             }
705         } else if(x>five){  /* assume x > 5.0 */
706             r = qr2[11]; s = qs2[11]+z*(qs2[12]+z*qs2[13]);
707             for(i=10;i>=0;i--) {
708                 r = z*r + qr2[i];
709                 s = z*s + qs2[i];
710             }
711         } else if(x>3.5L) {
712             r = qr3[12]; s = qs3[12];
713             for(i=11;i>=0;i--) {
714                 r = z*r + qr3[i];
715                 s = z*s + qs3[i];
716             }
717         } else if(x>2.5L) {
718             r = qr4[12]; s = qs4[12];
```



```
719             for(i=11;i>=0;i--) {
720                 r = z*r + qr4[i];
721                 s = z*s + qs4[i];
722             }
723         } else if(x> (1.0L/0.5625L)) {
724             r = qr5[12]; s = qs5[12];
725             for(i=11;i>=0;i--) {
726                 r = z*r + qr5[i];
727                 s = z*s + qs5[i];
728             }
729         } else {        /* assume x > 1.28 */
730             r = qr6[12]; s = qs6[12];
731             for(i=11;i>=0;i--) {
732                 r = z*r + qr6[i];
733                 s = z*s + qs6[i];
734             }
735         }
736         return t*(r/s);
737 }
```

```
**********************************************************
   28046 Sat May 10 12:08:59 2014
new/usr/src/lib/libm/common/LD/j1l.c
minor changes
patch06 - libm: fixed compilation issues after updates
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

/*
 * floating point Bessel's function of the first and second kinds
 * of order zero: j1(x),y1(x);
 *
 * Special cases:
 *      y0(0)=y1(0)=yn(n,0) = -inf with division by zero signal;
 *      y0(-ve)=y1(-ve)=yn(n,-ve) are NaN with invalid signal.
 */

#pragma weak j1l = __j1l
#pragma weak y1l = __y1l

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"
#include <math.h>
#if defined(__SUNPRO_C)
#include <sunmath.h>
#endif

#define GENERIC long double
static GENERIC
zero    = 0.0L,
small   = 1.0e-9L,
tiny    = 1.0e-38L,
one     = 1.0L,
five    = 5.0L,
invsqrtpi= 5.641895835477562869480794515607725858441e-0001L,
tpi     = 0.636619772367581343075535053490057448L;
```



```
static GENERIC pone(), qone();
static GENERIC r0[7] = {
  -6.249999999999999999999999999999627320e-0002L,
   1.940606727194041716205384618494641565464e-0003L,
  -3.005630423155733701856481469986459043883e-0005L,
   2.345586219403918667468341047369572169358e-0007L,
  -9.976809285885253587529010109133336669724e-0010L,
   2.218743258363623946078958783775107473381e-0012L,
  -2.071079656218700604767650924103578046280e-0015L,
};
static GENERIC s0[7] = {
   1.0e0L,
   1.061695903156199920738051277075003059555e-0002L,
   5.521860513111180371566951179398862692060e-0005L,
   1.824214367413754193524107877084979441407e-0007L,
   4.098957778439576834818838198039029353925e-0010L,
   6.047735079699666389853240009025264056197e-0013L,
   4.679044728878836197247923279512047035041e-0016L,
};

GENERIC
j1l(x) GENERIC x;{
        GENERIC z, d, s, c, ss, cc, r;
        int i, sgn;

        if(!finitel(x)) return one/x;
        sgn = signbitl(x);
        x = fabsl(x);
        if(x > 1.28L){
                s = sinl(x);
                c = cosl(x);
        /* j1(x) = sqrt(2/(pi*x))*(p1(x)*cos(x0)-q1(x)*sin(x0))
         * where x0 = x-3pi/4
         *      Better formula:
         *              cos(x0) = cos(x)cos(3pi/4)+sin(x)sin(3pi/4)
         *                      =  1/sqrt(2) * (sin(x) - cos(x))
         *              sin(x0) = sin(x)cos(3pi/4)-cos(x)sin(3pi/4)
         *                      = -1/sqrt(2) * (cos(x) + sin(x))
         * To avoid cancellation, use
         *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
         * to compute the worse one.
         */
                if(x>1.0e2450L) {       /* x+x may overflow */
                        ss = -s-c;
                        cc =  s-c;
                } else if(signbitl(s)!=signbitl(c)) {
                        cc = s - c;
                        ss = cosl(x+x)/cc;
                } else {
                        ss = -s-c;
                        cc = cosl(x+x)/ss;
                }
        /*
         * j1(x) = 1/sqrt(pi*x) * (P(1,x)*cc - Q(1,x)*ss)
         * y1(x) = 1/sqrt(pi*x) * (P(1,x)*ss + Q(1,x)*cc)
         */
                if(x>1.0e120L) return (invsqrtpi*cc)/sqrtl(x);
                d =  invsqrtpi*(pone(x)*cc-qone(x)*ss)/sqrtl(x);
                if(sgn==0) return d; else return -d;
        }
        if(x<=small) {
            if(x<=tiny) d = 0.5L*x;
            else d =  x*(0.5L-x*x*0.125L);
            if(sgn==0) return d; else return -d;
        }
```

```
125         z = x*x;
126             r = r0[6];
127             s = s0[6];
128             for(i=5;i>=0;i--) {
129                 r = r*z + r0[i];
130                 s = s*z + s0[i];
131             }
132         d = x*0.5L+x*(z*(r/s));
133         if(sgn==0) return d; else return -d;
134 }

136 static GENERIC u0[7] = {
137   -1.960570906462389484060557273467558703503e-0001L,
138    5.166389353148318460304315890665450006495e-0002L,
139   -2.229699464105910913337190798743451115604e-0003L,
140    3.625437034548863342715657067759078267158e-0005L,
141   -2.689902826993117212255524537353883987171e-0007L,
142    9.304570592456930912969387719010256018466e-0010L,
143   -1.234878126794286643318321347997500346131e-0012L,
144 };
145 static GENERIC v0[8] = {
146    1.0e0L,
147    1.369394302535807332517110204820556695644e-0002L,
148    9.508438148097659501433367062605935379588e-0005L,
149    4.399007309420092056052714797296467565655e-0007L,
150    1.488083087443756398305819693177715000787e-0009L,
151    3.751609832625793536245746965768587624922e-0012L,
152    6.680926434086257291872903276124244131448e-0015L,
153    6.676602383908906988160099057991121446058e-0018L,
154 };

156 GENERIC
157 y1l(x) GENERIC x;{
158         GENERIC z, s, c, ss, cc, u, v;
159         int i;

161         if(isnanl(x)) return x+x;
162         if(x <= zero){
163                 if(x==zero)
164                     return -one/zero;
165                 else
166                     return zero/zero;
167         }
168         if(x > 1.28L){
169                 if(!finitel(x)) return zero;
170                 s = sinl(x);
171                 c = cosl(x);
172         /* j1(x) = sqrt(2/(pi*x))*(p1(x)*cos(x0)-q1(x)*sin(x0))
173          * where x0 = x-3pi/4
174          *      Better formula:
175          *              cos(x0) = cos(x)cos(3pi/4)+sin(x)sin(3pi/4)
176          *                      =  1/sqrt(2) * (sin(x) - cos(x))
177          *              sin(x0) = sin(x)cos(3pi/4)-cos(x)sin(3pi/4)
178          *                      = -1/sqrt(2) * (cos(x) + sin(x))
179          * To avoid cancellation, use
180          *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
181          * to compute the worse one.
182          */
183                 if(x>1.0e2450L) {       /* x+x may overflow */
184                         ss = -s-c;
185                         cc =  s-c;
186                 } else if(signbitl(s)!=signbitl(c)) {
187                         cc = s - c;
188                         ss = cosl(x+x)/cc;
189                 } else {
190                         ss = -s-c;
```



```
191                         cc = cosl(x+x)/ss;
192                 }
193         /*
194          * j1(x) = 1/sqrt(pi*x) * (P(1,x)*cc - Q(1,x)*ss)
195          * y1(x) = 1/sqrt(pi*x) * (P(1,x)*ss + Q(1,x)*cc)
196          */
197                 if(x>1.0e91L) return (invsqrtpi*ss)/sqrtl(x);
198                 return invsqrtpi*(pone(x)*ss+qone(x)*cc)/sqrtl(x);
199         }
200         if(x<=tiny) {
201             return(-tpi/x);
202         }
203         z = x*x;
204             u = u0[6]; v = v0[6]+z*v0[7];
205             for(i=5;i>=0;i--){
206                 u = u*z + u0[i];
207                 v = v*z + v0[i];
208             }
209         return(x*(u/v) + tpi*(j1l(x)*logl(x)-one/x));
210 }

212 static GENERIC pr0[12] = {
213    1.00000000000000000000000000000000267e+0000L,
214    1.06071787504589145560218084327675800303 5e+0003L,
215    4.34434754289212702444668771218110585233 5e+0005L,
216    8.91568022072400701637792425271741045709 4e+0007L,
217    9.96950225993840606280987325756917127281 9e+0009L,
218    6.20029019313861303564651033870736831659 5e+0011L,
219    2.10597854878801511985181585442224733011 8e+0013L,
220    3.69663577278460123937173081031199836894 8e+0014L,
221    3.01591309792069468205795841253413451515 6e+0015L,
222    9.37029847133935309812327742732859272592 1e+0015L,
223    7.19034900519633596734079926507402944305 7e+0015L,
224    2.73609778624068999688039107492755251798 2e+0014L,
225 };
226 static GENERIC ps0[11] = {
227    1.0e0L,
228    1.06060068754589145560218084327675809510 7e+0003L,
229    4.34310609341697558914715390650533890096 1e+0005L,
230    8.91060586900217656658207224224433399059 e+0007L,
231    9.95912205863508788869071391762205654019 0e+0009L,
232    6.18874496723494823179248294917104184389 4e+0011L,
233    2.09886397695378350640175987380199030490 7e+0013L,
234    3.67287035701806319674672975147993890845 0e+0014L,
235    2.97553841924682492104901152957438588842 0e+0015L,
236    9.06365765999504320501868602928447987091 e+0015L,
237    6.40195334431474791672936644150889271169 1e+0015L,
238 };
239 static GENERIC pr1[12] = {
240    1.00000000000000000000002366752413066098 4e+0000L,
241    6.74615441997961875435480348812645297120 4e+0002L,
242    1.81121078108339015485701833029614597050 2e+0005L,
243    2.53309839037992426803800532909528784224 4e+0007L,
244    2.02968361980534214525233857087542460072 9e+0009L,
245    9.66085966219271146530106940159892998031 9e+0010L,
246    2.74339623864483151993409896771662131631 6e+0012L,
247    4.55309735414085437793102317026345524628 8e+0013L,
248    4.21024506985221975747616986497487072037 4e+0014L,
249    1.98733405622959648507664596717616980172 7e+0015L,
250    4.06712005278709689383897045575133893046 2e+0015L,
251    2.48653960638040639831084526491069139813 3e+0015L,
252 };
253 static GENERIC ps1[14] = {
254    1.0e0L,
255    6.74498254497961875435580868019685952178 2e+0002L,
256    1.81042179539696676203215529044136474035 0e+0005L,
```

```
257    2.5309864606443106515295837596999884835573e+0007L,
258    2.0267432760480231213602492888182902241 45e+0009L,
259    9.6374619244074059352452694070526413418 36e+0010L,
260    2.7323786284237664174022927970283141608 31e+0012L,
261    4.5223452749605271243548443640121842784 88e+0013L,
262    4.1606506683417431326853357584154698565 45e+0014L,
263    1.9437302429888582082434924248924359012 11e+0015L,
264    3.8802285326921279899011316185980674500 01e+0015L,
265    2.1780208161611546158410001736833029997 28e+0015L,
266   -8.9940626668422255515543466981716006341 73e+0013L,
267    1.3685203685088512534957648069346195749 90e+0013L,
268 };
269 static GENERIC pr2[12] = {
270    1.0000000000000000006938651621840396237282e+0000L,
271    3.6584162918504049814071010770379484466 98e+0002L,
272    5.2670737721703565477097946706028124475 37e+0004L,
273    3.9120121012268374630149252107358946204 42e+0006L,
274    1.6512956489741039571938749287141807656 25e+0008L,
275    4.1149011444807976099724849981421467834 99e+0009L,
276    6.0925243097660366815429805725263351476 72e+0010L,
277    5.2639131780712826167192499690741345705 77e+0011L,
278    2.5384085811243242233673410205380813309 94e+0012L,
279    6.2886079293602910278951269830153656776 48e+0012L,
280    6.8483300482111484190470550753865259452 80e+0012L,
281    2.2903096468388679414231781639914232446 90e+0012L,
282 };
283 static GENERIC ps2[14] = {
284    1.0e0L,
285    3.6572444168504050864594101657623198618 56e+0002L,
286    5.2628023584250232439923870758612373063 12e+0004L,
287    3.9058968139599196481362958616614838483 64e+0006L,
288    1.6467919077914612207426948421082027727 63e+0008L,
289    4.0961328030642560222249541202082014373 44e+0009L,
290    6.0466651959159504475444294457306802367 59e+0010L,
291    5.1980617397819913134140522123286532951 68e+0011L,
292    2.4842338518143339664015276264212542797 96e+0012L,
293    6.0478688069253158793396515394343152559 40e+0012L,
294    6.3331038312540916525016425672941018133 54e+0012L,
295    1.8751430987542849944676099369246850249 68e+0012L,
296   -5.2383309205633926929654127625088136015 34e+0010L,
297    4.6568886094393647254277891983837792599 57e+0009L,
298 };
299 static GENERIC pr3[13] = {
300    1.0000000000000009336887318068056137842897e+0000L,
301    2.2427199427284595884880515720028357291 83e+0002L,
302    1.9554506113820265502662577373310956910 92e+0004L,
303    8.7071432939936198993954005624091755907 39e+0005L,
304    2.1862678944870045659483242890109545053 16e+0007L,
305    3.2243285105419577923606915856675028646 88e+0008L,
306    2.8210573551513805973317928968827413648 97e+0009L,
307    1.4453713872954224043655847937960289798 40e+0010L,
308    4.1817431606698913577830110026566581078 64e+0010L,
309    6.3873710887679931193255361377945355139 22e+0010L,
310    4.5756199994127160780640705877674164363 96e+0010L,
311    1.2284156512116391606202844416905035508 42e+0010L,
312    7.2421703498755630534360505321531128820 72e+0008L,
313 };
314 static GENERIC ps3[13] = {
315    1.0e0L,
316    2.2415480677285295510498046104860614010 70e+0002L,
317    1.9528382167955521451321379329312371813 07e+0004L,
318    8.6845749264931857446281273410699745755 26e+0005L,
319    2.1763577710670379629408534128198521891 64e+0007L,
320    3.1999586823561329773192587831671221005 67e+0008L,
321    2.7862189315253346878446752199142018725 70e+0009L,
322    1.4162837769517415496314175231791603976 7e+0010L,
```



```
323    4.0429626592715679487356768346093488429 22e+0010L,
324    6.0281684626466945100838472229684444021 61e+0010L,
325    4.1184102267946414138338876065800852811 11e+0010L,
326    9.9187357362970384307441612533382022302 63e+0009L,
327    4.0929671982380980232191244874373033203 8e+0008L,
328 };
329 static GENERIC pr4[13] = {
330    1.0000000000015092209781573990420595533 90e+0000L,
331    1.4375518683781478511334999963237826077 87e+0002L,
332    7.9113355374181772960415180614045054280 04e+0003L,
333    2.1937109391153172147165189089357561048 04e+0005L,
334    3.3906624951367309625134897965382749843 82e+0006L,
335    3.0486553479293488910060706092938842747 89e+0007L,
336    1.6137816334894966063540451615274509751 95e+0008L,
337    4.9750898350372302771101561500384821599 88e+0008L,
338    8.6360470870151154038809044183395663232 64e+0008L,
339    7.9182029123283661401106712230769491015 09e+0008L,
340    3.4232946657989847334396503117227948532 94e+0008L,
341    5.6219049534419639610405039347826621362 1e+0007L,
342    2.0863035433102402607586704045094844997 93e+0006L,
343 };
344 static GENERIC ps4[13] = {
345    1.0e0L,
346    1.4363799933845323716704933195918473623 04e+0002L,
347    7.8946471547854306780610538488474366594 99e+0003L,
348    2.1846597533920975290089817415508785861 74e+0005L,
349    3.3661090833054651768035137381470494993 61e+0006L,
350    3.0119115459689968176976658666587226343 186e+0007L,
351    1.5822629137796898513167601484594148953 01e+0008L,
352    4.8192688094949379192179385895301382017 70e+0008L,
353    8.2013557629904506797028371234325271548 30e+0008L,
354    7.2682320939825109374174464212823412552 12e+0008L,
355    2.9509119090155729332621313239340364804 62e+0008L,
356    4.2428399243059344230108589665406212193 96e+0007L,
357    1.0643876204450907791821176663304051868 66e+0006L,
358 };
359 static GENERIC pr5[13] = {
360    1.0000000001024348052411714272538473538 61e+0000L,
361    9.1293322570836292590605022490259632348 21e+0001L,
362    3.1322384835869530375761193775045571914 13e+0003L,
363    5.3297825282693079712789431224541711078 61e+0004L,
364    4.9884601571841177906928730021030529441 45e+0005L,
365    2.6866020716157868161470103342560474693 78e+0006L,
366    8.4454185260289611977037998087012683018 31e+0006L,
367    1.5365753586461411574757258899079008273 90e+0007L,
368    1.5684058182365238217968627705865448119 45e+0007L,
369    8.4508762398887701023876186673623021735 47e+0006L,
370    2.1544149001395673284240268271632034460 77e+0006L,
371    2.1056569265650438988884602548080623522 05e+0005L,
372    4.7391650110233965070221343037368628129 75e+0003L,
373 };
374 static GENERIC ps5[13] = {
375    1.0e0L,
376    9.1176135095953274765091526733947038477 93e+0001L,
377    3.1216979724840156393012792292817707951 47e+0003L,
378    5.2944472227358935680409118738345764402 55e+0004L,
379    4.9303688821927723357982566841108878828 07e+0005L,
380    2.6348546856411652983021674357983574377 68e+0006L,
381    8.1854627754003263935558961570318182809 18e+0006L,
382    1.4624174230802151926096686426630306670 86e+0007L,
383    1.4506249939858516759828608441539548960 15e+0007L,
384    7.4604676475619952832190865671620061138 64e+0006L,
385    1.7542109814056124788692271425790563389 65e+0006L,
386    1.4632867211552719715262649145247466995 96e+0005L,
387    2.1558947257967020153412111165798270394 59e+0003L,
388 };
```

```
389 static GENERIC pr6[13] = {
390    1.00000000356485554674173592031574315 7129e+0000L,
391    5.73400393486254045811942350990951028 8366e+0001L,
392    1.20957249193585048608655969229179688 7976e+0003L,
393    1.24339839142228124793367477916366028 6838e+0004L,
394    6.93099675518143793725822099860170827 8787e+0004L,
395    2.19806765953275759864672224996676762 0099e+0005L,
396    4.03365943271205863393317911582057685 8455e+0005L,
397    4.25775965721900802701604720657457435 8678e+0005L,
398    2.51191739587600434948072127744576391 6389e+0005L,
399    7.81375615307062365417873165138188195 3552e+0004L,
400    1.15206917338112788138558809290586435 2891e+0004L,
401    6.54858078280408855377781603755152339 8082e+0002L,
402    8.66872537011690613232754276612793849 6880e+0000L,
403 };
404 static GENERIC ps6[13] = {
405    1.0e0L,
406    5.72228523635711456649922152573628620 5184e+0001L,
407    1.20301084287831793544458295062033957 0506e+0003L,
408    1.23005833578583550155825502172435371 208e+0004L,
409    6.80099855060786128886530043864808989 4412e+0004L,
410    2.13076782959930426298776934753685088 5921e+0005L,
411    3.84048346664391668175993697299215531 0026e+0005L,
412    3.94743237345922554286181914810808116 0393e+0005L,
413    2.23781623939308111148158843445738526 738e+0005L,
414    6.54582049512441972339894627379092154 0774e+0004L,
415    8.72956363032089274150072621327883473 7196e+0003L,
416    4.13076266029189475345017479419699881 3709e+0002L,
417    3.48036889867268464513033578601507559 5598e+0000L,
418 };
419 static GENERIC sixteen = 16.0L;
420 static GENERIC eight   = 8.0L;
421 static GENERIC huge    = 1.0e30L;

423 static GENERIC pone(x)
424 GENERIC x;
425 {
426         GENERIC s,r,t,z;
427         int i;
428         if(x>huge) return one;
429         t = one/x; z = t*t;
430         if(x>sixteen) {
431             r = z*pr0[11]+pr0[10]; s = ps0[10];
432             for(i=9;i>=0;i--) {
433                 r = z*r + pr0[i];
434                 s = z*s + ps0[i];
435             }
436         } else if(x>eight) {
437             r = pr1[11]; s = ps1[11]+z*(ps1[12]+z*ps1[13]);
438             for(i=10;i>=0;i--) {
439                 r = z*r + pr1[i];
440                 s = z*s + ps1[i];
441             }
442         } else if(x>five) {
443             r = pr2[11]; s = ps2[11]+z*(ps2[12]+z*ps2[13]);
444             for(i=10;i>=0;i--) {
445                 r = z*r + pr2[i];
446                 s = z*s + ps2[i];
447             }
448         } else if( x>3.5L) {
449             r = pr3[12]; s = ps3[12];
450             for(i=11;i>=0;i--) {
451                 r = z*r + pr3[i];
452                 s = z*s + ps3[i];
453             }
454         } else if( x>2.5L) {
```



```
455             r = pr4[12]; s = ps4[12];
456             for(i=11;i>=0;i--) {
457                 r = z*r + pr4[i];
458                 s = z*s + ps4[i];
459             }
460         } else if( x> (1.0L/0.5625L)){
461             r = pr5[12]; s = ps5[12];
462             for(i=11;i>=0;i--) {
463                 r = z*r + pr5[i];
464                 s = z*s + ps5[i];
465             }
466         } else {        /* assume x > 1.28 */
467             r = pr6[12]; s = ps6[12];
468             for(i=11;i>=0;i--) {
469                 r = z*r + pr6[i];
470                 s = z*s + ps6[i];
471             }
472         }
473         return r/s;
474 }
475

477 static GENERIC qr0[12] = {
478    3.74999999999999999999999999999999971033e-0001L,
479    4.25672603523705060160768227743309426 2226e+0002L,
480    1.87597649081287848919240997894540106 6066e+0005L,
481    4.17031426804804191427360368031774559 2790e+0007L,
482    5.09275013254385581729345111897455746551e+0009L,
483    3.49474967627848865410350579579413948 3404e+0011L,
484    1.32706214825743731699766781709669417 3709e+0013L,
485    2.64899313827342722690750374206655115 0490e+0014L,
486    2.51169566590954741222243049447399812 7684e+0015L,
487    9.27469450666228904322431049916470230 6096e+0015L,
488    8.15090417066366382933132030291179289 2002e+0015L,
489   -5.00191873370766235577203782962038876 5122e+0014L,
490 };
491 static GENERIC qs0[11] = {
492    1.0e0L,
493    1.13540038022988016042871527398215576 0093e+0003L,
494    5.00570118387712616432676554551659074 4360e+0005L,
495    1.11344420011371216798433760393304010 2987e+0008L,
496    1.36107481992522306277871756569903947 1124e+0010L,
497    9.35575098580284948443893390532598280 9653e+0011L,
498    3.56346278600898882500396554385799808 4828e+0013L,
499    7.15514511390009416364872686380380291 0454e+0014L,
500    6.87126683583447275805555901385184365 4113e+0015L,
501    2.62203089922673671264497498815734523 4092e+0016L,
502    2.60291272917287633065007702170613970 7746e+0016L,
503 };
504 static GENERIC qr1[12] = {
505    3.74999999999999999999776245820728440 5806e-0001L,
506    2.69788399888170683992925551749818998 0485e+0002L,
507    7.75519592578102848938693887047383441 1019e+0004L,
508    1.16677776210401777719821107289552896 8355e+0007L,
509    1.01150477298432116832001008452026106 9362e+0009L,
510    5.24600770357415685357775457172020555 0010e+0010L,
511    1.63769254988559268316611655169126653 7647e+0012L,
512    3.02230362369818566991299031092503938 2495e+0013L,
513    3.15476992729065568484610703026590998 7946e+0014L,
514    1.71581991344155477008973093480812336 0921e+0015L,
515    4.16504435575973262227353444513173618 8510e+0015L,
516    3.15138142087417470564310038170808628 7596e+0015L,
517 };
518 static GENERIC qs1[14] = {
519    1.0e0L,
520    7.19709170535121823978563317240827698 2828e+0002L,
```

```
   2.07001279959954868554488304129760986105 5e+0005L,
   3.11701481531765622187184015277845875451 6e+0007L,
   2.70571967890255497486332587702590297172 7e+0009L,
   1.40611361472734572692506064875086726409 8e+0011L,
   4.40377753606713132036300597863167481735 9e+0012L,
   8.17072569020932228306149938670316724289 4e+0013L,
   8.60945884497549528922779412696443121056 6e+0014L,
   4.76676636701547348125728060069495292020 4e+0015L,
   1.20228658794334219486355794088811564165 0e+0016L,
   1.01247432830620090952506393606175602412 0e+0016L,
   6.18355202267891785827322287961582407070 3e+0014L,
  -9.75673154855822699757373740098822572274 0e+0013L,
};
static GENERIC qr2[12] = {
   3.74999999999999481245647262226994293189 e-0001L,
   1.47136680728977135449118114016735902673 5e+0002L,
   2.27943248676844822014208096284352695125 0e+0004L,
   1.82894304852377122516380404335695828589 3e+0006L,
   8.37982838864782313583222059641772501083 7e+0007L,
   2.27981402933504402458539367127837802205 3e+0009L,
   3.71165395225711812083281778527146644142 0e+0010L,
   3.55765091451855454991673057255310504806 8e+0011L,
   1.92458348314609589625977432949893416065 0e+0012L,
   5.42438625606373639075956708829188714027 8e+0012L,
   6.83932562124177678620650970467174684173 7e+0012L,
   2.70216956314400116629168645230543631397 1e+0012L,
};
static GENERIC qs2[14] = {
   1.0e0L,
   3.92637919443938813570321193389520319108 9e+0002L,
   6.08914880410659829748833606300760931227 6e+0004L,
   4.89354616297327858371137635604161415064 5e+0006L,
   2.24757111911449784504638880181383221940 4e+0008L,
   6.13763566335017775129046933420075787264 5e+0009L,
   1.00511501978410285642449351952499895367 8e+0011L,
   9.72566446201450383286015138460467724062 0e+0011L,
   5.34552510048551111614863419284443463607 2e+0012L,
   1.54994400739894669172086273817395699477 9e+0013L,
   2.06714844117895262571030212416326476036 2e+0013L,
   9.40156540264196361129511948724259546230 1e+0012L,
   3.54821708622398274748837287769709374385 e+0011L,
  -2.93447034171904712007650993843241735236 5e+0010L,
};
static GENERIC qr3[13] = {
   3.74999999999941272408457983329745147209 1e-0001L,
   9.05847858029170621242297849293843558527 e+0001L,
   8.52405603316103875046108366671172438117 1e+0003L,
   4.10596715862910942775343456922363101473 0e+0005L,
   1.11832660337853134825978309197262333365 7e+0007L,
   1.79463668340357891852806490471413232934 3e+0008L,
   1.71431415746363595955613323600436889672 4e+0009L,
   9.62209203223608484657206725726766145603 0e+0009L,
   3.05775952448585915995776285878076835502 0e+0010L,
   5.12930678075479853160962145441593889002 0e+0010L,
   3.99912200279496107068063619434631604135 2e+0010L,
   1.12229845464349348598972156435810034538 8e+0010L,
   5.60398198764598970966883096852236258222 1e+0008L,
};
static GENERIC qs3[13] = {
   1.0e0L,
   2.41832866307657816983615517005363441992 2e+0002L,
   2.27962020590012104258752354128127287552 0e+0004L,
   1.10098422258572952147012901499221709279 4e+0006L,
   3.01074322367924709100426251628665451628 2e+0007L,
   4.86092554282736781728961926521559943399 6e+0008L,
   4.68666811103534869198271586430783958124 3e+0009L,
```



```
   2.66870178840510201742721470594673089407 4e+0010L,
   8.67739574610680264039058094483665058490 3e+0010L,
   1.51193645557495179065849879594510664303 6e+0011L,
   1.26084560443262347800201869687360835309 3e+0011L,
   4.05269227841985385391144023160086458980 5e+0010L,
   2.96551651921222606498326782224332969472 9e+0009L,
};
static GENERIC qr4[13] = {
   3.74999999991923416415466975440123072618 e-0001L,
   5.84421858077681986479116825348505510185 8e+0001L,
   3.48927351409291298267566941137143567022 0e+0003L,
   1.05052363777457568450966343001899547959 4e+0005L,
   1.76454917205970156550071731979278011528 9e+0006L,
   1.72553243884413379502806310268149737115 4e+0007L,
   9.93811484735977853996514024759017633487 4e+0007L,
   3.33171080818459554539688377020077284231 4e+0008L,
   6.27197055764188151160956044487279728269 8e+0008L,
   6.18852979867735707502077492390737913285 e+0008L,
   2.82190530274284997450998216787788501162 9e+0008L,
   4.61546735864691197677329025698432981489 6e+0007L,
   1.34814060873154646739668580269338069327 5e+0006L,
};
static GENERIC qs4[13] = {
   1.0e0L,
   1.56119266311234518526141829638990213337 2e+0002L,
   9.34667803114409827054722542312421308307 2e+0003L,
   2.82585124648229354783802384760170475159 0e+0005L,
   4.77657271162215609171090289112491155629 3e+0006L,
   4.71510695371713540297793804800626785930 2e+0007L,
   2.75396235089431131643965222761120903519 3e+0008L,
   9.42850143461546320776896478750041157522 3e+0008L,
   1.83265085877520678708823689645414157261 7e+0009L,
   1.90169737893974322694892087429659524225 7e+0009L,
   9.43332222685429378062718859922638081272 5e+0008L,
   1.80852054060867160868028452079885858737 0e+0008L,
   7.98334233173666275315721744691946239800 8e+0006L,
};
static GENERIC qr5[13] = {
      3.74999999533136443702898885051519044671 9e-0001L,
      3.73935638176655988267751459304162754791 1e+0001L,
      1.39956250062941352935526546291281980255 1e+0003L,
      2.59415405309894792534533221806221011175 3e+0004L,
      2.64014987929740864039416397939459431837 1e+0005L,
      1.54247185487319914203188909359144939799 5e+0006L,
      5.24227286897205337406757209899233542589 5e+0006L,
      1.02583448776941022132963307142604483993 5e+0007L,
      1.11655392423944894014223057906012420962 2e+0007L,
      6.31807606559591017637491630352588465351 4e+0006L,
      1.64121808616864040852763973591551288178 5e+0006L,
      1.52236979352917864416881388291213470644 4e+0005L,
      2.52653054106229720091418006020866958405 5e+0003L,
};
static GENERIC qs5[13] = {
      1.0e0L,
      9.99896073593507538039754565901628750666 0e+0001L,
      3.75876741784204374268647506054041673756 2e+0003L,
      7.01365280695230652012195974251978078165 3e+0004L,
      7.20894980881861509924652961621173044685 0e+0005L,
      4.27275392710961445541783618607220200925 2e+0006L,
      1.48252441135647069933612981411102543470 3e+0007L,
      2.98875036666567823342527923762770080347 3e+0007L,
      3.39695789026108049269470915055361918506 5e+0007L,
      2.05065248773859300411157809115630454038 6e+0007L,
      5.90050412081173254761651155594627945131 6e+0006L,
      6.56339140926016089702449808227318346834 7e+0005L,
      1.69262984501279020534896673147718704141 9e+0004L,
```

```
};
static GENERIC qr6[13] = {
    3.74999986151666413315756687085897542129 6e-0001L,
    2.36786375674776486312079743159947346891 8e+0001L,
    5.47671580211497624888206732563079314377 7e+0002L,
    6.14319035786984289402501294544096170251 e+0003L,
    3.71625053467799785051373359514046385173 0e+0004L,
    1.27088346382387675213832690502287565743 0e+0005L,
    2.49530144963681448164637166542908380138 8e+0005L,
    2.78957898821295224834048629625439860194 2e+0005L,
    1.71824794691110905593181908713739732463 4e+0005L,
    5.45897321401166571433032673220410636422 9e+0004L,
    7.91210268668794878604894333975959665281 3e+0003L,
    4.07796100616086693572203071514908793809 1e+0002L,
    3.76520697277024508555105723788252851042 8e+0000L,
};
static GENERIC qs6[13] = {
    1.0e0L,
    6.34164653294051730564189385267392680960 1e+0001L,
    1.47705827741404079093259753792067102535 9e+0003L,
    1.67440656403104449143604425339353648760 4e+0004L,
    1.02851650136975594989505080690894650768 e+0005L,
    3.59362004253288529508746350773328543420 7e+0005L,
    7.26792499138102091518587339945372479962 5e+0005L,
    8.46227751076881839996119142620500608308 8e+0005L,
    5.51439989223089216337361189564550025051 4e+0005L,
    1.89808424100925935354062027293218810229 9e+0005L,
    3.10294124211773901572198412308102625306 8e+0004L,
    1.95897118443146690768144065018142108614 3e+0003L,
    2.87885335731049508718172161388945512186 7e+0001L,
};
static GENERIC qone(x)
GENERIC x;
{
        GENERIC s,r,t,z;
        int i;
        if(x>huge) return 0.375L/x;
        t = one/x; z = t*t;
        if(x>sixteen) {
            r = z*qr0[11]+qr0[10]; s = qs0[10];
            for(i=9;i>=0;i--) {
                r = z*r + qr0[i];
                s = z*s + qs0[i];
            }
        } else if(x>eight) {
            r = qr1[11]; s = qs1[11]+z*(qs1[12]+z*qs1[13]);
            for(i=10;i>=0;i--) {
                r = z*r + qr1[i];
                s = z*s + qs1[i];
            }
        } else if (x>five) {    /* x > 5.0 */
            r = qr2[11]; s = qs2[11]+z*(qs2[12]+z*qs2[13]);
            for(i=10;i>=0;i--) {
                r = z*r + qr2[i];
                s = z*s + qs2[i];
            }
        } else if(x>3.5L) {
            r = qr3[12]; s = qs3[12];
            for(i=11;i>=0;i--) {
                r = z*r + qr3[i];
                s = z*s + qs3[i];
            }
        } else if(x>2.5L) {
            r = qr4[12]; s = qs4[12];
            for(i=11;i>=0;i--) {
                r = z*r + qr4[i];
```



```
                s = z*s + qs4[i];
            }
        } else if(x> (1.0L/0.5625L)) {
            r = qr5[12]; s = qs5[12];
            for(i=11;i>=0;i--) {
                r = z*r + qr5[i];
                s = z*s + qs5[i];
            }
        } else {        /* assume x > 1.28 */
            r = qr6[12]; s = qs6[12];
            for(i=11;i>=0;i--) {
                r = z*r + qr6[i];
                s = z*s + qs6[i];
            }
        }
        return t*(r/s);
}
```

```
**********************************************************
    7031 Sat May 10 12:09:00 2014
new/usr/src/lib/libm/common/LD/jnl.c
minor changes
patch06 - libm: fixed compilation issues after updates
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak jnl = __jnl
#pragma weak ynl = __ynl
#endif

/*
 * floating point Bessel's function of the 1st and 2nd kind
 * of order n: jn(n,x),yn(n,x);
 *
 * Special cases:
 *      y0(0)=y1(0)=yn(n,0) = -inf with division by zero signal;
 *      y0(-ve)=y1(-ve)=yn(n,-ve) are NaN with invalid signal.
 * Note 2. About jn(n,x), yn(n,x)
 *      For n=0, j0(x) is called,
 *      for n=1, j1(x) is called,
 *      for n<x, forward recursion us used starting
 *      from values of j0(x) and j1(x).
 *      for n>x, a continued fraction approximation to
 *      j(n,x)/j(n-1,x) is evaluated and then backward
 *      recursion is used starting from a supposed value
 *      for j(n,x). The resulting value of j(0,x) is
 *      compared with the actual value to correct the
 *      supposed value of j(n,x).
 *
 *      yn(n,x) is similar in all respects, except
 *      that forward recursion is used for all
 *      values of n>1.
 *
 */
```



```
#include "libm.h"
#include "longdouble.h"
#include <float.h>      /* LDBL_MAX */

#define GENERIC long double

static const GENERIC
invsqrtpi= 5.64189583547756286948079451560772585844l-0001L,
two  = 2.0L,
zero = 0.0L,
one  = 1.0L;

GENERIC
jnl(n,x) int n; GENERIC x;{
        int i, sgn;
        GENERIC a, b, temp = 0, z, w;

    /* J(-n,x) = (-1)^n * J(n, x), J(n, -x) = (-1)^n * J(n, x)
     * Thus, J(-n,x) = J(n,-x)
     */
        if(n<0){
                n = -n;
                x = -x;
        }
        if(n==0) return(j0l(x));
        if(n==1) return(j1l(x));
        if(x!=x) return x+x;
        if((n&1)==0)
                sgn=0;                  /* even n */
        else
                sgn = signbitl(x);      /* old n  */
        x = fabsl(x);
        if(x == zero||!finitel(x)) b = zero;
        else if((GENERIC)n<=x) {        /* Safe to use
                                           J(n+1,x)=2n/x *J(n,x)-J(n-1,x)
                                         */
            if(x>1.0e91L) {     /* x >> n**2
                                    Jn(x) = cos(x-(2n+1)*pi/4)*sqrt(2/x*pi)
                                    Yn(x) = sin(x-(2n+1)*pi/4)*sqrt(2/x*pi)
                                    Let s=sin(x), c=cos(x),
                                        xn=x-(2n+1)*pi/4, sqt2 = sqrt(2),then

                                           n    sin(xn)*sqt2    cos(xn)*sqt2
                                        ----------------------------------
                                           0     s-c             c+s
                                           1    -s-c            -c+s
                                           2    -s+c            -c-s
                                           3     s+c             c-s
                                */
                switch(n&3) {
                    case 0: temp =  cosl(x)+sinl(x); break;
                    case 1: temp = -cosl(x)+sinl(x); break;
                    case 2: temp = -cosl(x)-sinl(x); break;
                    case 3: temp =  cosl(x)-sinl(x); break;
                }
                b = invsqrtpi*temp/sqrtl(x);
            } else {
                a = j0l(x);
                b = j1l(x);
                for(i=1;i<n;i++){
                    temp = b;
                    b = b*((GENERIC)(i+i)/x) - a; /* avoid underflow */
                    a = temp;
                }
            }
```

```
125         } else {
126             if(x<1e-17L) {      /* use J(n,x) = 1/n!*(x/2)^n */
127                 b = powl(0.5L*x,(GENERIC) n);
128                 if (b!=zero) {
129                     for(a=one,i=1;i<=n;i++) a *= (GENERIC)i;
130                     b = b/a;
131                 }
132             } else {
133                 /* use backward recurrence */
134                 /*                          x      x^2      x^2
135                  *  J(n,x)/J(n-1,x) =  ----   ------   ------   .....
136                  *                          2n  - 2(n+1) - 2(n+2)
137                  *
138                  *                          1      1        1
139                  *  (for large x)   =  ----  ------   ------   .....
140                  *                          2n   2(n+1)   2(n+2)
141                  *                          -- - ------ - ------ -
142                  *                           x     x         x
143                  *
144                  * Let w = 2n/x and h=2/x, then the above quotient
145                  * is equal to the continued fraction:
146                  *                   1
147                  *      = -----------------------
148                  *                  1
149                  *         w - -----------------
150                  *                    1
151                  *              w+h - ---------
152                  *                    w+2h - ...
153                  *
154                  * To determine how many terms needed, let
155                  * Q(0) = w, Q(1) = w(w+h) - 1,
156                  * Q(k) = (w+k*h)*Q(k-1) - Q(k-2),
157                  * When Q(k) > 1e4      good for single
158                  * When Q(k) > 1e9      good for double
159                  * When Q(k) > 1e17     good for quaduple
160                  */
161             /* determin k */
162                 GENERIC t,v;
163                 double q0,q1,h,tmp; int k,m;
164                 w  = (n+n)/(double)x; h = 2.0/(double)x;
165                 q0 = w;  z = w+h; q1 = w*z - 1.0; k=1;
166                 while(q1<1.0e17) {
167                         k += 1; z += h;
168                         tmp = z*q1 - q0;
169                         q0 = q1;
170                         q1 = tmp;
171                 }
172                 m = n+n;
173                 for(t=zero, i = 2*(n+k); i>=m; i -= 2) t = one/(i/x-t);
174                 a = t;
175                 b = one;
176                 /* estimate log((2/x)^n*n!) = n*log(2/x)+n*ln(n)
177                    hence, if n*(log(2n/x)) > ...
178                     single 8.8722839355e+01
179                     double 7.09782712893383973096e+02
180                     long double 1.13565234062941439494919310779707650060170e+04
181                     then recurrent value may overflow and the result is
182                     likely underflow to zero
183                  */
184                 tmp = n;
185                 v = two/x;
186                 tmp = tmp*logl(fabsl(v*tmp));
187                 if(tmp<1.13565234062941439494919310779707650060170e+04L) {
188                     for(i=n-1;i>0;i--){
189                         temp = b;
190                         b = ((i+i)/x)*b - a;
```



```
191                         a = temp;
192                     }
193                 } else {
194                     for(i=n-1;i>0;i--){
195                         temp = b;
196                         b = ((i+i)/x)*b - a;
197                         a = temp;
198                         if(b>1e1000L) {
199                             a /= b;
200                             t /= b;
201                             b  = 1.0;
202                         }
203                     }
204                 }
205                 b = (t*j0l(x)/b);
206             }
207         }
208         if(sgn==1) return -b; else return b;
209 }

211 GENERIC ynl(n,x)
212 int n; GENERIC x;{
213         int i;
214         int sign;
215         GENERIC a, b, temp = 0;

217         if(x!=x)
218                 return x+x;
219         if (x <= zero) {
220                 if(x==zero)
221                         return -one/zero;
222                 else
223                         return zero/zero;
224         }
225         sign = 1;
226         if(n<0){
227                 n = -n;
228                 if((n&1) == 1) sign = -1;
229         }
230         if(n==0) return(y0l(x));
231         if(n==1) return(sign*y1l(x));
232         if(!finitel(x)) return zero;

234         if(x>1.0e91L) { /* x >> n**2
235                                     Jn(x) = cos(x-(2n+1)*pi/4)*sqrt(2/x*pi)
236                                     Yn(x) = sin(x-(2n+1)*pi/4)*sqrt(2/x*pi)
237                                     Let s=sin(x), c=cos(x),
238                                         xn=x-(2n+1)*pi/4, sqt2 = sqrt(2),then

240                                            n    sin(xn)*sqt2    cos(xn)*sqt2
241                                         ----------------------------------
242                                            0     s-c              c+s
243                                            1    -s-c             -c+s
244                                            2    -s+c             -c-s
245                                            3     s+c              c-s
246                                 */
247                 switch(n&3) {
248                     case 0: temp =  sinl(x)-cosl(x); break;
249                     case 1: temp = -sinl(x)-cosl(x); break;
250                     case 2: temp = -sinl(x)+cosl(x); break;
251                     case 3: temp =  sinl(x)+cosl(x); break;
252                 }
253                 b = invsqrtpi*temp/sqrtl(x);
254         } else {
255                 a = y0l(x);
256                 b = y1l(x);
```

```
257                 /*
258                  * fix 1262058 and take care of non-default rounding
259                  */
260                 for (i = 1; i < n; i++) {
261                         temp = b;
262                         b *= (GENERIC) (i + i) / x;
263                         if (b <= -LDBL_MAX)
264                                 break;
265                         b -= a;
266                         a = temp;
267                 }
268         }
269         if(sign>0) return b; else return -b;
270 }
```

```
**********************************************************
    1350 Sat May 10 12:09:00 2014
new/usr/src/lib/libm/common/LD/lgammal.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak lgammal = __lgammal

/*
 * long double lgammal(long double x);
 */

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

extern int signgam;
extern int signgaml;

long double
lgammal(long double x) {
        long double y = __k_lgammal(x, &signgaml);

        signgam = signgaml;     /* SUSv3 requires the setting of signgam */
        return y;
}
```

```
**********************************************************
    1235 Sat May 10 12:09:00 2014
new/usr/src/lib/libm/common/LD/lgammal_r.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * long double lgammal_r(long double x, int *signgamlp);
 */

#pragma weak lgammal_r = __lgammal_r

#include "libm.h"
#include "longdouble.h"

long double
lgammal_r(long double x, int *signgamlp) {
        return __k_lgammal(x, signgamlp);
}
```

```
**********************************************************
    1619 Sat May 10 12:09:00 2014
new/usr/src/lib/libm/common/LD/log1pl.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak log1pl = __log1pl
#endif

/*
 * log1pl(x)
 * Kahan's trick based on log(1+x)/x being a slow varying function.
 */

#include "libm.h"

#if defined(__x86)
#define __swapRD        __swap87RD
#endif
extern enum fp_direction_type __swapRD(enum fp_direction_type);

long double
log1pl(long double x) {
        long double y;
        enum fp_direction_type rd;

        if (x != x)
                return (x + x);
        if (x < -1.L)
                return (logl(x));
        rd = __swapRD(fp_nearest);
        y = 1.L + x;
        if (y != 1.L) {
                if (y == x)
                        x = logl(x);
                else
```



```
                        x *= logl(y) / (y - 1.L);
        }
        if (rd != fp_nearest)
                (void) __swapRD(rd);
        return (x);
}
```

```
**********************************************************
    2495 Sat May 10 12:09:00 2014
new/usr/src/lib/libm/common/LD/logbl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak logbl = __logbl
#endif

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */
#define _C99SUSv3_logb  _C99SUSv3_logb_subnormal_is_like_ilogb

#if defined(__sparc)
#define ISNORMALL(k, x) (k != 0x7fff)                   /* assuming k != 0 */
#define X86PDNRM(k, x)
#define XSCALE_OFFSET   0x406f                          /* 0x3fff + 112 */
static const long double xscale = 5192296858534827628530496329220096.0L;
                                                        /* 2^112 */
#elif defined(__x86)
/*
 * if pseudo-denormal, replace by the equivalent normal
 */
#define X86PDNRM(k, x)  if (k == 0 && (((int *) &x)[1] & 0x80000000) != 0) \
                                ((int *) &x)[2] |= k = 1
#if defined(HANDLE_UNSUPPORTED)                         /* assuming k != 0 */
#define ISNORMALL(k, x) (k != 0x7fff && (((int *) &x)[1] & 0x80000000) != 0)
#else
#define ISNORMALL(k, x) (k != 0x7fff)
#endif
#define XSCALE_OFFSET   0x403e                          /* 0x3fff + 63 */
static const long double xscale = 9223372036854775808.0L;       /* 2^63 */
#endif

static long double
raise_division(long double v) {
#pragma STDC FENV_ACCESS ON
```



```
        static const long double zero = 0.0L;
        return (v / zero);
}

long double
logbl(long double x) {
        int k = XBIASED_EXP(x);

        X86PDNRM(k, x);
        if (k == 0) {
                if (ISZEROL(x))
                        return (raise_division(-1.0L));
                else if ((__xpg6 & _C99SUSv3_logb) != 0) {
                        x *= xscale;            /* scale up by 2^112 or 2^63 */
                        return (long double) (XBIASED_EXP(x) - XSCALE_OFFSET);
                } else
                        return ((long double) (-16382));
        } else if (ISNORMALL(k, x))
                return ((long double) (k - 0x3fff));
        else
                return (x * x);
}
```

```
**********************************************************
    6381 Sat May 10 12:09:00 2014
new/usr/src/lib/libm/common/LD/longdouble.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#include <sys/ieeefp.h>

extern long double __k_cosl(long double, long double);
extern long double __k_lgammal(long double, int *);
extern long double __k_sincosl(long double, long double, long double *);
extern long double __k_sinl(long double, long double);
extern long double __k_tanl(long double, long double, int);
extern long double __poly_libmq(long double, int, long double *);
extern int __rem_pio2l(long double, long double *);

extern long double acosdl(long double);
extern long double acoshl(long double);
extern long double acosl(long double);
extern long double acospil(long double);
extern long double acospl(long double);
extern long double aintl(long double);
extern long double anintl(long double);
extern long double annuityl(long double, long double);
extern long double asindl(long double);
extern long double asinhl(long double);
extern long double asinl(long double);
extern long double asinpil(long double);
extern long double asinpl(long double);
extern long double atan2dl(long double, long double);
extern long double atan2l(long double, long double);
extern long double atan2pil(long double, long double);
extern long double atandl(long double);
extern long double atanhl(long double);
extern long double atanl(long double);
extern long double atanpil(long double);
extern long double atanpl(long double);
extern long double cbrtl(long double);
```



```
extern long double ceill(long double);
extern long double compoundl(long double, long double);
extern long double copysignl(long double, long double);
extern long double cosdl(long double);
extern long double coshl(long double);
extern long double cosl(long double);
extern long double cospil(long double);
extern long double cospl(long double);
extern long double erfcl(long double);
extern long double erfl(long double);
extern long double exp10l(long double);
extern long double exp2l(long double);
extern long double expl(long double);
extern long double expm1l(long double);
extern long double fabsl(long double);
extern int finitel(long double);
extern long double floorl(long double);
extern long double fmodl(long double, long double);
extern enum fp_class_type fp_classl(long double);
extern long double gammal(long double);
extern long double hypotl(long double, long double);
extern int ilogbl(long double);
extern long double infinityl(void);
extern int irintl(long double);
extern int isinfl(long double);
extern int isnanl(long double);
extern int isnormall(long double);
extern int issubnormall(long double);
extern int iszerol(long double);
extern long double j0l(long double);
extern long double j1l(long double);
extern long double jnl(int, long double);
extern long double lgammal(long double);
extern long double log10l(long double);
extern long double log1pl(long double);
extern long double log2l(long double);
extern long double logbl(long double);
extern long double logl(long double);
extern long double max_normall(void);
extern long double max_subnormall(void);
extern long double min_normall(void);
extern long double min_subnormall(void);
extern long double nextafterl(long double, long double);
extern int nintl(long double);
extern long double pow_li(long double *, int *);
extern long double powl(long double, long double);
extern long double quiet_nanl(long);
extern long double remainderl(long double, long double);
extern long double rintl(long double);
extern long double scalbl(long double, long double);
extern long double scalbnl(long double, int);
extern long double signaling_nanl(long);
extern int signbitl(long double);
extern long double significandl(long double);
extern void sincosdl(long double, long double *, long double *);
extern void sincosl(long double, long double *, long double *);
extern void sincospil(long double, long double *, long double *);
extern void sincospl(long double, long double *, long double *);
extern long double sindl(long double);
extern long double sinhl(long double);
extern long double sinl(long double);
extern long double sinpil(long double);
extern long double sinpl(long double);
extern long double sqrtl(long double);
extern long double tandl(long double);
extern long double tanhl(long double);
```

```
128 extern long double tanl(long double);
129 extern long double tanpil(long double);
130 extern long double tanpl(long double);
131 extern long double y0l(long double);
132 extern long double y1l(long double);
133 extern long double ynl(int, long double);

135 extern long double q_copysign_(long double *, long double *);
136 extern long double q_fabs_(long double *);
137 extern int iq_finite_(long double *);
138 extern long double q_fmod_(long double *, long double *);
139 extern enum fp_class_type iq_fp_class_(long double *);
140 extern int iq_ilogb_(long double *);
141 extern long double q_infinity_(void);
142 extern int iq_isinf_(long double *);
143 extern int iq_isnan_(long double *);
144 extern int iq_isnormal_(long double *);
145 extern int iq_issubnormal_(long double *);
146 extern int iq_iszero_(long double *);
147 extern long double q_max_normal_(void);
148 extern long double q_max_subnormal_(void);
149 extern long double q_min_normal_(void);
150 extern long double q_min_subnormal_(void);
151 extern long double q_nextafter_(long double *, long double *);
152 extern long double q_quiet_nan_(long *);
153 extern long double q_remainder_(long double *, long double *);
154 extern long double q_scalbn_(long double *, int *);
155 extern long double q_signaling_nan_(long *);
156 extern int iq_signbit_(long double *);
```

```
**********************************************************
    2759 Sat May 10 12:09:00 2014
new/usr/src/lib/libm/common/LD/nextafterl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak nextafterl = __nextafterl
#endif

#include "libm.h"
#include <float.h>              /* LDBL_MAX, LDBL_MIN */

#if defined(__sparc)
#define n0      0
#define n1      1
#define n2      2
#define n3      3
#define X86PDNRM1(x)
#define INC(px) { \
                        if (++px[n3] == 0) \
                                if (++px[n2] == 0) \
                                        if (++px[n1] == 0) \
                                                ++px[n0]; \
                }
#define DEC(px) { \
                        if (--px[n3] == 0xffffffff) \
                                if (--px[n2] == 0xffffffff) \
                                        if (--px[n1] == 0xffffffff) \
                                                --px[n0]; \
                }
#elif defined(__x86)
#define n0      2
#define n1      1
#define n2      0
#define n3      0
/*
 * if pseudo-denormal, replace by the equivalent normal
```



```
 */
#define X86PDNRM1(x)    if (XBIASED_EXP(x) == 0 && (((int *) &x)[1] & \
                                0x80000000) != 0) \
                                ((int *) &x)[2] |= 1
#define INC(px) { \
                        if (++px[n2] == 0) \
                                if ((++px[n1] & ~0x80000000) == 0) \
                                        px[n1] = 0x80000000, ++px[n0]; \
                }
#define DEC(px) { \
                        if (--px[n2] == 0xffffffff) \
                                if (--px[n1] == 0x7fffffff) \
                                        if ((--px[n0] & 0x7fff) != 0) \
                                                px[n1] |= 0x80000000; \
                }
#endif

long double
nextafterl(long double x, long double y) {
        int *px = (int *) &x;
        int *py = (int *) &y;

        if (x == y)
                return (y);             /* C99 requirement */
        if (x != x || y != y)
                return (x * y);

        if (ISZEROL(x)) {       /* x == 0.0 */
                px[n0] = py[n0] & XSGNMSK;
                px[n1] = px[n2] = 0;
                px[n3] = 1;
        } else {
                X86PDNRM1(x);
                if ((px[n0] & XSGNMSK) == 0) {  /* x > 0.0 */
                        if (x > y)      /* x > y */
                                DEC(px)
                        else
                                INC(px)
                } else {
                        if (x < y)      /* x < y */
                                DEC(px)
                        else
                                INC(px)
                }
        }
#ifndef lint
        {
                volatile long double dummy;
                int k = XBIASED_EXP(x);

                if (k == 0)
                        dummy = LDBL_MIN * copysignl(LDBL_MIN, x);
                else if (k == 0x7fff)
                        dummy = LDBL_MAX * copysignl(LDBL_MAX, x);
        }
#endif
        return (x);
}
```

```
**********************************************************
    1768 Sat May 10 12:09:00 2014
new/usr/src/lib/libm/common/LD/scalbl.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak scalbl = __scalbl

/*
 * scalbl(x,n): return x * 2**n by manipulating exponent.
 */

#include "libm.h"
#include "longdouble.h"

#include <sys/isa_defs.h>

long double
scalbl(long double x, long double fn) {
        int *py = (int *) &fn, n;
        long double z;

        if (isnanl(x) || isnanl(fn))
                return x * fn;

        /* fn is +/-Inf */
#if defined(_BIG_ENDIAN)
        if ((py[0] & 0x7fff0000) == 0x7fff0000) {
                if ((py[0] & 0x80000000) != 0)
#else
        if ((py[2] & 0x7fff) == 0x7fff) {
                if ((py[2] & 0x8000) != 0)
#endif
                        return x / (-fn);
                else
                        return x * fn;
        }
```



```
        if (rintl(fn) != fn)
                return (fn - fn) / (fn - fn);
        if (fn > 65000.0L)
                z = scalbnl(x, 65000);
        else if (-fn > 65000.0L)
                z = scalbnl(x, -65000);
        else {
                n = (int) fn;
                z = scalbnl(x, n);
        }
        return z;
}
```

****
1121 Sat May 10 12:09:01 2014
new/usr/src/lib/libm/common/LD/signgaml.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#pragma weak signgaml = __signgaml

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

int signgaml = 0;
```

```
**********************************************************
    1253 Sat May 10 12:09:01 2014
new/usr/src/lib/libm/common/LD/significandl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak significandl = __significandl
#endif

#include "libm.h"

long double
significandl(long double x) {
        if (ISZEROL(x) || XBIASED_EXP(x) == 0x7fff)     /* 0/+-Inf/NaN */
                return (x + x);
        else
                return (scalbnl(x, -ilogbl(x)));
}
```

```
**********************************************************
    2927 Sat May 10 12:09:01 2014
new/usr/src/lib/libm/common/LD/sincosl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak sincosl = __sincosl

/* INDENT OFF */
/* cosl(x)
 * Table look-up algorithm by K.C. Ng, November, 1989.
 *
 * kernel function:
 *      __k_sincosl     ... sin and cos function on [-pi/4,pi/4]
 *      __rem_pio2l     ... argument reduction routine
 *
 * Method.
 *      Let S and C denote the sin and cos respectively on [-PI/4, +PI/4].
 *      1. Assume the argument x is reduced to y1+y2 = x-k*pi/2 in
 *         [-pi/2 , +pi/2], and let n = k mod 4.
 *      2. Let S=S(y1+y2), C=C(y1+y2). Depending on n, we have
 *
 *          n        sin(x)      cos(x)        tan(x)
 *     ----------------------------------------------------------
 *          0          S           C             S/C
 *          1          C          -S            -C/S
 *          2         -S          -C             S/C
 *          3         -C           S            -C/S
 *     ----------------------------------------------------------
 *
 * Special cases:
 *      Let trig be any of sin, cos, or tan.
 *      trig(+-INF)  is NaN, with signals;
 *      trig(NaN)    is that NaN;
 *
 * Accuracy:
 *      computer TRIG(x) returns trig(x) nearly rounded.
```



```
 */
/* INDENT ON */

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

#include <sys/isa_defs.h>

void
sincosl(long double x, long double *s, long double *c) {
        long double y[2], z = 0.0L;
        int n, ix;
#if defined(__i386) || defined(__amd64)
        int *px = (int *) &x;
#endif

        /* trig(Inf or NaN) is NaN */
        if (!finitel(x)) {
                *s = *c = x - x;
                return;
        }

        /* High word of x. */
#if defined(__i386) || defined(__amd64)
        XTOI(px, ix);
#else
        ix = *(int *) &x;
#endif

        /* |x| ~< pi/4 */
        ix &= 0x7fffffff;
        if (ix <= 0x3ffe9220)
                *s = __k_sincosl(x, z, c);

        /* argument reduction needed */
        else {
                n = __rem_pio2l(x, y);
                switch (n & 3) {
                case 0:
                        *s = __k_sincosl(y[0], y[1], c);
                        break;
                case 1:
                        *c = -__k_sincosl(y[0], y[1], s);
                        break;
                case 2:
                        *s = -__k_sincosl(y[0], y[1], c);
                        *c = -*c;
                        break;
                case 3:
                        *c = __k_sincosl(y[0], y[1], s);
                        *s = -*s;
                }
        }
}
```

```
**********************************************************
    6047 Sat May 10 12:09:01 2014
new/usr/src/lib/libm/common/LD/sincospil.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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#pragma weak sincospil = __sincospil

/*
 * void sincospil(long double x, long double *s, long double *c)
 * *s = sinl(pi*x); *c = cosl(pi*x);
 *
 * Algorithm, 10/17/2002, K.C. Ng
 * ------------------------------
 * Let y = |4x|, z = floor(y), and n = (int)(z mod 8.0) (displayed in binary).
 *      1. If y==z, then x is a multiple of pi/4. Return the following values:
 *              ---------------------------------------------------
 *                n  x mod 2    sin(x*pi)    cos(x*pi)   tan(x*pi)
 *              ---------------------------------------------------
 *               000  0.00       +0 ___       +1 ___       +0
 *               001  0.25       +\/0.5       +\/0.5       +1
 *               010  0.50       +1 ___       +0 ___       +inf
 *               011  0.75       +\/0.5       -\/0.5       -1
 *               100  1.00       -0 ___       -1 ___       +0
 *               101  1.25       -\/0.5       -\/0.5       +1
 *               110  1.50       -1 ___       -0 ___       +inf
 *               111  1.75       -\/0.5       +\/0.5       -1
 *              ---------------------------------------------------
 *      2. Otherwise,
 *              ---------------------------------------------------
 *                n     t        sin(x*pi)    cos(x*pi)   tan(x*pi)
 *              ---------------------------------------------------
 *               000  (y-z)/4     sinpi(t)     cospi(t)    tanpi(t)
 *               001  (z+1-y)/4   cospi(t)     sinpi(t)    1/tanpi(t)
 *               010  (y-z)/4     cospi(t)    -sinpi(t)   -1/tanpi(t)
 *               011  (z+1-y)/4   sinpi(t)    -cospi(t)   -tanpi(t)
 *               100  (y-z)/4    -sinpi(t)    -cospi(t)    tanpi(t)
```



```
 *               101  (z+1-y)/4  -cospi(t)    -sinpi(t)    1/tanpi(t)
 *               110  (y-z)/4    -cospi(t)     sinpi(t)   -1/tanpi(t)
 *               111  (z+1-y)/4  -sinpi(t)     cospi(t)   -tanpi(t)
 *              ---------------------------------------------------
 *
 * NOTE. This program compute sinpi/cospi(t<0.25) by __k_sin/cos(pi*t, 0.0).
 * This will return a result with error slightly more than one ulp (but less
 * than 2 ulp). If one wants accurate result,  one may break up pi*t in
 * high (tpi_h) and low (tpi_l) parts and call __k_sin/cos(tip_h, tip_lo)
 * instead.
 */

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

#include <sys/isa_defs.h>

#define I(q, m) ((int *) &(q))[m]
#define U(q, m) ((unsigned *) &(q))[m]
#if defined(__i386) || defined(__amd64)
#define LDBL_MOST_SIGNIF_I(ld)  ((I(ld, 2) << 16) | (0xffff & (I(ld, 1) >> 15)))
#define LDBL_LEAST_SIGNIF_U(ld) U(ld, 0)
#define PREC    64
#define PRECM1  63
#define PRECM2  62
static const long double twoPRECM2 = 9.22337203685477580800000000000000e+18L;
#else
#define LDBL_MOST_SIGNIF_I(ld)  I(ld, 0)
#define LDBL_LEAST_SIGNIF_U(ld) U(ld, sizeof(long double) / sizeof(int) - 1)
#define PREC    113
#define PRECM1  112
#define PRECM2  111
static const long double twoPRECM2 = 5.19229685853482762853049632922009 6e+33L;
#endif

static const long double
zero    = 0.0L,
quater  = 0.25L,
one     = 1.0L,
pi      = 3.14159265358979323846264338327950288419 7e+0000L,
sqrth   = 0.70710678118654752440084436210484903928483593768847 4,
tiny    = 1.0e-100;

void
sincospil(long double x, long double *s, long double *c) {
        long double y, z, t;
        int hx, n, k;
        unsigned lx;

        hx = LDBL_MOST_SIGNIF_I(x);
        lx = LDBL_LEAST_SIGNIF_U(x);
        k = ((hx & 0x7fff0000) >> 16) - 0x3fff;
        if (k >= PRECM2) {              /* |x| >= 2**(Prec-2) */
                if (k >= 16384) {
                        *s = *c = x - x;
                }
                else {
                        if (k >= PREC) {
                                *s = zero;
                                *c = one;
                        }
                        else if (k == PRECM1) {
                                if ((lx & 1) == 0) {
                                        *s = zero;
                                        *c = one;
```

```
127                                 }
128                                 else {
129                                         *s = -zero;
130                                         *c = -one;
131                                 }
132                         }
133                         else {  /* k = Prec - 2 */
134                                 if ((lx & 1) == 0) {
135                                         *s = zero;
136                                         *c = one;
137                                 }
138                                 else {
139                                         *s = one;
140                                         *c = zero;
141                                 }
142                                 if ((lx & 2) != 0) {
143                                         *s = -*s;
144                                         *c = -*c;
145                                 }
146                         }
147                 }
148         }
149         else if (k < -2)        /* |x| < 0.25 */
150                 *s = __k_sincosl(pi * fabsl(x), zero, c);
151         else {
152                 /* y = |4x|, z = floor(y), and n = (int)(z mod 8.0) */
153                 y = 4.0L * fabsl(x);
154                 if (k < PRECM2) {
155                         z = y + twoPRECM2;
156                         n = LDBL_LEAST_SIGNIF_U(z) & 7; /* 3 LSb of z */
157                         t = z - twoPRECM2;
158                         k = 0;
159                         if (t == y)
160                                 k = 1;
161                         else if (t > y) {
162                                 n -= 1;
163                                 t = quater + (y - t) * quater;
164                         }
165                         else
166                                 t = (y - t) * quater;
167                 }
168                 else {  /* k = Prec-3 */
169                         n = LDBL_LEAST_SIGNIF_U(y) & 7; /* 3 LSb of z */
170                         k = 1;
171                 }
172                 if (k) {        /* x = N/4 */
173                         if((n & 1) != 0)
174                                 *s = *c = sqrth + tiny;
175                         else
176                                 if ((n & 2) == 0) {
177                                         *s = zero;
178                                         *c = one;
179                                 }
180                                 else {
181                                         *s = one;
182                                         *c = zero;
183                                 }
184                         if ((n & 4) != 0)
185                                 *s = -*s;
186                         if (((n + 1) & 4) != 0)
187                                 *c = -*c;
188                 }
189                 else {
190                         if ((n & 1) != 0)
191                                 t = quater - t;
192                         if (((n + (n & 1)) & 2) == 0)
```



```
193                                 *s = __k_sincosl(pi * t, zero, c);
194                         else
195                                 *c = __k_sincosl(pi * t, zero, s);
196                         if ((n & 4) != 0)
197                                 *s = -*s;
198                         if (((n + 2) & 4) != 0)
199                                 *c = -*c;
200                 }
201         }
202         if (hx < 0)
203                 *s = -*s;
204 }
205 #undef U
206 #undef LDBL_LEAST_SIGNIF_U
207 #undef I
208 #undef LDBL_MOST_SIGNIF_I
```

```
**********************************************************
    2239 Sat May 10 12:09:01 2014
new/usr/src/lib/libm/common/LD/sinhl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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```

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 */

#pragma weak sinhl = __sinhl

#include "libm.h"
#include "longdouble.h"

/* SINH(X)
 * RETURN THE HYPERBOLIC SINE OF X
 *
 * Method :
 *      1. reduce x to non-negative by SINH(-x) = - SINH(x).
 *      2.
 *                                                  EXPM1(x) + EXPM1(x)/(EXPM1(x)+1)
 *          0 <= x <= lnovft     : SINH(x) := -------------------------------
 *                                                          2
 *
 *     lnovft <= x <  INF        : SINH(x) := EXP(x-MEP1*ln2)*2**ME
 *
 * here
 *      lnovft          logarithm of the overflow threshold
 *                      = MEP1*ln2 chopped to machine precision.
 *      ME              maximum exponent
 *      MEP1            maximum exponent plus 1
 *
 * Special cases:
 *      SINH(x) is x if x is +INF, -INF, or NaN.
 *      only SINH(0)=0 is exact for finite argument.
 *
 */

static const long double C[] = {
```



```
        0.5L,
        1.0L,
        1.13565234062941394879149e+04L,
        7.00444768624254908785898 5e-16L
};

#define half    C[0]
#define one     C[1]
#define lnovft  C[2]
#define lnovlo  C[3]

long double
sinhl(long double x)
{
        long double     r, t;

        if (!finitel(x))
                return (x + x); /* x is INF or NaN */
        r = fabsl(x);
        if (r < lnovft) {
                t = expm1l(r);
                r = copysignl((t + t / (one + t)) * half, x);
        } else {
                r = copysignl(expl((r - lnovft) - lnovlo), x);
                r = scalbnl(r, 16383);
        }
        return (r);
}
```

```
**********************************************************
    2866 Sat May 10 12:09:01 2014
new/usr/src/lib/libm/common/LD/sinl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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#pragma weak sinl = __sinl

/* INDENT OFF */
/* sinl(x)
 * Table look-up algorithm by K.C. Ng, November, 1989.
 *
 * kernel function:
 *      __k_sinl                ... sin function on [-pi/4,pi/4]
 *      __k_cosl                ... cos function on [-pi/4,pi/4]
 *      __rem_pio2l     ... argument reduction routine
 *
 * Method.
 *      Let S and C denote the sin and cos respectively on [-PI/4, +PI/4].
 *      1. Assume the argument x is reduced to y1+y2 = x-k*pi/2 in
 *         [-pi/2 , +pi/2], and let n = k mod 4.
 *      2. Let S=S(y1+y2), C=C(y1+y2). Depending on n, we have
 *
 *          n        sin(x)      cos(x)        tan(x)
 *     ----------------------------------------------------------
 *          0          S           C             S/C
 *          1          C          -S            -C/S
 *          2         -S          -C             S/C
 *          3         -C           S            -C/S
 *     ----------------------------------------------------------
 *
 * Special cases:
 *      Let trig be any of sin, cos, or tan.
 *      trig(+-INF)  is NaN, with signals;
 *      trig(NaN)    is that NaN;
 *
 * Accuracy:
```



```
 *      computer TRIG(x) returns trig(x) nearly rounded.
 */
/* INDENT ON */

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

#include <sys/isa_defs.h>

long double
sinl(long double x) {
        long double y[2], z = 0.0L;
        int n, ix;
#if defined(__i386) || defined(__amd64)
        int *px = (int *) &x;
#endif

        /* sin(Inf or NaN) is NaN */
        if (!finitel(x))
                return x - x;

        /* High word of x. */
#if defined(__i386) || defined(__amd64)
        XTOI(px, ix);
#else
        ix = *(int *) &x;
#endif
        /* |x| ~< pi/4 */
        ix &= 0x7fffffff;
        if (ix <= 0x3ffe9220)
                return __k_sinl(x, z);

        /* argument reduction needed */
        else {
                n = __rem_pio2l(x, y);
                switch (n & 3) {
                case 0:
                        return __k_sinl(y[0], y[1]);
                case 1:
                        return __k_cosl(y[0], y[1]);
                case 2:
                        return -__k_sinl(y[0], y[1]);
                case 3:
                        return -__k_cosl(y[0], y[1]);
                /* NOTREACHED */
                }
        }
        return 0.0L;
}
```

```
**********************************************************
    5594 Sat May 10 12:09:01 2014
new/usr/src/lib/libm/common/LD/sinpil.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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#pragma weak sinpil = __sinpil

/* long double sinpil(long double x),
 * return long double precision sinl(pi*x).
 *
 * Algorithm, 10/17/2002, K.C. Ng
 * ------------------------------
 * Let y = |4x|, z = floor(y), and n = (int)(z mod 8.0) (displayed in binary).
 *      1. If y==z, then x is a multiple of pi/4. Return the following values:
 *            ------------------------------------------------
 *              n  x mod 2    sin(x*pi)    cos(x*pi)   tan(x*pi)
 *            ------------------------------------------------
 *             000  0.00       +0 ___       +1 ___       +0
 *             001  0.25       +\/0.5       +\/0.5       +1
 *             010  0.50       +1 ___       +0 ___       +inf
 *             011  0.75       +\/0.5       -\/0.5       -1
 *             100  1.00       -0 ___       -1 ___       +0
 *             101  1.25       -\/0.5       -\/0.5       +1
 *             110  1.50       -1 ___       -0 ___       +inf
 *             111  1.75       -\/0.5       +\/0.5       -1
 *            ------------------------------------------------
 *      2. Otherwise,
 *            ------------------------------------------------
 *              n     t        sin(x*pi)    cos(x*pi)   tan(x*pi)
 *            ------------------------------------------------
 *             000  (y-z)/4     sinpi(t)     cospi(t)    tanpi(t)
 *             001  (z+1-y)/4   cospi(t)     sinpi(t)    1/tanpi(t)
 *             010  (y-z)/4     cospi(t)    -sinpi(t)   -1/tanpi(t)
 *             011  (z+1-y)/4   sinpi(t)    -cospi(t)   -tanpi(t)
 *             100  (y-z)/4    -sinpi(t)    -cospi(t)    tanpi(t)
 *             101  (z+1-y)/4  -cospi(t)    -sinpi(t)    1/tanpi(t)
```



```
 *             110  (y-z)/4    -cospi(t)     sinpi(t)   -1/tanpi(t)
 *             111  (z+1-y)/4  -sinpi(t)     cospi(t)   -tanpi(t)
 *            ------------------------------------------------
 *
 * NOTE. This program compute sinpi/cospi(t<0.25) by __k_sin/cos(pi*t, 0.0).
 * This will return a result with error slightly more than one ulp (but less
 * than 2 ulp). If one wants accurate result,  one may break up pi*t in
 * high (tpi_h) and low (tpi_l) parts and call __k_sin/cos(tip_h, tip_lo)
 * instead.
 */

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

#include <sys/isa_defs.h>

#define I(q, m) ((int *) &(q))[m]
#define U(q, m) ((unsigned *) &(q))[m]
#if defined(__i386) || defined(__amd64)
#define LDBL_MOST_SIGNIF_I(ld)  ((I(ld, 2) << 16) | (0xffff & (I(ld, 1) >> 15)))
#define LDBL_LEAST_SIGNIF_U(ld) U(ld, 0)
#define PREC    64
#define PRECM1  63
#define PRECM2  62
static const long double twoPRECM2 = 9.22337203685477580800000000000000e+18L;
#else
#define LDBL_MOST_SIGNIF_I(ld)  I(ld, 0)
#define LDBL_LEAST_SIGNIF_U(ld) U(ld, sizeof(long double) / sizeof(int) - 1)
#define PREC    113
#define PRECM1  112
#define PRECM2  111
static const long double twoPRECM2 = 5.19229685853482762853049632922009 6e+33L;
#endif

static const long double
zero    = 0.0L,
quater  = 0.25L,
one     = 1.0L,
pi      = 3.14159265358979323846264338327950288419 7e+0000L,
sqrth   = 0.70710678118654752440084436210484903928 4835937688474,
tiny    = 1.0e-100;

long double
sinpil(long double x) {
        long double y, z, t;
        int hx, n, k;
        unsigned lx;

        hx = LDBL_MOST_SIGNIF_I(x);
        lx = LDBL_LEAST_SIGNIF_U(x);
        k = ((hx & 0x7fff0000) >> 16) - 0x3fff;
        if (k >= PRECM2) {              /* |x| >= 2**(Prec-2) */
                if (k >= 16384)
                        y = x - x;
                else {
                        if (k >= PREC)
                                y = zero;
                        else if (k == PRECM1)
                                y = (lx & 1) == 0 ? zero: -zero;
                        else {  /* k = Prec - 2 */
                                y = (lx & 1) == 0 ? zero : one;
                                if ((lx & 2) != 0)
                                        y = -y;
                        }
                }
```

```
127         }
128         else if (k < -2)        /* |x| < 0.25 */
129                 y = __k_sinl(pi * fabsl(x), zero);
130         else {
131                 /* y = |4x|, z = floor(y), and n = (int)(z mod 8.0) */
132                 y = 4.0L * fabsl(x);
133                 if (k < PRECM2) {
134                         z = y + twoPRECM2;
135                         n = LDBL_LEAST_SIGNIF_U(z) & 7; /* 3 LSb of z */
136                         t = z - twoPRECM2;
137                         k = 0;
138                         if (t == y)
139                                 k = 1;
140                         else if (t > y) {
141                                 n -= 1;
142                                 t = quater + (y - t) * quater;
143                         }
144                         else
145                                 t = (y - t) * quater;
146                 }
147                 else {  /* k = Prec-3 */
148                         n = LDBL_LEAST_SIGNIF_U(y) & 7; /* 3 LSb of z */
149                         k = 1;
150                 }
151                 if (k) {        /* x = N/4 */
152                         if((n & 1) != 0)
153                                 y = sqrth + tiny;
154                         else
155                                 y = (n & 2) == 0 ? zero : one;
156                         if ((n & 4) != 0)
157                                 y = -y;
158                 }
159                 else {
160                         if ((n & 1) != 0)
161                                 t = quater - t;
162                         if (((n + (n & 1)) & 2) == 0)
163                                 y = __k_sinl(pi * t, zero);
164                         else
165                                 y = __k_cosl(pi * t, zero);
166                         if ((n & 4) != 0)
167                                 y = -y;
168                 }
169         }
170         return hx >= 0 ? y : -y;
171 }
172 #undef U
173 #undef LDBL_LEAST_SIGNIF_U
174 #undef I
175 #undef LDBL_MOST_SIGNIF_I
```

```
**********************************************************
    2608 Sat May 10 12:09:01 2014
new/usr/src/lib/libm/common/LD/tanhl.c
tanhl.c
patch06 - libm: fixed compilation issues after updates
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak tanhl = __tanhl
#endif

/*
 * tanhl(x) returns the hyperbolic tangent of x
 *
 * Method :
 *      1. reduce x to non-negative:  tanhl(-x) = - tanhl(x).
 *      2.
 *        0      <  x <=  small    :  tanhl(x) := x
 *                                                -expm1l(-2x)
 *        small  <  x <=  1        :  tanhl(x) := --------------
 *                                               expm1l(-2x) + 2
 *                                                     2
 *        1      <= x <= threshold :  tanhl(x) := 1 -  ---------------
 *                                                   expm1l(2x) + 2
 *     threshold <  x <= INF       :  tanhl(x) := 1.
 *
 * where
 *      single :        small = 1.e-5           threshold = 11.0
 *      double :        small = 1.e-10          threshold = 22.0
 *      quad   :        small = 1.e-20          threshold = 45.0
 *
 * Note: threshold was chosen so that
 *              fl(1.0+2/(expm1(2*threshold)+2)) == 1.
 *
 * Special cases:
 *      tanhl(NaN) is NaN;
```



```
 *      only tanhl(0.0)=0.0 is exact for finite argument.
 */

#include "libm.h"
#include "longdouble.h"

static const long double small = 1.0e-20L, one = 1.0, two = 2.0,
#ifndef lint
        big = 1.0e+20L,
#endif
        threshold = 45.0L;

long double
tanhl(long double x) {
        long double t, y, z;
        int signx;
        volatile long double dummy;

        if (isnanl(x))
                return (x + x);         /* x is NaN */
        signx = signbitl(x);
        t = fabsl(x);
        z = one;
        if (t <= threshold) {
                if (t > one)
                        z = one - two / (expm1l(t + t) + two);
                else if (t > small) {
                        y = expm1l(-t - t);
                        z = -y / (y + two);
                } else {
#ifndef lint
                        dummy = t + big;
                                                        /* inexact if t != 0 */
#endif
                        return (x);
                }
        } else if (!finitel(t))
                return (copysignl(one, x));
        else
                return (signx ? -z + small * small : z - small * small);
        return (signx ? -z : z);
}
```

```
**********************************************************
    2640 Sat May 10 12:09:01 2014
new/usr/src/lib/libm/common/LD/tanl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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#pragma weak tanl = __tanl

/* INDENT OFF */
/* cosl(x)
 * Table look-up algorithm by K.C. Ng, November, 1989.
 *
 * kernel function:
 *      __k_tanl        ... tangent function on [-pi/4,pi/4]
 *      __rem_pio2l     ... argument reduction routine
 *
 * Method.
 *      Let S and C denote the sin and cos respectively on [-PI/4, +PI/4].
 *      1. Assume the argument x is reduced to y1+y2 = x-k*pi/2 in
 *         [-pi/2 , +pi/2], and let n = k mod 4.
 *      2. Let S=S(y1+y2), C=C(y1+y2). Depending on n, we have
 *
 *          n        sin(x)      cos(x)        tan(x)
 *     ----------------------------------------------------------
 *          0          S           C             S/C
 *          1          C          -S            -C/S
 *          2         -S          -C             S/C
 *          3         -C           S            -C/S
 *     ----------------------------------------------------------
 *
 * Special cases:
 *      Let trig be any of sin, cos, or tan.
 *      trig(+-INF)  is NaN, with signals;
 *      trig(NaN)    is that NaN;
 *
 * Accuracy:
 *      computer TRIG(x) returns trig(x) nearly rounded.
```



```
 */
/* INDENT ON */

#include "libm.h"
#include "libm_synonyms.h"
#include "longdouble.h"

#include <sys/isa_defs.h>

long double
tanl(long double x) {
        long double y[2], z = 0.0L;
        int n, ix;
#if defined(__i386) || defined(__amd64)
        int *px = (int *) &x;
#endif

        /* trig(Inf or NaN) is NaN */
        if (!finitel(x))
                return x - x;

        /* High word of x. */
#if defined(__i386) || defined(__amd64)
        XTOI(px, ix);
#else
        ix = *(int *) &x;
#endif

        /* |x| ~< pi/4 */
        ix &= 0x7fffffff;
        if (ix <= 0x3ffe9220)
                return __k_tanl(x, z, 0);

        /* argument reduction needed */
        else {
                n = __rem_pio2l(x, y);
                return __k_tanl(y[0], y[1], n & 1);
        }
}
```

```
**********************************************************
   11257 Sat May 10 12:09:02 2014
new/usr/src/lib/libm/common/Q/_TBL_atanl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
 * Table of constants for atanl.
 * By K.C. Ng, March 9, 1989
 */

#include "libm.h"

const long double _TBL_atanl_hi[] = {
        +1.24354994546761435031354849163871024165 7e-0001L,
        +1.32039761614638749274684406526569532262 5e-0001L,
        +1.39708874289163645183367776739095056816 1e-0001L,
        +1.47361481088651635609802760396845518210 7e-0001L,
        +1.54996741923940982303714374933492191333 7e-0001L,
        +1.62613828597948575373641563761557800620 2e-0001L,
        +1.70211925285474404490496607099761713695 4e-0001L,
        +1.77790228992676070796624799215824688994 6e-0001L,
        +1.85347949995694764886025961228544646672 6e-0001L,
        +1.92884312257974664197058710690227303498 8e-0001L,
        +2.00398553825878514653945785034378384461 5e-0001L,
        +2.07889927202262993605334983102994324756 3e-0001L,
        +2.15357699697738048024459627166489641657 4e-0001L,
        +2.22801153759394515771032122140432555250 2e-0001L,
        +2.30219587276843730240170959679802990655 5e-0001L,
        +2.37612313865471252473883634325637779198 9e-0001L,
        +2.44978663126864154172082481211275806419 6e-0001L,
        +2.59629629408257531029946443183971905601 1e-0001L,
        +2.74167451119658797599371898342175785924 4e-0001L,
        +2.88587361894077395623611419958218345043 3e-0001L,
        +3.02884868374971405560556094505558218122 8e-0001L,
        +3.17055753209147009809015576674467329758 5e-0001L,
        +3.31096076704132094944338787756944554212 6e-0001L,
        +3.45002177207105108867681286900051684082 9e-0001L,
```



```
        +3.58770670270572220395920063926460522153 6e-0001L,
        +3.72398446676754221923655038283701826414 1e-0001L,
        +3.85882669398073775897695484607231396381 9e-0001L,
        +3.99220769575252565614716696158864764911 0e-0001L,
        +4.12410441597387306899791289667126942609 2e-0001L,
        +4.25449637370042289542263605180792330138 2e-0001L,
        +4.38336559857957805445616049214771308958 8e-0001L,
        +4.51069655988523476375639257282193440738 0e-0001L,
        +4.63647609000806116214256231461214397133 4e-0001L,
        +4.88333951056405523867164960747064844596 4e-0001L,
        +5.12389460310737706666601020584259238055 6e-0001L,
        +5.35811237960463700269085068707691446984 7e-0001L,
        +5.58599315343562435971508216401661228758 7e-0001L,
        +5.80756353567670399203274475001500823751 2e-0001L,
        +6.02287346134964181682122694204232919224 6e-0001L,
        +6.23199329934065930992475349060374593677 9e-0001L,
        +6.43501108793284386802809228717322604472 7e-0001L,
        +6.63202992706093255362543102382758341723 e-0001L,
        +6.82316554874748078256429981711152987847 3e-0001L,
        +7.00854407884450172457951281786751273186 2e-0001L,
        +7.18829999621624505417014151525904698910 4e-0001L,
        +7.36257428981428131742835271089146624792 7e-0001L,
        +7.53151280962194389524739370269028886005 7e-0001L,
        +7.69526480405658260406820035985654017266 0e-0001L,
        +7.85398163397448309615660845819875693698 e-0001L,
        +8.15691923316223411021460838745645826722 8e-0001L,
        +8.44153986113171002517844148271647467386 3e-0001L,
        +8.70903457075652953140173112597814072916 5e-0001L,
        +8.96055384571343956174800718029937795466 0e-0001L,
        +9.19719605350416817228603454821089409693 1e-0001L,
        +9.42000040379463664737937170534593621158 9e-0001L,
        +9.62994330680936201815195835997099896773 0e-0001L,
        +9.82793723247329067985710611014666037625 7e-0001L,
        +1.00148313569423473291832959530143748963 4e+0000L,
        +1.01914134426634973463842917023063621235 e+0000L,
        +1.03584125300880017658469447032544407354 8e+0000L,
        +1.05165021254837366745986731208629990269 2e+0000L,
        +1.06663036531574356307917634742027990860 1e+0000L,
        +1.08083900054116831088715672921719978590 0e+0000L,
        +1.09432890732118991989278831461023527630 3e+0000L,
        +1.10714871779409050301706546017853704975 4e+0000L,
        +1.13095374397916044647093351553632775600 3e+0000L,
        +1.15257199721566751804014986261275146728 3e+0000L,
        +1.17227388112847638660059494413370460068 6e+0000L,
        +1.19028994968253173292773377482931828033 8e+0000L,
        +1.20681737028525253039551158005657662568 e+0000L,
        +1.22202532321098963704174174392257041202 9e+0000L,
        +1.23605948947808194190945197110907861462 1e+0000L,
        +1.24904577239825442582991707728109004835 5e+0000L,
        +1.26109338225244041931394088124733576401 2e+0000L,
        +1.27229739520871734129619374982248057464 6e+0000L,
        +1.28274087974427074736288525113649551640 7e+0000L,
        +1.29249666778978526790309142140708167235 3e+0000L,
        +1.30162883400919614380478585036668550244 5e+0000L,
        +1.31019393504755563425643768917190534375 4e+0000L,
        +1.31824205101683704985933020232713630404 3e+0000L,
        +1.32581766366803246505923921042847568861 6e+0000L,
        +1.33970565959899953932830375258955785024 e+0000L,
        +1.35212738092095465718914794138981275987 7e+0000L,
        +1.36330010035969395428929852782509915602 7e+0000L,
        +1.37340076694501586086127192644496106048 4e+0000L,
        +1.38257482149012585805996741776856851639 5e+0000L,
        +1.39094282700241834864276869438364323954 9e+0000L,
        +1.39860551227195759501267008161142827278 6e+0000L,
        +1.40564764938026978095219340199580806644 1e+0000L,
        +1.41214106460849521536761367185848908528 2e+0000L,
```

```
128         +1.41814699839963145940386030397000986326 1e+0000L,
129         +1.42371797140649411890181904661072971089 0e+0000L,
130         +1.42889927219073269641847007453719840013 9e+0000L,
131         +1.43373015248470898664047190966988738802 6e+0000L,
132         +1.43824479449822259796140424793548160396 7e+0000L,
133         +1.44247309910910182002529205993772918103 5e+0000L,
134         +1.44644133224813518419996684247588038661 1e+0000L,
135 };

136 const long double _TBL_atanl_lo[] = {
137         +1.40748691976280638023172028204143085906 5e-0036L,
138         -4.95969615947399255557304394379996694998 7e-0036L,
139         +8.95277456251946488739312134463618378815 2e-0036L,
140         +1.18804374232078957181807658435449644303 0e-0035L,
141         -2.78102781120451453784253751282343545146 3e-0037L,
142         +1.47972203770238003272955362343151472623 9e-0036L,
143         -4.21695614005481987328703848018496340681 9e-0036L,
144         +7.24312296669134846499303236563160234946 8e-0036L,
145         -2.15734300898391702998956793537906515911 9e-0036L,
146         -9.95157454051267235544523672981286051863 1e-0036L,
147         -3.90655589923248381816175697303978765674 3e-0036L,
148         +5.52602922717937268132119806646613031444 e-0036L,
149         +8.84157222159143218076822543180364520436 9e-0036L,
150         -8.17677287915861792541933236282855882094 4e-0036L,
151         -1.33441230346561422437971138230283387642 1e-0036L,
152         -4.49273312078133829089307339246813258921 9e-0036L,
153         +4.49455114718124903932018243367625014833 6e-0036L,
154         -1.66880815042792235557767244596484405672 7e-0035L,
155         +1.56297575861079557694610865689373296841 1e-0035L,
156         -2.23898355633080785525079703853315108481 1e-0035L,
157         -4.83123217455473115518704506711821629583 2e-0036L,
158         -1.43361723529058328769589266109806988443 1e-0035L,
159         -8.74401819988999328029891741709605817248 1e-0036L,
160         +5.92846360085298374457803607854645559386 5e-0036L,
161         -2.23766512484362412760610552950435149936 3e-0035L,
162         +6.07458375993361054142803107566774421364 8e-0036L,
163         +1.53721871104519496777923447620299670230 9e-0035L,
164         +2.09760680567511562416571215824787902471 6e-0035L,
165         -5.56239564054954380607268622026228191149 7e-0036L,
166         +1.96973667078324718418584119348973519015 2e-0035L,
167         +2.10703119644794885090347336942488754370 e-0035L,
168         -2.30273563629820016022565185108542298445 6e-0035L,
169         +4.89509642257334926686184352202977056848 e-0036L,
170         -7.23801434777944582138727230508202647576 6e-0036L,
171         +1.63656488657036140316374433960495688581 1e-0035L,
172         -3.98858119582345307937291299198032341974 0e-0035L,
173         +4.15877221209126135104177839232274259734 4e-0035L,
174         +3.83474214545564721536846873773337135027 39e-0035L,
175         -9.22511789336387217235158964654889909065 9e-0036L,
176         +1.40946196904559895261757367418546503965 4e-0036L,
177         +3.35688578054722352706128514258108036794 5e-0035L,
178         +3.90909910555225523950181068032321188034 0e-0035L,
179         +5.29564169796542081405218627072970396535 9e-0036L,
180         -5.09608468199455143678470639236625071367 2e-0036L,
181         -4.49590144252776158583296803939183152050 0e-0035L,
182         +3.80392265445516342665668576159626142903 4e-0035L,
183         -4.40565228728955121083086421966116896576 2e-0036L,
184         +1.60250241924821610762238077534256190769 5e-0036L,
185         +2.16795253253094525619926100651083806352 6e-0035L,
186         +1.98440380135154221257153629257367541040 7e-0035L,
187         +3.91396194717997468345052273535684324572 4e-0035L,
188         +2.11134438079754535055184534367995618547 3e-0035L,
189         +3.15585572774446927550398169443927701854 3e-0035L,
190         +1.62950445203554614082655856195002383356 1e-0035L,
191         -3.50872452092703058561512303561712089458 0e-0035L,
192         +2.90410418642828556795910552709461173000 9e-0035L,
193         +2.90410418642828556795910552709461173000 9e-0035L,
```



```
194         -2.31288434538183565909319952098066272332 8e-0035L,
195         -7.71249231814715784399679738207159798748 1e-0035L,
196         +2.75390278298869224290920635904499538193 3e-0035L,
197         -9.45008994531813089510845459908375277344 5e-0035L,
198         -7.30617553020320923375949460016431815910 1e-0035L,
199         -4.17361448139537521939527701574043190664 3e-0035L,
200         +3.43699483562564070453448552628642574964 7e-0035L,
201         -6.37902434922980909073020849242756348974 8e-0035L,
202         -9.68429438163532612910041278660940048846 4e-0036L,
203         +4.87467575391388709092759583266980605772 8e-0035L,
204         -8.75338864770841908845116013685854785275 1e-0035L,
205         +1.42847439923279188926925511380822048416 0e-0035L,
206         +5.72627762110733895425656256934744905722 8e-0035L,
207         -3.22548831487804112455948222707503549131 7e-0035L,
208         +7.88535481906098773259655252523767351356 1e-0035L,
209         +8.40817367390371940975150383653688292831 8e-0035L,
210         +7.47228703575636838150782429819345423942 5e-0035L,
211         +7.99772028257934352894348136008700704397 4e-0036L,
212         -8.05778407733621390548484923462939533215 3e-0035L,
213         +1.42177467536705830654900402090530858042 6e-0035L,
214         +1.22324869142212050041097435603231269932 7e-0035L,
215         +8.96960550708300364473619572179466404214 6e-0035L,
216         -3.14803944350818844106860667398493670460 9e-0035L,
217         -5.09271460407153450132406425176115711623 6e-0035L,
218         -5.74319977159241365681338594327058588616 6e-0035L,
219         -4.39204514050837702790997660804795084430 0e-0035L,
220         +9.11067539849077155630186667763132196437 2e-0035L,
221         -3.70325690142728410095124007730643565350 3e-0035L,
222         +8.81674194297467142769098254051317691390 7e-0035L,
223         -3.83893416960283525037523128617033105192 3e-0036L,
224         -3.34629593419608915463408955080142512133 5e-0035L,
225         -3.92126267767860743839161884989555550809 9e-0035L,
226         -7.83403973963778672558644945685914177502 2e-0035L,
227         +7.46810186324569865206006403406243610055 8e-0035L,
228         +8.91109186189569184511355948761654817983 9e-0035L,
229         +3.94181606322718905304317971456687085749 1e-0035L,
230         -4.10481140885801048201934356383271816121 9e-0035L,
231         -2.31654194515821533263839447562209445011 5e-0035L,
232         -1.84283125815253194093993302037054598200 7e-0035L,
233         +7.14773165467094823454117120179094021222 0e-0035L,
234         +2.99145015784358746621536377070195345257 1e-0035L,
235 };
```

```
**********************************************************
    9104 Sat May 10 12:09:02 2014
new/usr/src/lib/libm/common/Q/_TBL_cosl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

/*
 * table of cosl(x) where x is 0.15625 + i*0.03125, i=0,1,...,74.
 * {0x3ffc4000,0,0,0} --> (inc 0x800) -->  {0x3ffe9000,0,0,0}
 *    0.15625              0.03125           0.78125  (pi/4 = 0.785395663...)
 */

#include "libm.h"

const long double _TBL_cosl_hi[] = {
        +9.87817783816471944100503034363211316509 3e-0001L,
        +9.87202377854830490396088533511622444395 2e-0001L,
        +9.86571908399497588757337407495308408601 5e-0001L,
        +9.85926385070661435747059252869435441508 e-0001L,
        +9.85265817718213816204294709759578993935 9e-0001L,
        +9.84590216421599806014395107782068736444 1e-0001L,
        +9.83899591489663972178309351416487245336 7e-0001L,
        +9.83193953460493072527875761298968427513 4e-0001L,
        +9.82473313101255257487327683243622495014 7e-0001L,
        +9.81737681408035776334596147904709003197 1e-0001L,
        +9.80987069605669190469329896435309664556 9e-0001L,
        +9.80221489147568096247851867421742018287 2e-0001L,
        +9.79440951715548359998530954502987493325 8e-0001L,
        +9.78645469219650867884267679743275284253 4e-0001L,
        +9.77835053797959793331971572944454549333 0e-0001L,
        +9.77009717816417384802045690214576788462 4e-0001L,
        +9.76169473868635276723989035435135533696 7e-0001L,
        +9.75314334775702326477279855622261093860 1e-0001L,
        +9.74444313585988903497110560454343440501 e-0001L,
        +9.73559423574948171458312514509898101201 2e-0001L,
        +9.72659678244912752670913058267565259785 1e-0001L,
        +9.71745091324889467619266494132502964321 1e-0001L,
        +9.70815676770349462947490545785046027025 5e-0001L,
```



```
        +9.69871448763015344992344045916930776126 7e-0001L,
        +9.68912421710644784144595449494189205340 5e-0001L,
        +9.66950029230677822008341623610531503405 0e-0001L,
        +9.64928619104771009581074665315748371400 1e-0001L,
        +9.62848314709379699899701093480214364686 2e-0001L,
        +9.60709243015561903066659350581313471704 6e-0001L,
        +9.58511534581228627301969408154919821785 6e-0001L,
        +9.56255323543175296975599942263028361169 0e-0001L,
        +9.53940747608894733981324795987611622831 9e-0001L,
        +9.51567948048172202145488217364270962165 7e-0001L,
        +9.49137069684463027665847421762105623007 7e-0001L,
        +9.46648260886053321846099507295532976110 8e-0001L,
        +9.44101673557004345630017691253124859960 0e-0001L,
        +9.41497463127881068644511236053670814653 7e-0001L,
        +9.38835788546265488632578305984712554158 6e-0001L,
        +9.36116812267055290294237411019508588031 8e-0001L,
        +9.33340700242548435655299229469995526590 9e-0001L,
        +9.30507621912314291149476792229555480641 1e-0001L,
        +9.27617750192851909628030798799961350191 8e-0001L,
        +9.24671261467036098502113014560138770999 6e-0001L,
        +9.21668335573351918175411368202712714238 3e-0001L,
        +9.18609155794918267837824977185498625801 e-0001L,
        +9.15493908848301228563917732180221881664 5e-0001L,
        +9.12322784872117846492029542047341733757 7e-0001L,
        +9.09095977415431051650381735684476417490 5e-0001L,
        +9.05813683425936420744516660652700257708 8e-0001L,
        +9.02476103237941504925183272675895999494 8e-0001L,
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        +8.95635902463170698900570000446256350344 8e-0001L,
        +8.92133699366994404723900253723788575076 7e-0001L,
        +8.88577045028035543317609023116020980097 3e-0001L,
        +8.84966156526143291697296536966647926423 6e-0001L,
        +8.81301254251340599140161908298100172881 3e-0001L,
        +8.77582561890372716116281582603829680940 1e-0001L,
        +8.69984718058417388828915599901466242988 7e-0001L,
        +8.62174479934880504367162510253324274125 0e-0001L,
        +8.54153754277385385143451785105103176441 2e-0001L,
        +8.45924499231067954459723078597493262424 6e-0001L,
        +8.37488723850523685315353348917240617151 3e-0001L,
        +8.28848487609325734810171790119116638151 0e-0001L,
        +8.20005899897234008255550633876556042568 8e-0001L,
        +8.10963119505217902189534803941080724352 0e-0001L,
        +8.01722354098418450607492605652964207827 7e-0001L,
        +7.92285859671785431415013237817093985302 e-0001L,
        +7.82655940026272796930787447428139025948 5e-0001L,
        +7.72834946152471544810851845913425177563 9e-0001L,
        +7.62825275710576250507098753625427971862 1e-0001L,
        +7.52629372418066476054541324847143115989 3e-0001L,
        +7.42249725458501306991347253449610536720 6e-0001L,
        +7.31688868873820886311838753000084529015 0e-0001L,
        +7.20949380945696418043812784148447687909 2e-0001L,
        +7.10033883566079674974121643959490219433 3e-0001L,
};

const long double _TBL_cosl_lo[] = {
        +4.74271307836705897892468107620526418364 8e-0035L,
        -3.40092258003815335290903420767718156009 3e-0035L,
        -2.47327949936985362476252401212720724632 3e-0035L,
        -3.90232087700451800071623206454623857873 4e-0035L,
        +2.26568029505818066141517497778527952117 3e-0035L,
        -2.25477224644420325917058830210466299108 5e-0036L,
        +2.73414318948066207810486330723761264878 0e-0035L,
        -3.70191256069344643865620216844635567782 2e-0035L,
        -1.64924358891557584625463868014230342232 0e-0035L,
        +2.72504265569871489104445700186865318736 7e-0035L,
        -1.90899259410096419886996331536278344971 2e-0036L,
```

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128         -1.4655475546271277169188605590126987044 71e-0035L,
129         +4.4287805659156075706684479729006798999 52e-0035L,
130         +1.4393136576237689072277201408574546958 43e-0035L,
131         -3.7920742290518041693721085377919270200 38e-0035L,
132         -2.6107794853201527062866601290451881172 10e-0036L,
133         -2.8772797424948158304794486062698549998 91e-0035L,
134         +3.9910658355892566800202909496157232384 76e-0035L,
135         +3.0994790595505341930451453859254833279 91e-0035L,
136         +1.1466116869119827022871676795100218796 95e-0035L,
137         -3.9175923181931490496607695856025275822 31e-0035L,
138         -1.9519713219999850083718006825741399339 78e-0035L,
139         +2.9745882097239385912527768202120283679 60e-0035L,
140         -2.0383907565704265305371152677869087451 16e-0036L,
141         -5.5363470611346198939887328774932638449 43e-0036L,
142         -4.3897221443279241206208805999048053709 46e-0035L,
143         -3.6668583267082077500247554560276113649 38e-0035L,
144         +4.8898696638334345079942201305182133622 72e-0036L,
145         -5.8701155823158396071201335160122195620 69e-0036L,
146         +2.5077077937163648114573508939315438056 85e-0035L,
147         +3.2161657219086599705110364513583720717 49e-0035L,
148         +2.8807568905247860200839597292465718761 09e-0035L,
149         +6.3684262859811565830874928879988460605 79e-0036L,
150         +6.8443396599163715225030919046886013600 28e-0037L,
151         -4.3290633966300089094152942049882462158 17e-0035L,
152         +1.0381253524012022960982246117214558391 21e-0035L,
153         +3.2070936660316560207159024105488495784 74e-0036L,
154         -3.9875806877397403134858507275224548077 13e-0035L,
155         +3.4048159123671065843540986243903216159 09e-0035L,
156         -4.7525570725167983112480089883138219993 62e-0035L,
157         +2.7454108855173298257333528568541609188 01e-0035L,
158         +7.5852037191634575628120116712685471214 53e-0036L,
159         -4.1418712486003182510864934725117583804 72e-0035L,
160         -1.8358799543395762294871026354147932189 92e-0035L,
161         +2.9760828277827443346005774579840984927 75e-0035L,
162         -3.5077551795530695481509090116830563584 98e-0035L,
163         +7.8690388655637367426794813217884556813 09e-0036L,
164         +1.2088601402844415573377602508567795279 31e-0035L,
165         -3.6095030760594116977567656300446713983 02e-0035L,
166         +2.2628289950134441901830629568021060200 46e-0035L,
167         -2.0677261549090437066667027515475197563 91e-0035L,
168         +3.7359374165986688308862049554231178515 11e-0035L,
169         -1.1077193760256731473269307926469249208 84e-0035L,
170         +4.1235427895466473144381365517702211191 98e-0036L,
171         +4.5337057028832563044203782631346214163 96e-0035L,
172         -1.4341919231211668778394561900962944536 34e-0035L,
173         -2.8948496018136392485519253854069885120 04e-0035L,
174         -4.6816863830057562678274131979218386004 37e-0035L,
175         -3.7155681831753358223456247183577179989 47e-0035L,
176         -1.6870753401309515287322206172257317156 63e-0035L,
177         +1.9805494714198987817916434292527405285 44e-0035L,
178         +2.7276199787208453304577771867732615590 81e-0035L,
179         +1.4308250810049658171904817550623977014 22e-0035L,
180         -1.7200881195523082341672433229799124694 21e-0035L,
181         +1.1048129285679443642605140241880434647 04e-0035L,
182         +6.0948785130523308932562793945896374085 56e-0036L,
183         +2.4751955822847316787924889167380762138 91e-0035L,
184         +1.6933204567923791942780771288506254166 2e-0035L,
185         +3.9497522934121166423724153474114691624 40e-0035L,
186         +4.2206741188860150500474893938232507950 70e-0035L,
187         +3.7130695865766318966545086431110457105 44e-0035L,
188         -3.7892527004980091353992347387128752635 43e-0035L,
189         +1.4825563754893169718499171029319861963 06e-0035L,
190         +4.7869128573367337949953632605081183242 72e-0035L,
191         -4.0962322476369244322089675290790244174 75e-0035L,
192 };
```

```
**********************************************************
    4494 Sat May 10 12:09:02 2014
new/usr/src/lib/libm/common/Q/_TBL_expl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
 * Table of constants for expl.
 * By K.C. Ng, March 9, 1989
 */

#include "libm.h"

const long double _TBL_expl_hi[] = {
        +1.0000000000000000000000000000000000000000e+0000L,
        +1.0218971486541166782344801347832994397 82e+0000L,
        +1.0442737824274138403219664787399290087 85e+0000L,
        +1.0671404006768236181695211209928091626 07e+0000L,
        +1.0905077326652576592070106557607079789 93e+0000L,
        +1.1143867425958925363088129569196030678 00e+0000L,
        +1.1387886347566916537038302838415112547 20e+0000L,
        +1.1637248587775775138135735990921853123 43e+0000L,
        +1.1892071150027210667174999705604759152 93e+0000L,
        +1.2152473599804688781165202513387984576 24e+0000L,
        +1.2418578120734840485936774687265956055 11e+0000L,
        +1.2690509571917332225544190810323380047 15e+0000L,
        +1.2968395546510096659337541177924511598 35e+0000L,
        +1.3252366431597412946295370954987216741 13e+0000L,
        +1.3542555469368927282980147401407028043 43e+0000L,
        +1.3839098819638319548726595272651928180 02e+0000L,
        +1.4142135623730950488016887242096980785 70e+0000L,
        +1.4451808069770466200370062414716709056 78e+0000L,
        +1.4768261459394993113869074803740499239 24e+0000L,
        +1.5091644275934227397660195510331935314 20e+0000L,
        +1.5422108254079408236122918620907348413 07e+0000L,
        +1.5759808451078864864552701601819050089 06e+0000L,
        +1.6104903319492543081795206673574005834 59e+0000L,
        +1.6457554781539648445187567247258224456 67e+0000L,
```



```
        +1.6817928305074290860622509524664297900 80e+0000L,
        +1.7186192981224779156293443764563125045 16e+0000L,
        +1.7562521603732994831121606193753132212 94e+0000L,
        +1.7947090750031071864277032421277818143 54e+0000L,
        +1.8340080864093424634870831895882888560 77e+0000L,
        +1.8741676341102999013299989499544465344 39e+0000L,
        +1.9152065613971472938726112702958308878 50e+0000L,
        +1.9571441241754002690183222516268714911 90e+0000L,
};

const long double _TBL_expl_lo[] = {
        +0.0000000000000000000000000000000000000000e+0000L,
        +1.8050678742033095474557333305457378646 51e-0035L,
        -9.3745202922804274219575674197308321438 43e-0035L,
        -1.5969684472927587707129096302314999712 33e-0035L,
        +9.1124934101250229785116861016724866621 19e-0035L,
        -6.5042282069785482872303747752593887109 85e-0035L,
        -8.1484688445258511373256917674881553236 05e-0035L,
        -5.0662145767218003133723307451429033509 63e-0035L,
        -1.3598309746888169737498756382459191189 24e-0035L,
        +9.4974276355631964703077105664332465971 09e-0035L,
        -3.2831705231769986016150659653339152619 32e-0036L,
        -5.0172357093871904102901865304584289508 62e-0035L,
        -2.3914747976891091716228343016026401392 58e-0035L,
        -8.3505713576339088152988907379440838530 80e-0036L,
        +7.0367568890732650424217371906718764407 29e-0035L,
        -5.1824848530646464575368930185669561898 17e-0035L,
        +9.4222425486218320656921167363940648797 58e-0035L,
        -3.9675008253988623091673061302164182811 03e-0035L,
        +7.1435289915633006145232736150927672435 21e-0035L,
        +1.1598712528679851242465178341004443277 47e-0035L,
        +4.6969334783581154953097392132018744666 85e-0035L,
        -3.3865131759950047107992419849998191651 97e-0035L,
        -8.5873187742982470688686559351038744535 22e-0035L,
        -9.6059515487493505031854993622460690888 35e-0035L,
        +9.6097339321280127845075586971417858136 55e-0035L,
        +6.3783979214400284392447614497808485459 57e-0035L,
        +7.7924307856958642494564611251692777011 77e-0035L,
        +7.3613377675884565241319308366339321950 88e-0035L,
        -6.4729951479133472300352145756121705252 66e-0035L,
        +8.5874744179536986942787980622952296242 07e-0035L,
        +2.3718154228251748356916512283026909779 51e-0035L,
        -3.0268916820961187730045973742190031425 6e-0037L,
};
```

```
**********************************************************
   16910 Sat May 10 12:09:02 2014
new/usr/src/lib/libm/common/Q/_TBL_expm1l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
 * Table of constants for expm1l.
 * By K.C. Ng, June 30, 1995
 */

#include "libm.h"

const long double _TBL_expm1lx[] = {
        +7.81249999999999999999999995004619e-03L,
        +2.34374999999999999999999998790275e-02L,
        +3.90624999999999999999999999981095794e-02L,
        +5.46875000000000000000000007637516e-02L,
        +7.03125000000000000000000001673152e-02L,
        +8.59375000000000000000000004285194e-02L,
        +1.01562499999999999999999997969348e-01L,
        +1.17187499999999999999999998630182e-01L,
        +1.32812499999999999999999999246480e-01L,
        +1.48437500000000000000000000096296e-01L,
        +1.64062499999999999999999999947037e-01L,
        +1.79687500000000000000000000007190941e-01L,
        +1.95312499999999999999999999874815e-01L,
        +2.10937499999999999999999999877222e-01L,
        +2.26562500000000000000000000019259e-01L,
        +2.42187499999999999999999999800185e-01L,
        +2.57812499999999999999999999615918e-01L,
        +2.73437499999999999999999999903704e-01L,
        +2.89062499999999999999999998362960e-01L,
        +3.04687500000000000000000000240741e-01L,
        +3.20312499999999999999999999542592e-01L,
        +3.35937499999999999999999999619629e-01L,
        +3.51562500000000000000000000001040002e-01L,
        +3.67187499999999999999999999999316295e-01L,
```



```
        +3.82812500000000000000000000000871483e-01L,
        +3.98437500000000000000000000000385186e-01L,
        +4.14062499999999999999999999999975926e-01L,
        +4.29687500000000000000000000000385186e-01L,
        +4.45312500000000000000000000032119697e-01L,
        +4.60937499999999999999999999999956667e-01L,
        +4.76562500000000000000000000000134815e-01L,
        +4.92187499999999999999999999999388517e-01L,
        +5.07812499999999999999999999999778518e-01L,
        +5.23437499999999999999999999999325925e-01L,
        +5.39062499999999999999999999990649610e-01L,
        +5.54687500000000000000000000000452594e-01L,
        +5.70312500000000000000000000000645187e-01L,
        +5.85937499999999999999999999999807407e-01L,
        +6.01562500000000000000000000000182963e-01L,
        +6.17187500000000000000000000000048148e-01L,
        +6.32812500000000000000000000000943706e-01L,
        +6.48437499999999999999999999999470369e-01L,
        +6.64062500000000000000000000000192593e-01L,
        +6.79687500000000000000000000000693335e-01L,
        +6.95312500000000000000000000001482966e-01L,
        +7.10937500000000000000000000000154074e-01L,
        +7.26562500000000000000000000000385186e-01L,
        +7.42187500000000000000000000000115556e-01L,
        +7.57812500000000000000000000000048148e-01L,
        +7.73437499999999999999999999999942222e-01L,
        +7.89062499999999999999999999999720740e-01L,
        +8.04687499999999999999999999999634073e-01L,
        +8.20312499999999999999999999999797777e-01L,
        +8.35937500000000000000000000000828150e-01L,
        +8.51562499999999999999999999999865185e-01L,
        +8.67187499999999999999999999999682222e-01L,
        +8.82812499999999999999999999999749629e-01L,
        +8.98437499999999999999999999999836296e-01L,
        +9.14062499999999999999999999999229628e-01L,
        +9.29687500000000000000000000000462223e-01L,
        +9.45312499999999999999999999999499258e-01L,
        +9.60937499999999999999999999999894074e-01L,
        +9.76562499999999999999999999999855555e-01L,
        +9.92187500000000000000000000000028889e-01L,
        +1.00781249999999999999999999999870963e+00L,
        +1.02343750000000000000000000000003852e+00L,
        +1.03906249999999999999999999999998074e+00L,
        +1.05468749999999999999999999999801629e+00L,
        +1.07031250000000000000000000000182963e+00L,
        +1.08593750000000000000000000000021185e+00L,
        +1.10156249999999999999999999999978815e+00L,
        +1.11718749999999999999999999999986518e+00L,
        +1.13281249999999999999999999999984593e+00L,
        +1.14843749999999999999999999999980741e+00L,
        +1.16406250000000000000000000000000000e+00L,
        +1.17968749999999999999999999999998074e+00L,
        +1.19531250000000000000000000000196445e+00L,
        +1.21093749999999999999999999999976889e+00L,
        +1.22656250000000000000000000000017333e+00L,
        +1.24218749999999999999999999999976889e+00L,
        +1.25781249999999999999999999999980741e+00L,
        +1.27343749999999999999999999999951852e+00L,
        -7.81250000000000000000000000074012886e-03L,
        -2.34374999999999999999999999997418050e-02L,
        -3.90624999999999999999999999998134255e-02L,
        -5.46875000000000000000000000006361587e-02L,
        -7.03125000000000000000000000006271309e-02L,
        -8.59375000000000000000000000001721300e-02L,
        -1.01562500000000000000000000000020463e-01L,
        -1.17187500000000000000000000000290093e-01L,
```

```
128         -1.32812499999999999999999999999987963e-01L,
129         -1.48437499999999999999999999999942222e-01L,
130         -1.64062500000000000000000000000026482e-01L,
131         -1.79687500000000000000000000000052963e-01L,
132         -1.95312499999999999999999999999867592e-01L,
133         -2.10937500000000000000000000000081852e-01L,
134         -2.26562500000000000000000000000250371e-01L,
135         -2.42187499999999999999999999999718333e-01L,
136         -2.57812500000000000000000000001059261e-01L,
137         -2.73437499999999999999999999999570036e-01L,
138         -2.89062500000000000000000000000520001e-01L,
139         -3.04687499999999999999999999999792963e-01L,
140         -3.20312500000000000000000000000231112e-01L,
141         -3.35937499999999999999999999999383702e-01L,
142         -3.51562499999999999999999999999903704e-01L,
143         -3.67187499999999999999999999999634073e-01L,
144         -3.82812499999999999999999999999956667e-01L,
145         -3.98437500000000000000000000000004815e-01L,
146         -4.14062499999999999999999999999870000e-01L,
147         -4.29687500000000000000000000000216667e-01L,
148         -4.45312500000000000000000000000072222e-01L,
149         -4.60937499999999999999999999999513703e-01L,
150         -4.76562500000000000000000000000539260e-01L,
151         -4.92187499999999999999999999999759259e-01L,
152         -5.07812500000000000000000000000067408e-01L,
153         -5.23437500000000000000000000001386670e-01L,
154         -5.39062499999999999999999999996427400e-01L,
155         -5.54687500000000000000000000000404445e-01L,
156         -5.70312499999999999999999999998536293e-01L,
157         -5.85937499999999999999999999999634073e-01L,
158         -6.01562500000000000000000000000028889e-01L,
159         -6.17187499999999999999999999998468886e-01L,
160         -6.32812499999999999999999999999335554e-01L,
161         -6.48437500000000000000000000000356297e-01L,
162         -6.64062500000000000000000000000019259e-01L,
163         -6.79687500000000000000000000000067408e-01L,
164         -6.95312499999999999999999999998439997e-01L,
165         -7.10937500000000000000000000000009630e-01L,
166         -7.26562500000000000000000000000414075e-01L,
167         -7.42187499999999999999999999998738516e-01L,
168         -7.57812500000000000000000000000019259e-01L,
169         -7.73437500000000000000000000000808891e-01L,
170         -7.89062500000000000000000000000028889e-01L,
171         -8.04687500000000000000000000000096296e-01L,
172         -8.20312499999999999999999999999634073e-01L,
173         -8.35937500000000000000000000000086667e-01L,
174         -8.51562500000000000000000000000115556e-01L,
175         -8.67187500000000000000000000000028889e-01L,
176         -8.82812500000000000000000000000577779e-01L,
177         -8.98437500000000000000000000000587409e-01L,
178         -9.14062500000000000000000000000654816e-01L,
179         -9.29687499999999999999999999999210369e-01L,
180         -9.45312500000000000000000000000115556e-01L,
181         -9.60937499999999999999999999999682222e-01L,
182         -9.76562500000000000000000000000298519e-01L,
183         -9.92187499999999999999999999999711111e-01L,
184         -1.00781249999999999999999999999953778e+00L,
185         -1.02343750000000000000000000000279260e+00L,
186         -1.03906250000000000000000000000000000e+00L,
187         -1.05468750000000000000000000000042370e+00L,
188         -1.07031249999999999999999999999969185e+00L,
189         -1.08593749999999999999999999999965333e+00L,
190         -1.10156250000000000000000000000144445e+00L,
191         -1.11718750000000000000000000000007704e+00L,
192         -1.13281250000000000000000000000052000e+00L,
193         -1.14843750000000000000000000000021185e+00L,
```



```
194         -1.16406250000000000000000000000188741e+00L,
195         -1.17968749999999999999999999999915259e+00L,
196         -1.19531250000000000000000000000196445e+00L,
197         -1.21093749999999999999999999999965333e+00L,
198         -1.22656249999999999999999999999940296e+00L,
199         -1.24218749999999999999999999999955704e+00L,
200         -1.25781250000000000000000000000036593e+00L,
201         -1.27343750000000000000000000000005778e+00L,
202 };
203 const long double _TBL_expm1l[] = {
204         +7.84309720644797769345355976012307574 55e-03L,
205         +2.37143166023579169688505321657677196 84e-02L,
206         +3.98354713362300005766220098751721352 95e-02L,
207         +5.62104973169319711813367037681378399 69e-02L,
208         +7.28433924348774444113000950108155620 14e-02L,
209         +8.97382175380932310182820254185168740 73e-02L,
210         +1.06899097423657482787602393747 5648642e-01L,
211         +1.24330221844750717451732905444941152 41e-01L,
212         +1.42035846533565589676161431348791893 60e-01L,
213         +1.60020294240325147029215213894096927 13e-01L,
214         +1.78287955788663242663143308195855285 11e-01L,
215         +1.96843291147624771821968527701544105 8e-01L,
216         +2.15690830520547451830018254540395310 82e-01L,
217         +2.34835175451091004684016110876001226 14e-01L,
218         +2.54280999466837520048212530906858730 1e-01L,
219         +2.74033051619660929276496538716337469 15e-01L,
220         +2.94096152846373309826110626810023548 22e-01L,
221         +3.14475201944549134284134921979871692 90e-01L,
222         +3.35175174369196792611040910663591638 35e-01L,
223         +3.56201123927340233058488259385760266 18e-01L,
224         +3.77558184011883670360762237889248550 83e-01L,
225         +3.99251568854906835786205945495184257 77e-01L,
226         +4.21286574800696755559539937707591567 16e-01L,
227         +4.43668581598826862752366843442765422 91e-01L,
228         +4.66403053717599142207258062226190013 43e-01L,
229         +4.89495541678169979605576447401371111 80e-01L,
230         +5.12951683409685435624383754114332689 70e-01L,
231         +5.36777205625756795486309563197762816 77e-01L,
232         +5.60977925222612454340429658953437343 85e-01L,
233         +5.85559750699267491090407732343794542 82e-01L,
234         +6.10528683600057658836857671513901172 10e-01L,
235         +6.35890819979889980172694488605470304 19e-01L,
236         +6.61652351892567681933037464039013873 46e-01L,
237         +6.87819568902552837244679628749563448 75e-01L,
238         +7.14398859620535805136917017311111441 72e-01L,
239         +7.41396713263186370198292276571131099 38e-01L,
240         +7.68819721237467388648403656081341143 98e-01L,
241         +7.96674578749897744017962429199062931 19e-01L,
242         +8.24968086441157506894248439887473697 33e-01L,
243         +8.53707152046434380376529987739472178 33e-01L,
244         +8.82898792081916797507455187760523227 14e-01L,
245         +9.12550133557845420536249894768996784 86e-01L,
246         +9.42668415718541275986297583136760727 82e-01L,
247         +9.73260991809835345726397741763077597 62e-01L,
248         +1.00433533087433112418969960416354844 86e+00L,
249         +1.03589901957493844718030789427785398 46e+00L,
250         +1.06795976404712380001389829540322391 49e+00L,
251         +1.10052539178032932374053021098430952 28e+00L,
252         +1.13360385352901985960690827964758863 72e+00L,
253         +1.16720322525382460547028266530268560 58e+00L,
254         +1.20133171009324730534303191976950988 59e+00L,
255         +1.23599764036642635641959285563240518 53e+00L,
256         +1.27120947960743379863789006923969898 92e+00L,
257         +1.30697582463160985190656812713904269 92e+00L,
258         +1.34330540763443748746708235710537504 23e+00L,
259         +1.38020709832346946436560480393706765 04e+00L,
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263         +1.53371726724228986565932763196844115 87e+00L,
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266         +1.65531289772409169804623611329668093 82e+00L,
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364         -7.06700937678973111177650760579269385 75e-01L,
365         -7.11248118167921797368566796118526201 91e-01L,
366         -7.15724801157712289797535083741438734 45e-01L,
367         -7.20132079610763748689413672445407332 50e-01L,
368 };
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```
**********************************************************
   29209 Sat May 10 12:09:02 2014
new/usr/src/lib/libm/common/Q/_TBL_ipio2l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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/*
 * Table of constants for 2/pi, used in __rem_pio2l (trigl) function.
 * By K.C. Ng, April 25, 1989
 */

#include "libm.h"

const int _TBL_ipio2l_inf[] = { /* by DHBailey MP package */
        0xA2F983, 0x6E4E44, 0x1529FC, 0x2757D1, 0xF534DD, 0xC0DB62,
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        0x27CB09, 0xB74F46, 0x3F669E, 0x5FEA2D, 0x7527BA, 0xC7EBE5,
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```



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130         0x84D4E9, 0xA9B4FC, 0xD1EEEF, 0xC9352E, 0x61392F, 0x442138,
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132         0xCC2254, 0xDC552A, 0xD6C6C0, 0x96190B, 0xB8701A, 0x649569,
133         0x605A26, 0xEE523F, 0x0F117F, 0x11B5F4, 0xF5CBFC, 0x2DBC34,
134         0xEEBC34, 0xCC5DE8, 0x605EDD, 0x9B8E67, 0xEF3392, 0xB817C9,
135         0x9B5861, 0xBC57E1, 0xC68351, 0x103ED8, 0x4871DD, 0xDD1C2D,
136         0xA118AF, 0x462C21, 0xD7F359, 0x987AD9, 0xC0549E, 0xFA864F,
137         0xFC0656, 0xAE79E5, 0x362289, 0x22AD38, 0xDC9367, 0xAAE855,
138         0x382682, 0x9BE7CA, 0xA40D51, 0xB13399, 0x0ED7A9, 0x480569,
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141         0x5FD45E, 0xA4677B, 0x7AACBA, 0xA2F655, 0x23882B, 0x55BA41,
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143         0xE956FF, 0xCA0F1C, 0x8A59C5, 0x2BFA94, 0xC5C1D3, 0xCFC50F,
144         0xAE5ADB, 0x86C547, 0x624385, 0x3B8621, 0x94792C, 0x876110,
145         0x7B4C2A, 0x1A2C80, 0x12BF43, 0x902688, 0x893C78, 0xE4C4A8,
146         0x7BDBE5, 0xC23AC4, 0xEAF426, 0x8A67F7, 0xBF920D, 0x2BA365,
147         0xB1933D, 0x0B7CBD, 0xDC51A4, 0x63DD27, 0xDDE169, 0x19949A,
148         0x9529A8, 0x28CE68, 0xB4ED09, 0x209F44, 0xCA984E, 0x638270,
149         0x237C7E, 0x32B90F, 0x8EF5A7, 0xE75614, 0x08F121, 0x2A9DB5,
150         0x4D7E6F, 0x5119A5, 0xABF9B5, 0xD6DF82, 0x61DD96, 0x023616,
151         0x9F3AC4, 0xA1A283, 0x6DED72, 0x7A8D39, 0xA9B882, 0x5C326B,
152         0x5B2746, 0xED3400, 0x7700D2, 0x55F4FC, 0x4D5901, 0x8071E0,
153         0xE13F89, 0xB295F3, 0x64A8F1, 0xAEA74B, 0x38FC4C, 0xEAB2BB,
154         0x47270B, 0xABC3A7, 0x34BA60, 0x52DD34, 0xF8563A, 0xEB7E8A,
155         0x31BB36, 0x5895B7, 0x47F7A9, 0x94C3AA, 0xD39225, 0x1E7F3E,
156         0xD8974E, 0xBBA94F, 0xD8AE01, 0xE661B4, 0x393D8E, 0xA523AA,
157         0x33068E, 0x1633B5, 0x3BB188, 0x1D3A9D, 0x4013D0, 0xCC1BE5,
158         0xF862E7, 0x3BF28F, 0x39B5BF, 0x0BC235, 0x22747E, 0xA247C0,
159         0xD52D1F, 0x19ADD3, 0x9094DF, 0x9311D0, 0xB42B25, 0x496DB2,
160         0xE264B2, 0x5EF135, 0x3BC6A4, 0x1A4AD0, 0xAAC92E, 0x64E886,
161         0x573091, 0x982CFB, 0x311B1A, 0x08728B, 0xBDCEE1, 0x60E142,
162         0xEB641D, 0xD0BBA3, 0xE559D4, 0x597B8C, 0x2A4483, 0xF332BA,
163         0xF84867, 0x2C8D1B, 0x2FA9B0, 0x50F3DD, 0xF9F573, 0xDB61B4,
164         0xFE233E, 0x6C41A6, 0xEEA318, 0x775A26, 0xBC5E5C, 0xCEA708,
165         0x94DC57, 0xE20196, 0xF1E839, 0xBE4851, 0x5D2D2F, 0x4E9555,
166         0xD96EC2, 0xE7D755, 0x6304E0, 0xC02E0E, 0xFC40A0, 0xBBF9B3,
167         0x7125A7, 0x222DFB, 0xF619D8, 0x838C1C, 0x6619E6, 0xB20D55,
168         0xBB5137, 0x79E809, 0xAF9149, 0x0D73DE, 0x0B0DA5, 0xCE7F58,
169         0xAC1934, 0x724667, 0x7A1A13, 0x9E26BC, 0x4555E7, 0x585CB5,
170         0x711D14, 0x486991, 0x480D60, 0x56ADAB, 0xD62F64, 0x96EE0C,
171         0x212FF3, 0x5D6D88, 0xA67684, 0x95651E, 0xAB9E0A, 0x4DDEFE,
172         0x571010, 0x836A39, 0xF8EA31, 0x9E381D, 0xEAC8B1, 0xCAC96B,
173         0x37F21E, 0xD505E9, 0x984743, 0x9FC56C, 0x0331B7, 0x3B8BF8,
174         0x86E56A, 0x8DC343, 0x6230E7, 0x93CFD5, 0x6A8F2D, 0x733005,
175         0x1AF021, 0xA09FCB, 0x7415A1, 0xD56B23, 0x6FF725, 0x2F4BC7,
176         0xB8A591, 0x7FAC59, 0x5C55DE, 0x212C38, 0xB13296, 0x5CFF50,
177         0x366262, 0xFA7B16, 0xF4D9A6, 0x2ACFE7, 0xF07403, 0xD4D604,
178         0x6FD916, 0x31B1BF, 0xCBB450, 0x5BD7C8, 0x0CE194, 0x6BD643,
179         0x4FD91C, 0xDF4543, 0x5F3453, 0xE2B5AA, 0xC9AEC8, 0x131485,
180         0xF9D2BF, 0xBADB9E, 0x76F5B9, 0xAF15CF, 0xCA3182, 0x14B56D,
181         0xE9FE4D, 0x50FC35, 0xF5AED5, 0xA2D0C1, 0xC96057, 0x192EB6,
182         0xE91D92, 0x07D144, 0xAEA3C6, 0x343566, 0x26D5B4, 0x3161E2,
183         0x37F1A2, 0x209EFF, 0x958E23, 0x493798, 0x35F4A6, 0x4BDC02,
184         0xC2BE13, 0xBE80A0, 0x0B72A3, 0x115C5F, 0x1E1BD1, 0x0DB4D3,
185         0x869E85, 0x96976B, 0x2AC91F, 0x8A26C2, 0x3070F0, 0x041412,
186         0xFC9FA5, 0xF72A38, 0x9C6878, 0xE2AA76, 0x50CFE1, 0x559274,
187         0x934E38, 0x0A92F7, 0x5533F0, 0xA63DB4, 0x399971, 0xE2B755,
188         0xA98A7C, 0x008F19, 0xAC54D2, 0x2EA0B4, 0xF5F3E0, 0x60C849,
189         0xFFD269, 0xAE52CE, 0x7A5FDD, 0xE9CE06, 0xFB0AE8, 0xA50CCE,
190         0xEA9D3E, 0x3766DD, 0xB834F5, 0x0DA090,
191 };

193 #if 0
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194 const int _TBL_ipio2l_66[] = {
195         0xA2F983, 0x6E4E44, 0x152A00, 0x062BC4, 0x0DA276, 0xBED4C1,
196         0xFDF905, 0x5CD5BA, 0x767CEC, 0x1F80D6, 0xC26053, 0x3A0070,
197         0x107C2A, 0xF68EE9, 0x687B7A, 0xB990AA, 0x38DE4B, 0x96CFF3,
198         0x92735E, 0x8B34F6, 0x195BFC, 0x27F88E, 0xA93EC5, 0x3958A5,
199         0x3E5D13, 0x1C55A8, 0x5B4A8B, 0xA42E04, 0x12D105, 0x35580D,
200         0xF62347, 0x450900, 0xB98BCA, 0xF7E8A4, 0xA2E5D5, 0x69BC52,
201         0xF0381D, 0x1A0A88, 0xFE8714, 0x7F6735, 0xBB7D4D, 0xC6F642,
202         0xB27E80, 0x6191BF, 0xB6B750, 0x52776E, 0xD60FD0, 0x607DCC,
203         0x68BFAF, 0xED69FC, 0x6EB305, 0xD2557D, 0x25BDFB, 0x3E4AA1,
204         0x84472D, 0x8B0376, 0xF77740, 0xD290DF, 0x15EC8C, 0x45A5C3,
205         0x6181EF, 0xC5E7E8, 0xD8909C, 0xF62144, 0x298428, 0x6E5D9D,
206         0xF9A9B4, 0xCDBD2F, 0xC083E7, 0x0D3957, 0xECA3B2, 0x96223C,
207         0xC1080D, 0x087D47, 0x7D7576, 0xA614B1, 0x42A4B6, 0xAA173C,
208         0xE217E5, 0xFDCD34, 0x279D5F, 0x39AACA, 0x1CA8DF, 0x8B6633,
209         0x5C49E4, 0xB56803, 0x1E7938, 0x741FDC, 0x4CB19B, 0xCECC3B,
210         0x921EB7, 0x7C0FC3, 0x361F23, 0xF9EE22, 0xBA4235, 0xA5FCA3,
211         0xBD4680, 0xFCDF65, 0xFC96AD, 0x31C90C, 0x919EEB, 0xFE0FB7,
212         0x75B4B0, 0x693961, 0x75BCAA, 0xEB6F39, 0xA343C0, 0xD16FF2,
213         0x33DAD0, 0xC1E095, 0x053182, 0x11E4A1, 0x40F943, 0x32D314,
214         0xAF1B98, 0xE1B05A, 0xE5F3AD, 0x6E633F, 0x363D14, 0xA3777C,
215         0xC8C6EE, 0x001E18, 0x0D180C, 0xAA1369, 0xEDFBA2, 0x998A9D,
216         0x16E799, 0x693B75, 0x90EF50, 0x938DD4, 0xFB7ACD, 0x67CEEB,
217         0x249DE3, 0x9B9B52, 0xD8CDAC, 0xC31A54, 0x855FBF, 0x848591,
218         0x0954B0, 0x946B8C, 0xA4C7B4, 0x9A9E51, 0xF20425, 0xAA2637,
219         0xFC6657, 0x7D8625, 0x620B74, 0x8B578D, 0xEC9A05, 0xDEF24F,
220         0x7F19B0, 0xFC2544, 0x1DA0F1, 0x23790C, 0xC4294D, 0x6D3C32,
221         0x66FE56, 0xD45562, 0x66264F, 0xA24162, 0x13E930, 0xB0E7C0,
222         0xFA0E97, 0xBFC62C, 0x0E663F, 0x90F33B, 0x55E73C, 0xD791F7,
223         0xD3F00D, 0xAB01C7, 0x40CF8F, 0xA593BA, 0xE627D5, 0x4A8308,
224         0x32DC06, 0x80C876, 0x1C3DB5, 0xB5489F, 0x632CDF, 0xB02517,
225         0xD17EFA, 0x92570F, 0xFAED44, 0x8F8536, 0x27069B, 0xC014DC,
226         0x997D48, 0x961D61, 0x7A960B, 0x31B622, 0xD3C425, 0xA69520,
227         0x98D29E, 0xF1C973, 0x5483D7, 0x99611E, 0xEAFF5F, 0x7DEFF1,
228         0x98475C, 0x91C787, 0x537E17, 0x068C65, 0xF05E52, 0x942F04,
229         0x37CF92, 0xEF4223, 0xC4C52F, 0x521DAA, 0xBAAF97, 0x972236,
230         0xA2B3D3, 0x62C921, 0x8D3A8B, 0x2B3302, 0x6061B9, 0x0CBE94,
231         0x75F451, 0xBD06DE, 0x86042D, 0xFB61ED, 0x4C8869, 0x590232,
232         0x479963, 0x23518D, 0xAF5D28, 0x60C9DE, 0x473DB0, 0x9DE009,
233         0xD8FC4C, 0xE96991, 0x9CA455, 0x800BC8, 0x977CE0, 0xDCBFA6,
234         0x19D249, 0xA0F76D, 0x5F9B2F, 0x452BB3, 0x77E091, 0xB6383A,
235         0x7BE9C2, 0x4BF7C1, 0x8A5EBF, 0xEB0D55, 0x9AF4DC, 0x275CA0,
236         0xED09D0, 0xE50A7F, 0x9BEF42C, 0x4803AF, 0x56139F, 0xD58848,
237         0x797D96, 0xB8352E, 0x49D90D, 0x7607E0, 0xC99256, 0x75F530,
238         0xB72237, 0x1AF080, 0xC2E813, 0x06CFA9, 0xB9DF8E, 0x919C38,
239         0x89D97E, 0x0464D5, 0xB12EEF, 0xD14165, 0x365A72, 0x550D35,
240         0x3772D8, 0xF41B58, 0x0378A7, 0x2D5D7D, 0xD6E433, 0xDD2018,
241         0x139FD7, 0x1B5621, 0x94E046, 0x97A323, 0x693176, 0x28DF59,
242         0xD24273, 0x0E4E26, 0xA9A8F6, 0xF15B41, 0x450EE3, 0x57EA61,
243         0x7DADA6, 0xF21086, 0x394BEE, 0x8F4813, 0x3FDEE9, 0xF3A53D,
244         0xAB2F40, 0x8B1E2B, 0xA07FD4, 0x992CC4, 0x63532D, 0x9F35A2,
245         0x6FA290, 0x0094DE, 0xD2A24D, 0x755B81, 0x79F9E1, 0xFE1D35,
246         0xFEE8CC, 0x9224C5, 0x54E2CE, 0x41F31C, 0xF45138, 0xED6D10,
247         0x6B439D, 0xD2BE46, 0xC327D4, 0x68BFB0, 0x46D5A5, 0x79B285,
248         0x776D7C, 0xE18647, 0x00E32F, 0xEBB7F2, 0x5DE307, 0x5A8EA0,
249         0x06CEFE, 0x20923C, 0x354CE1, 0xAD09C5, 0x56996D, 0xCFB124,
250         0xEF7BC1, 0x76BF72, 0xF20753, 0x5BBAFA, 0xB8A2B2, 0x5914F2,
251         0x5D834F, 0xE64A08, 0x14C3AB, 0x07796B, 0xF2212D, 0xC74049,
252         0xB61C6A, 0x282CFC, 0x25070C, 0x315BF1, 0x6FEAD3, 0x2CD2E5,
253         0xD10F9C, 0x1972BB, 0x908073, 0x0F368C, 0x69BE97, 0xA242B0,
254         0x722DFE, 0xAFE6A2, 0x143D8B, 0x5C5699, 0x48232B, 0xFF49AC,
255         0xB5FA62, 0x6AD778, 0x7A844D, 0x258AA0, 0x8EDE3D, 0x9A9496,
256         0x49924E, 0xA33E97, 0x4F43FA, 0xC40741, 0x2F764A, 0x8EB2B1,
257         0x8E67D3, 0x9FF324, 0x51B11B, 0x5D6E09, 0xE9AD3E, 0xFFA902,
258         0xF48653, 0x0845D3, 0xDED33E, 0x32D30E, 0x6247CA, 0x7C586D,
259         0x2EAF9E, 0x323A35, 0xAD11FB, 0x0F420C, 0x0E0685, 0x401B60,
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260         0xBB3D43, 0xF4D489, 0xBCDC4C, 0x40FFBA, 0x18AB08, 0x7AC72D,
261         0x5E76DB, 0xE8344E, 0x3975A2, 0xF9611B, 0x1121F3, 0x3A429C,
262         0x9B18EC, 0xF298B1, 0x8AEC78, 0x1C248B, 0x69108F, 0xDB2D37,
263         0xA1A613, 0x910359, 0x521451, 0xD4441F, 0x0BB3B6, 0x50D9DB,
264         0xBD589F, 0x62A62E, 0xA9B903, 0x935F63, 0x058BEC, 0x78BCB5,
265         0x2CB460, 0x3A9037, 0x0291C4, 0x1FABC1, 0xBE7D05, 0xF948E7,
266         0x6BA5CD, 0xF62A0A, 0x9AEA19, 0x2257AB, 0x2E0D7D, 0x9EB93F,
267         0x5E3F77, 0xD4A13F, 0x08E3DB, 0xDFD689, 0x2B9B4E, 0xB58427,
268         0x25424B, 0x1197FD, 0xCF298A, 0x314008, 0xD5687F, 0x0F0EAC,
269         0x13C485, 0xF684B2, 0xED7EC7, 0x6E636D, 0x28C933, 0xE19058,
270         0x688B6A, 0xC88905, 0xFB2F31, 0x61304C, 0xC19765, 0x60D81A,
271         0x57F276, 0xC6EFC4, 0x048954, 0x303470, 0xDA6F6F, 0x93901A,
272         0x911439, 0x363D12, 0x59E72B, 0x6F9F1E, 0x57C584, 0xDF0D23,
273         0xBB743F, 0xADE99C, 0x546097, 0xFCC820, 0xCBB968, 0xDA9B5F,
274         0x0DC271, 0x563337, 0x9ED662, 0xE7C44F, 0x3129F8, 0xF5EAF9,
275         0xDAF7F2, 0xCD09FF, 0xA92535, 0x441C29, 0x7DF436, 0xE2B00A,
276         0x36746F, 0xF1DC61, 0x9D3C9C, 0x63AB71, 0xB8F3BB, 0x1C80F6,
277         0x62FF65, 0x5FFE5F, 0x3B2814, 0xBADE27, 0x1B384B, 0x268AA9,
278         0xBD91EF, 0xCA436B, 0xABE107, 0x88DCA6, 0xC3AFC0, 0x85D155,
279         0x464A48, 0xBFDAEB, 0xC6F389, 0x907C11, 0x0D3E41, 0xCD2197,
280         0x549008, 0x817E4E, 0x8C7154, 0x1DC37F, 0x5E897E, 0xA9A2FE,
281         0xEC6060, 0xCC0728, 0x430D3B, 0x62471C, 0xD3A4D3, 0x2BA57B,
282         0xE5D15A, 0xD632F3, 0xF2B76F, 0xEC8498, 0xAE41C2, 0xAAF413,
283         0xEAF5C0, 0xDD1B07, 0xB9A2A0, 0x59F230, 0xA3F61B, 0x8F8643,
284         0x05DE6B, 0x1B5B8E, 0x63ECC5, 0xBFF01D, 0x8F1440, 0x3F8ADF,
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286         0xDF6E34, 0x8D4604, 0x4F6594, 0x639063, 0x6B51CC, 0x0D05CD,
287         0x009607, 0xE7BF70, 0xC9A0EA, 0x0D80DD, 0xA1A065, 0x0DCB8F,
288         0xA48430, 0x715934, 0x6FC8E4, 0x6FFC52, 0xEF8B05, 0xDE506A,
289         0xE62BBC, 0x31480F, 0xEA64EA, 0x51E6FB, 0x9AE773, 0x21C54D,
290         0xBFA080, 0x273D1E, 0x9FFD4E, 0x0C2CA8, 0x0690A5, 0xF8773B,
291         0x4B2680, 0x6E3F56, 0xC8B89F, 0x0B7BD0, 0x71C8BF, 0x5AABD3,
292         0x2BA93E, 0x9D2EE1, 0xCDF2FA, 0xEE57BE, 0x84A116, 0xDA756D,
293         0x8FD6C0, 0x927153, 0xFF5EF3, 0x9F8331, 0x713411, 0xF945F3,
294         0x0382B2, 0x8BAE30, 0xBC45A4, 0x630101, 0x5C9C3A, 0x643CFD,
295         0x48115C, 0x17F03E, 0xB5F55E, 0x288DAF, 0x725660, 0xFB58E0,
296         0xFC189E, 0x1ECA69, 0xFB19A6, 0xFA7A92, 0x7CC48E, 0x869372,
297         0x58089A, 0x16DB5C, 0xADC0CD, 0x09D3D4, 0xD1108E, 0xDC64ED,
298         0x3A999C, 0xAA8716, 0x5A3D8E, 0x7037FB, 0x1976AD, 0xE477D7,
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302         0x1084A6, 0xE18E5D, 0x2D8589, 0x203345, 0x4851AF, 0xA71EDC,
303         0x03B6B1, 0x267970, 0xDEC908, 0x795BED, 0x7099B9, 0x209321,
304         0x7FC2E7, 0x0F3E5E, 0xC7A4F4, 0x088129, 0x59AE63, 0x4E3251,
305         0x344268, 0x79285D, 0x2B9494, 0xF1E2A2, 0xF7DA20, 0xDF6756,
306         0xCA3BA3, 0x422489, 0xA2239C, 0x38724D, 0x2AC767, 0x601E9D,
307         0xB47C6C, 0xA22481, 0xBBB655, 0x1EC0C4, 0xD84A97, 0xD449EE,
308         0x162C9D, 0x782F29, 0xCEB4FA, 0xE317BC, 0x2FFDBD, 0xB342D2,
309         0xB2CB19, 0x323AB9, 0x1AFF93, 0x13A8DF, 0x86B5A5, 0x5741D6,
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312         0xE46933, 0xA764E4, 0x754266, 0xFA4F98, 0x643DA5, 0xCA775C,
313         0x7F1632, 0xE671A3, 0x4BF4C6, 0xA82378, 0xEFD317, 0xE62D38,
314         0xD461C9, 0x8EEC80, 0xC89882, 0x4CC73C, 0x830F3F, 0xE4B200,
315         0x582615, 0x6CD558, 0xA66727, 0xEF7975, 0xFEA5CE, 0x147A40,
316         0x4796E4, 0xC07761, 0xF5D5B3, 0x6B65FB, 0xE4F14D, 0xA837CA,
317         0x9A152A, 0x554E94, 0x83EC5F, 0xA62174, 0x85E2ED, 0xCCE71C,
318         0x3540FF, 0x088A84, 0xBA2816, 0x293610, 0x4C3EE7, 0x8E55A9,
319         0x49E5E5, 0x782178, 0x45D2AA, 0x9BB449, 0x00D282, 0xF61E67,
320         0xE2F7DE, 0xCC6AA1, 0xCD1979, 0x52FEDB, 0x9A8776, 0x70A018,
321         0x500271, 0x1273BA, 0xDE648E, 0x7AC7F7, 0x767725, 0xD0A457,
322         0xF17250, 0xBC578C, 0x2DFD3A, 0x97F988, 0xA576C8, 0x8129BB,
323         0x22D9C3, 0x0436ED, 0x650791, 0xA314EC, 0x42A0B3, 0x37A521,
324         0x4BFB2B, 0x8C1B7F, 0x115E17, 0xF7C27F, 0xC1D5EB, 0x060487,
325         0x8A28D6, 0x41330F, 0xBFAE67, 0x7774E8, 0x4CCC3C, 0x6B2F80,
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326         0x628BF2, 0x1E41A6, 0x8D0B22, 0xBC85BA, 0xCCF461, 0xBEC69C,
327         0xDF8A10, 0x3C5E71, 0x2F8D5F, 0x63D3DA, 0x5934D1, 0x2CA35D,
328         0xC687A2, 0x24E9B4, 0x1843D3, 0x5C9B97, 0x9B580C, 0x780B2C,
329         0x59943D, 0x0744D0, 0x8DA6E3, 0x07AAF6, 0x2214D0, 0x72E8D7,
330         0x54151B, 0x514DE9, 0x8DCC3B, 0x0CEB00, 0x2C4DE3, 0x5012AE,
331         0xD7B72E, 0xB7DE9A, 0x641B2F, 0xF9CF17, 0x8BD282, 0x9F31A3,
332         0xDED846, 0x467E05, 0x26CCEA, 0xF8E404, 0x65572E, 0x82C594,
333         0xE572A9, 0x895653, 0xA1AA94, 0x8DD876, 0x5E9A61, 0x69EB1C,
334         0x0385A9, 0x5BC844, 0x95B2DF, 0x6678F6, 0xFA7033, 0xE4F434,
335         0x5584A9, 0x32C099, 0x9AD846, 0xB3FFD1, 0xA81C56, 0x4E54EF,
336         0x54D173, 0xF191B4, 0x49B2A2, 0xB309D9, 0x546D8D, 0xC0A51E,
337         0xCAFFC0, 0x785400, 0x05F69D, 0x894056, 0xC33098, 0xDFF6C2,
338         0x908D97, 0x05CC96, 0x46484B, 0xBD7B9D, 0xB152F5, 0x5A7461,
339         0x59CA20, 0x8F8EF5, 0xC9FF05, 0xF6F398, 0x856C97, 0x81E07C,
340         0xAE5EDA, 0x51BDC9, 0xF26437, 0xBBC8CE, 0x091B52, 0x68B6A5,
341         0x90750E, 0x925EF9, 0x3D9CB3, 0x46EA96, 0x97D648, 0x78BCC7,
342         0xF4B488, 0x05275E, 0x6619DF, 0x56D4A0, 0x8C5C41, 0xDB345A,
343         0x0B79DA, 0x496369, 0x96109B, 0x667664, 0xC40CF9, 0x91D7CA,
344         0x119F1A, 0xA99272, 0xCBB529, 0xBB033E, 0x8F91C0, 0x570045,
345         0xB845C2, 0x2B8E52, 0x687AFB, 0x0D0AA3, 0x200863, 0x043B83,
346         0xF129DE, 0x49C2D6, 0x9641D2, 0xC4747C, 0x220804, 0x503F05,
347         0x7E274F, 0xCA83D9, 0x9D6495, 0x0E5039,
348 };
349 const int _TBL_ipio2l_53[] = {
350         0xA2F983, 0x6E4E44, 0x16F3C4, 0xEA69B5, 0xD3E131, 0x60E1D2,
351         0xD7982A, 0xC031F5, 0xD67BCC, 0xFD1375, 0x60919B, 0x3FA0BB,
352         0x612ABB, 0x714F9B, 0x03DA8A, 0xC05948, 0xD023F4, 0x5AFA37,
353         0x51631D, 0xCD7A90, 0xC0474A, 0xF6A6F3, 0x1A52E1, 0x5C3927,
354         0x3ADA45, 0x4E2DB5, 0x64E8C4, 0x274A5B, 0xB74ADC, 0x1E6591,
355         0x2822BE, 0x4771F5, 0x12A63F, 0x83BD35, 0x2488CA, 0x1FE1BE,
356         0x42C21A, 0x682569, 0x2AFB91, 0x68ADE1, 0x4A42E5, 0x9BE357,
357         0xB79675, 0xCE998A, 0x83AF8B, 0xE645E6, 0xDF0789, 0x9E9747,
358         0xAA15FF, 0x358C3F, 0xAF3141, 0x72A3F7, 0x2BF1D4, 0xF3AD96,
359         0x7D759F, 0x257FCE, 0x29FB69, 0xB1B42C, 0xC32DE1, 0x8C0BBD,
360         0x31EC2F, 0x942026, 0x85DCE7, 0x653FF3, 0x136FA7, 0x0D7A5F,
361         0x93FC61, 0x035287, 0xC77FCA, 0x73530A, 0xC6BC15, 0x0E4B0F,
362         0x568FCE, 0x2D3456, 0x4D7FE1, 0xA12CD1, 0xB2CEA2, 0x531C62,
363         0x70B4D2, 0x1BCE9A, 0x87704D, 0x6B83D7, 0xAA8121, 0x2530EA,
364         0x2074BF, 0x28A071, 0x9D69C3, 0x406DD8, 0xF58783, 0x115D89,
365         0x5E85F3, 0xAACDCC, 0x8C0B57, 0xD7DFFE, 0x550D96, 0xC43EB4,
366         0x89ABA7, 0x94F595, 0x56F260, 0x06A4CD, 0x7FD2E2, 0x6FDFA8,
367         0x3E9C98, 0xBFD682, 0xAD3A12, 0x23A8A6, 0x173A89, 0x5DE9BD,
368         0x95A978, 0x28E484, 0x5964F3, 0x496AF0, 0x4B1DA9, 0x989061,
369         0xBD2BF2, 0xE01A90, 0x0905B7, 0xAC39AC, 0x52D5B7, 0x109F25,
370         0x3AE1DC, 0xF90A7C, 0x33F4E5, 0xF5DFDF, 0x1522D0, 0x562CE6,
371         0x392CFF, 0xEB9032, 0x10A08E, 0x0B1D7F, 0x42B80A, 0x366DD2,
372         0xC24F89, 0x02222E, 0x21494C, 0x985287, 0x87FD07, 0x2EE361,
373         0xAD8D68, 0xE72273, 0x9E8D59, 0xD09999, 0x10F4A1, 0x1079A3,
374         0xE9BEAF, 0x9C0887, 0x09C622, 0xEBCF06, 0x974532, 0x086A8F,
375         0x6CEA05, 0x388C00, 0x74969E, 0xC85B16, 0x385A38, 0x9A2F35,
376         0x670531, 0xABA6D0, 0xEFD3C1, 0x27AD92, 0xF4203E, 0x3D619F,
377         0x4D05F4, 0x9AE7CC, 0x03B592, 0x41FF55, 0xCAFCA5, 0x1A0987,
378         0x88AB79, 0x3627D4, 0x25B12A, 0x52594A, 0xA2BEB0, 0x25C3F2,
379         0x4489DA, 0x7959A7, 0xEAEC89, 0xB34714, 0x960196, 0x1FC33A,
380         0x7F0275, 0x32EF92, 0x0111CE, 0x8E4685, 0x6F5B34, 0xF6123A,
381         0x5543B2, 0xE9A02A, 0x74E03F, 0x54D5A8, 0x086A2C, 0x4A9CD3,
382         0x921191, 0x229764, 0x0A1A84, 0x9B45AE, 0xC653A5, 0xB15F33,
383         0x100FD1, 0x7DD740, 0xB20CD3, 0x0A0786, 0xF506C3, 0x25EBF4,
384         0x3AB39E, 0xE3BB24, 0x27646F, 0xEECE57, 0x706BFE, 0xC7A869,
385         0x57ED51, 0x118C82, 0x2B0FF5, 0xC8E545, 0xC43D80, 0x2A3183,
386         0x4C1BB9, 0xBC108A, 0x099779, 0xF9ECC8, 0x2A1063, 0x5D2F6A,
387         0x8F2675, 0x12FF6D, 0x32EED9, 0xE4A245, 0x7392CF, 0x5C240B,
388         0xC476FF, 0x97AFC7, 0xB76131, 0x665E05, 0x67BD57, 0x19E998,
389         0x3A5863, 0x23B8AA, 0x5B5608, 0x8A66C6, 0x5F2AD3, 0x78BAFA,
390         0x3516CE, 0xCBEA16, 0x6E40D4, 0xB463D4, 0xA6C12F, 0xABD3D7,
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394         0x435F6B, 0x48058B, 0x417DA0, 0xE01217, 0x085A69, 0xB50E36,
395         0x79A4CD, 0xD74907, 0x26C4B5, 0xB90054, 0x06C3AD, 0x5AB38F,
396         0x585E91, 0xD04E4F, 0x2938CE, 0xD4EAA7, 0xA06DE5, 0x40BFE5,
397         0xDE6849, 0xEF65F0, 0xF1D4BB, 0x94C21E, 0x66E978, 0x1B9B94,
398         0x961043, 0x5961B8, 0xBAAA74, 0xD662EE, 0x9DABF6, 0x0AFE28,
399         0x9587A4, 0xA632BC, 0x09149F, 0xDEA996, 0x2CAFD7, 0xBDE29B,
400         0x7159E6, 0x1F7C49, 0xF2E2ED, 0xBFA992, 0x7C77EF, 0xC245D0,
401         0xB2D129, 0x993E75, 0xAB4C0C, 0x5C84B6, 0x17F542, 0x45314E,
402         0x1DEF1B, 0xE3BDCC, 0xB3AE86, 0x24522F, 0x918FC6, 0x2138D5,
403         0x883646, 0x6858B6, 0x032762, 0x5170F8, 0x4974EA, 0x76BF77,
404         0xECDA8A, 0x9EADDD, 0x2404EF, 0xC52A5D, 0xF2E858, 0xC42D60,
405         0xD18C08, 0xDE59B2, 0x4CC3A6, 0x94D888, 0x4C4AF0, 0xCF1F8C,
406         0xBF2F6F, 0x7B4535, 0x98B0DB, 0x2BE0CF, 0x4616A7, 0xA8D9FB,
407         0x88CA7A, 0x5087E1, 0x18DD8A, 0x1A9F4F, 0x1DCECE, 0xF8609E,
408         0xE2F0C8, 0x9AD7D4, 0xE3CDFE, 0xC6FDD5, 0x8FF3CD, 0x7D45AA,
409         0xD34957, 0x7C1963, 0x6CE098, 0xB70215, 0x326BBF, 0x47B3A6,
410         0xF9235D, 0x6F66F5, 0xC6E40C, 0xE7F50B, 0xFF2FDD, 0x5A1251,
411         0xE95EF1, 0xDE8E67, 0xECEE9B, 0xC9F98E, 0x722224, 0x6DF750,
412         0x81D08F, 0x2BFCF0, 0xDDC10D, 0x775314, 0xDB1D87, 0x41626B,
413         0x9EDF31, 0x7738D9, 0x8D9EB4, 0x4F1C2A, 0xF3E795, 0xB69699,
414         0xD9A56D, 0x31BB1B, 0x542975, 0xAB917B, 0x63927C, 0x9BB764,
415         0x84A598, 0x0A0C51, 0x5E48C4, 0x7780E3, 0x87E156, 0x155972,
416         0xE406F8, 0x48AB9E, 0x3CCDDA, 0x010F87, 0x683B70, 0x400CAD,
417         0x5DE5C5, 0x7262FA, 0xFA248D, 0x013AF2, 0xE2E8B5, 0x995F7D,
418         0x7F8C4B, 0x0E8B59, 0x1006F1, 0x40B6E9, 0x760654, 0xCBCC8C,
419         0x086F40, 0xDC7F6F, 0xFCD0D4, 0xA47ADE, 0x5204FA, 0xF38A9D,
420         0xE76C7C, 0x575207, 0x499BF1, 0x0DB01C, 0x09098E, 0x957A71,
421         0xD53E0E, 0x61DF1D, 0xE6EF34, 0x5821EC, 0x96BCC0, 0xDC96CE,
422         0xA9C0AE, 0x130B2C, 0xCCC589, 0x829BB9, 0x2A75BA, 0x97611C,
423         0x0CEAB8, 0x165D9D, 0x35AD41, 0x82A805, 0x975628, 0x5601A6,
424         0x074F08, 0x80A27D, 0xEFA64E, 0xD7BB4B, 0x5E6397, 0xC92FFC,
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426         0x913E3E, 0xABF50B, 0x95B24A, 0x3FC9C5, 0xE7BA15, 0x8C7F70,
427         0xF81358, 0x774606, 0xCE8C0D, 0xB6B268, 0xB85BA6, 0xAC9B2E,
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432         0x6F7D83, 0x86D665, 0x5C7744, 0xDD183E, 0x1C2E17, 0x712F5E,
433         0x4AACCB, 0xB69B68, 0xA1201F, 0x743C2B, 0xF6AD70, 0x92E024,
434         0xF34FD8, 0x33712E, 0xFE1D73, 0x4471F0, 0x7D0526, 0x58AF47,
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436         0xABEEE4, 0xA5D495, 0xA407A4, 0x31BB4B, 0x0AA1E3, 0x518E7C,
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438         0x4B683B, 0x8D48F7, 0xF4FBD8, 0xD4FE0A, 0xE961DE, 0x87BD37,
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444         0x7325ED, 0x8F8F4C, 0xC1E426, 0x3066AD, 0x0759A4, 0xE03390,
445         0x70CC9A, 0x524F77, 0xCDD489, 0x97DD24, 0xA81858, 0xF24513,
446         0xA9C18E, 0x2A2F82, 0xC2C014, 0xB8E7F0, 0x934036, 0xD36E51,
447         0xD9A089, 0xDBC587, 0xB30418, 0x969192, 0x0A5213, 0xE21841,
448         0x2881EC, 0x9A293F, 0x0DF705, 0x85B497, 0xE430B9, 0xE90ECF,
449         0xC15FDC, 0x9E8A7E, 0xC5472D, 0xB54FBD, 0x456AF2, 0xCA80B6,
450         0xAE25FE, 0xA03B46, 0x6C6CFD, 0x78382A, 0x0E7877, 0x7F2D31,
451         0x03C827, 0x61CF52, 0x339A2F, 0x2286A9, 0xE41DF0, 0x640F5C,
452         0xBEF364, 0x010506, 0x6D2C21, 0x841EFF, 0x7F3B5D, 0xD98DC8,
453         0x0F9421, 0xA25B0C, 0x4C2C44, 0x922392, 0xB98A8A, 0x6179B9,
454         0xF7B419, 0x289AAF, 0xE92F47, 0x5E47A2, 0x82927F, 0xC7290E,
455         0x6C925C, 0xBA5A3C, 0x8FB7F6, 0x9C4BEE, 0x02C529, 0x0CFCD7,
456         0x5EBD8C, 0x7196E0, 0x4B917E, 0x6B9780, 0x6A1731, 0xA617FF,
457         0x27A20D, 0x5A56A3, 0x43C4DB, 0xC62EA4, 0x637A84, 0x1C46F9,
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458         0x33C780, 0x61A278, 0x4915C9, 0xD6C776, 0x6A7C66, 0xD8DD0C,
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461         0x29F24C, 0x579C7E, 0xBF3682, 0xDCB460, 0xAE08B3, 0xA524BC,
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466         0x7D2AC4, 0xAB5697, 0xAC61EB, 0xE5DAF0, 0x654ED6, 0x8E77E3,
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468         0x9E3E45, 0x0E3CC7, 0xC12454, 0xCCBCB6, 0x17979E, 0xD0D374,
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471         0x913BB7, 0x17D064, 0xF6C9CE, 0xAC5D11, 0xD0C313, 0xBCCCB6,
472         0xAAD4FC, 0xE47B2C, 0xFE4362, 0xF2E712, 0x2D5EFF, 0x833822,
473         0x58A1D7, 0x68377C, 0xE49B25, 0x22B179, 0x048796, 0x069400,
474         0xE670D3, 0xD2CB85, 0x55FBE6, 0x67F281, 0xFE2DE0, 0x8CFAF2,
475         0x9865BC, 0x210CD3, 0x86DD70, 0x43D00F, 0x55E279, 0x679252,
476         0x8D4F58, 0xE17AC5, 0x6A6127, 0x1B0876, 0x5D8ED0, 0x701330,
477         0xD5BD25, 0xC9A126, 0x57C571, 0xDC5C3F, 0xB6D34E, 0xB72383,
478         0x001A9E, 0x7D36C0, 0x8151F6, 0x65D7C1, 0xE1F513, 0xCD372A,
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481         0x40AAF7, 0x7FD285, 0x069B36, 0x03C00A, 0x13C7D5, 0x0DA14C,
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487         0x714252, 0xC73FB9, 0x662D89, 0x3D83BA, 0xBDF046, 0x2E4F62,
488         0x76B7C0, 0x81336C, 0xBE80A9, 0x4C9D72, 0x739A15, 0x47972C,
489         0xA36A1B, 0xD31731, 0x54BA46, 0x2E8C72, 0xFEA5A5, 0x9A7E5F,
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491         0x6CD8F9, 0xD02E1F, 0x1C3F2F, 0xFCF8F0, 0x4C2C6D, 0x0B2169,
492         0x48B9CE, 0x42737D, 0xA8E974, 0x64062D, 0xA86C59, 0xEEC419,
493         0x047C83, 0x996A23, 0xF2A4C8, 0x4BE1B8, 0x348286, 0xE84240,
494         0x8337CB, 0xE55A2F, 0xC17750, 0xA4DA06, 0x64347F, 0x59A5A1,
495         0xDFF53D, 0x62A571, 0xEECF3A, 0x886700, 0xC06DAF, 0x4E161F,
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498         0xCEB88F, 0x7FAED3, 0xDB9116, 0x31CF72, 0x1A5136, 0xC4F362,
499         0xDE4799, 0x768043, 0x386207, 0x8E5497, 0xB0EF6D, 0x6C57FB,
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501         0x6157FE, 0xC5731C, 0xEF1A2E, 0x60EC10, 0xA67EFE, 0x486A73,
502         0x8004F6, 0xC3F482, 0x63BA28, 0x107282,
503 };
504 #endif
```

```
**********************************************************
    7822 Sat May 10 12:09:02 2014
new/usr/src/lib/libm/common/Q/_TBL_logl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
 * Table of constants for logl.
 * By K.C. Ng, March 9, 1989
 */

#include "libm.h"

const long double _TBL_logl_hi[] = {
        +0.0000000000000000000000000000000000000000e+0000L,
        +1.5504186535965254150854044093203958752 74e-0002L,
        +3.0771658666753688371028204543131423549427e-0002L,
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        +6.0624621816434842580606129724837429974 42e-0002L,
        +7.5223421237587525698605320390868275788 24e-0002L,
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        +1.8492233849401199266390350597230773146 15e-0001L,
        +1.9782574332991988036257203745337829257 63e-0001L,
        +2.1056476910734963766955275316260887024 97e-0001L,
        +2.2314355131420975576629499370279971040 32e-0001L,
        +2.3556607131276690907758811630090963371 26e-0001L,
        +2.4783616390458125678060268679527200816 99e-0001L,
        +2.5995752443692606697207949330852317390 65e-0001L,
        +2.7193371548364175883166942420311366852 88e-0001L,
        +2.8376817313064459834690104587945471353 12e-0001L,
        +2.9546421289383587638668177009161075350 02e-0001L,
        +3.0702503529491186207512436665524198343 11e-0001L,
```



```
        +3.1845373111853461581024711406860785615 31e-0001L,
        +3.2975328637246798181442280143624787844 88e-0001L,
        +3.4092658697059321030508900015446624269 52e-0001L,
        +3.5197642315717818465544755204825428813 0e-0001L,
        +3.6290549368936845313782429453982725215 23e-0001L,
        +3.7371640979358408082101673312267575254 99e-0001L,
        +3.8441169891033203973479004873695081103 20e-0001L,
        +3.9499380824086897810639397835206553189 15e-0001L,
        +4.0546510810816438197801303229941379322 04e-0001L,
        +4.1582789514371096561332882595117448266 05e-0001L,
        +4.2608439531090006312454473855698423563 71e-0001L,
        +4.3623676677491807034904122391785095757 36e-0001L,
        +4.4628710262841951153258998740559942080 63e-0001L,
        +4.5623743348158759438080538408187057197 56e-0001L,
        +4.6608972992459922455861918787364536547 69e-0001L,
        +4.7584590486996391426520938936776558244 36e-0001L,
        +4.8550781578170080780179106330112555350 46e-0001L,
        +4.9507726679785151459796452130348994806 04e-0001L,
        +5.0455601075239528705830818288179488164 63e-0001L,
        +5.1394575110223431680100586682876695249 12e-0001L,
        +5.2324814376454783651680693535350375638 40e-0001L,
        +5.3246479886947184387392343795832631511 44e-0001L,
        +5.4159728243274437157654221116898413568 47e-0001L,
        +5.5064711795266227925994798613045553648 07e-0001L,
        +5.5961578793542268627088834665328436032 87e-0001L,
        +5.6850473535266871207873858040822945993 734e-0001L,
        +5.7731536503482360431811170675594990732 34e-0001L,
        +5.8604904500357820890411939164020353168 40e-0001L,
        +5.9470710774669278951434349590056581348 79e-0001L,
        +6.0329085143808426234058496635521551666 82e-0001L,
        +6.1180154110599290352988976088821255236 26e-0001L,
        +6.2024040975185752885149429543236279432 83e-0001L,
        +6.2860865942237413774430812939979007275 20e-0001L,
        +6.3690746223706923162049422813721571230 62e-0001L,
        +6.4513796137358470166522829833408641609 16e-0001L,
        +6.5330127201274563875861571909468580139 03e-0001L,
        +6.6139848224536500826023544877769330609 28e-0001L,
        +6.6943065394262926729888508405095750033 79e-0001L,
        +6.7739882359180614080968245650252746174 92e-0001L,
        +6.8530400309891941654404766999569518506 29e-0001L,
};

const long double _TBL_logl_lo[] = {
        +0.0000000000000000000000000000000000000000e+0000L,
        +1.9492428771251263890303741483552770373 60e-0027L,
        +3.0536379285974251562898000588306290523 49e-0027L,
        +3.1194110290975925497245992197965796983 55e-0027L,
        +2.3155828333117796947293020298740440047 47e-0027L,
        +1.9592794138848629196962306424810016449 14e-0026L,
        +3.2073196658509406891125909313215845852 32e-0026L,
        +3.4283630853482158869012402005606901914 23e-0026L,
        +5.1320066888212186442797930356391585911 04e-0026L,
        +6.6258269602781916230613139029871366757 60e-0026L,
        +6.5119460111338299044782139989273808177 16e-0027L,
        +6.2728362771108058770481262335487100958 28e-0027L,
        +6.4803458012575463263114230100011848013 74e-0026L,
        +8.6686941889544302560184918553370055162 55e-0026L,
        +3.3743583176498967535335829211308009233 37e-0026L,
        +5.9569742643470821864292479445186677575 30e-0026L,
        +9.6607034792971448649414617855651801914 97e-0026L,
        +1.0264013377642437288559586071278317182 21e-0025L,
        +7.8951252739829033515418225476253519740 82e-0026L,
        +1.2337878706698339852746113295316527538 61e-0027L,
        +7.0329885493453776747364244782965163775 26e-0026L,
        +1.7647080005312957286333848476708486258 1e-0025L,
        +1.3596335344168138787499884623414866062 57e-0025L,
```

```
128         +1.73880135918257881610002903051956252756 5e-0025L,
129         +9.95219917394421146390105838414333328773 4e-0026L,
130         +1.04845419325028900815893184235633313986 1e-0026L,
131         +1.99625889965747864771675591466416056217 0e-0025L,
132         +1.05461349717632816043910038350891528389 3e-0027L,
133         +5.14376625939880315803542861394468770065 7e-0026L,
134         +9.95931477540945784344560844636911691873 3e-0026L,
135         +1.37443400574865016493703284949615951258 4e-0026L,
136         +5.80129162364184525536027614469182932329 8e-0026L,
137         +8.31649353433515888261899100710284414900 5e-0026L,
138         +6.70037278226953847274925293521549931108 0e-0026L,
139         +1.41038492383259596731393602463911419987 3e-0025L,
140         +9.91432703430900714023454709434522404405 1e-0026L,
141         +1.93214069585942897298829235711303603829 9e-0025L,
142         +1.54082059176462325753092263202800195274 8e-0025L,
143         +5.96311240343812536811876904737161453874 1e-0026L,
144         +1.96936615829731613814011585598175447132 0e-0025L,
145         +1.38896633470741402392647656715721939321 3e-0026L,
146         +6.35393437172967660378527761298716089945 0e-0026L,
147         +3.48856380048336199963339503051658669679 9e-0025L,
148         +2.21445450640618899313915914870586159808 8e-0025L,
149         +2.89581367085256464307376970190538052487 8e-0025L,
150         +2.85501815927492953210740611076590004735 5e-0025L,
151         +9.27314499632851039294991151883397780965 8e-0026L,
152         +1.93074457923613878089594210578701175269 7e-0025L,
153         +1.53873542233157408810219267751974687745 3e-0025L,
154         +1.84458667664202898538398927240920653846 8e-0025L,
155         +3.54763546494183970807156313188531012852 1e-0025L,
156         +4.46471208178310208708428174863533222258 1e-0026L,
157         +5.06286395197045949550057530034750832487 7e-0026L,
158         +2.20306095088979015720451825791081807419 1e-0025L,
159         +5.54060223132319616338842851712643525472 3e-0027L,
160         +3.37134884062443992383069221172153114990 9e-0025L,
161         +7.63743935671945781166784414179348867092 9e-0026L,
162         +1.99043983478884229278021167682866665754 7e-0025L,
163         +1.97800645489846549371892308556987376971 9e-0025L,
164         +1.62116188083180622341608135547281961230 9e-0025L,
165         +3.89931957632055129215163280450191396592 0e-0025L,
166         +1.86423527809785886589317767058210039092 4e-0025L,
167         +1.53494820836805365573554154853993615222 1e-0025L,
168         +4.08971537801358017475955063344317614818 2e-0025L,
169 };
```

```
**********************************************************
    9104 Sat May 10 12:09:02 2014
new/usr/src/lib/libm/common/Q/_TBL_sinl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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/*
 * table of sinl(x) where x is 0.15625 + i*0.03125, i=0,1,...,74.
 * {0x3ffc4000,0,0,0} --> (inc 0x800) -->  {0x3ffe9000,0,0,0}
 *    0.15625              0.03125           0.78125  (pi/4 = 0.785395663...)
 */

#include "libm.h"

const long double _TBL_sinl_hi[] = {
        +1.55614992773556041209920643203516258 1492e-0001L,
        +1.59472458931843419942596388113090809 1043e-0001L,
        +1.63327491736612850846866172454354370 0180e-0001L,
        +1.67180032364806734370966028200751272 2777e-0001L,
        +1.71030022031395019281347969239834331 2832e-0001L,
        +1.74877401990272189895685369108520190 1772e-0001L,
        +1.78722113535153659375356241864180723 5164e-0001L,
        +1.82564098000471555399545651359413015 4574e-0001L,
        +1.86403296762269884552379983103205261 1919e-0001L,
        +1.90239651239099061763985887630757328 7214e-0001L,
        +1.94073102892909791156055200214145403 6336e-0001L,
        +1.97903593229946284652393910991812785 3182e-0001L,
        +2.01731063801638804725038151164000970 7423e-0001L,
        +2.05555456205495517656833020605493696 3632e-0001L,
        +2.09376712085993643711890752724881652 2107e-0001L,
        +2.13194773135469890616073033118478462 4987e-0001L,
        +2.17009581095010156760578095826055396 3420e-0001L,
        +2.20821077755338490552856347927749052 3429e-0001L,
        +2.24629204957705292350428549796424819 8189e-0001L,
        +2.28433904594774745424737831346195679 9859e-0001L,
        +2.32235118611511462413930877746235872 2636e-0001L,
        +2.36032789006066333735434291794518083 5158e-0001L,
        +2.39826857830661564441369251810886573 7937e-0001L,
```



```
        +2.43617267192474886012230947705214636 7777e-0001L,
        +2.47403959254522929596848704849389203 2583e-0001L,
        +2.54965960415878467487556574864872627 6685e-0001L,
        +2.62512399769153281450949626395692931 0415e-0001L,
        +2.70042816718585031552755063618827054 2366e-0001L,
        +2.77556751646336325922023446828128567 8680e-0001L,
        +2.85053745940547424587763033323252560 6110e-0001L,
        +2.92533342023327543624702326493913422 5079e-0001L,
        +2.99995083378683051163248282011699943 7532e-0001L,
        +3.07438514580380850670502958201980709 7725e-0001L,
        +3.14863181319745250865036315126939015 6066e-0001L,
        +3.22268630433386625687745919893188031 3050e-0001L,
        +3.29654409930860171914317725126463175 6945e-0001L,
        +3.37020069022530762612817541738100244 419e-0001L,
        +3.44365158145698408207172046472223746 8910e-0001L,
        +3.51689228994814059222584896955547015 5541e-0001L,
        +3.58991834546065053677710299152868941 1936e-0001L,
        +3.66272529086047561372909351716264176 8533e-0001L,
        +3.73530868238692946416839752660848112 0900e-0001L,
        +3.80766408992390192057200703388896675 0813e-0001L,
        +3.87978709727025046051079690813741959 7834e-0001L,
        +3.95167330240934236244832640419653657 0776e-0001L,
        +4.02331831777773111271055988809823868 862e-0001L,
        +4.09471777053295066122694027011452236 2676e-0001L,
        +4.16586730282041119259112448831069656 5000e-0001L,
        +4.23676257203938010361683988031102479 8208e-0001L,
        +4.30739925110803197216321517850849189 7943e-0001L,
        +4.37777302872755132861618974702796680 1523e-0001L,
        +4.44787960964527211433056012529525211 1499e-0001L,
        +4.51771471491683776581688750134062869 5303e-0001L,
        +4.58727408216736592377295028972874773 2442e-0001L,
        +4.65655346585160182681199512507546779 1328e-0001L,
        +4.72554863751304451146551317808516941 8350e-0001L,
        +4.79425538604203000273287935215571401 9245e-0001L,
        +4.93078685753923057265136552753487120 5832e-0001L,
        +5.06611454814257367642296000893867191 9466e-0001L,
        +5.20020541953727004760213699874674729 7451e-0001L,
        +5.33302673536020173329131103308161528 8994e-0001L,
        +5.46454606919203564403349553749411000 8818e-0001L,
        +5.59473131247366877384844006003116688 4132e-0001L,
        +5.72355068234507240384953706824503607 5406e-0001L,
        +5.85097272940462154805399314150080458 5059e-0001L,
        +5.97696634538701531238647618967334337 0299e-0001L,
        +6.10150077075791371273742393566183220 0218e-0001L,
        +6.22454560223436830419267050904433302 049e-0001L,
        +6.34607080015269296850309914203671436 4826e-0001L,
        +6.46604669591152370524042159882800762 9792e-0001L,
        +6.58444399910567541589583954884041989 4459e-0001L,
        +6.70123380473162894654531583500648494 6172e-0001L,
        +6.81638760023334166733241952779893907 8545e-0001L,
        +6.92987727246317910281815490823048209 5679e-0001L,
        +7.04167511454533672780059509973942843 8828e-0001L,
};

const long double _TBL_sinl_lo[] = {
        -7.83989563419287980121718050629497269 5887e-0036L,
        -7.57927816753309325311281372034091458 5189e-0036L,
        +1.81380344301155485770367902300754291 7336e-0036L,
        -5.68504020033720134384215716332201432 7778e-0036L,
        +7.01395875187487608875416030203241432 6691e-0036L,
        +9.10116408055805006113433827277389417 722e-0036L,
        -1.52906926517265103202547561260594031 9203e-0036L,
        -5.87310081226687207995288421925490023 1461e-0036L,
        +1.76460304806826780010586715975331839 5454e-0036L,
        +1.74779926779027285952172963586839475 234e-0036L,
        -9.67304741051998267208945242944928999 4858e-0036L,
```

```
128         -7.66682775083712270792316972724402427704e-0036L,
129         -4.27513434754966978435151290617384119608 8e-0036L,
130         -1.82690407278032215281598502613912196970 6e-0036L,
131         -1.59470287344329449965314638482515809255 9e-0036L,
132         -7.18061508424058278625676541972387138323 3e-0036L,
133         +1.07356488794216831812829549198201193525 7e-0035L,
134         +6.16626760260418531412311120754391797463 3e-0036L,
135         +2.42061510849297469844695751870058591599 5e-0036L,
136         +1.86429164070753854115500895290153283250 6e-0036L,
137         -4.96930483364191020075024624332928967658 3e-0036L,
138         +7.19191092060059183778828373944522279083 5e-0036L,
139         +2.39867036569896287240938444445071448005 6e-0036L,
140         +2.62571762304925649926556361620115271019 2e-0036L,
141         -7.36487001108599532943597115275811618023 9e-0036L,
142         +2.20280377918534721005071688328074153785 0e-0035L,
143         +3.24923677072031064673177178571821726889 1e-0036L,
144         +2.43873593656197652942855805580428667477 2e-0035L,
145         -1.35848595468998128214344668770083054686 8e-0036L,
146         +2.04269325885902918802700123680403748767 4e-0035L,
147         +1.93539408668704450308003687950685127956 9e-0035L,
148         +1.35174265535697850139283361475571050435 6e-0035L,
149         +1.06515172423204645839241099453417140226 6e-0035L,
150         +1.92431240212432926993057705062834160306 4e-0035L,
151         -1.49505897804759263483853908335500227986 7e-0035L,
152         -1.22606996784743214973082192294232853767 8e-0035L,
153         -2.21435756148839473677777545049890664299 3e-0035L,
154         -3.19791885005480924937758467594051927316 1e-0036L,
155         +1.75293433418270210567525412802083294034 1e-0035L,
156         -2.06772389262723681394169702571120887364 e-0035L,
157         -1.96768433534936592675897818253108988915 1e-0035L,
158         -1.48023494778986556048879113411517128468 0e-0035L,
159         -2.02009541175208636336924533372496107190 3e-0035L,
160         +8.01904783870935075844443278617586417385 6e-0036L,
161         +7.57560031388312550940040194042627819866 5e-0036L,
162         -1.95678722882848174723569916504871562645 8e-0035L,
163         +2.23945241468457597921655785729821353838 3e-0035L,
164         -2.00488106831998813675438269796963611942 0e-0035L,
165         +1.40484456388654470329473096579312594704 3e-0035L,
166         +1.54096780001629398850891218396761547567 3e-0035L,
167         +9.62794364503442612477117426033922582734 1e-0036L,
168         -1.67187936511493678007508371613954898981 8e-0035L,
169         -1.19387223016472295893794387275284504743 4e-0035L,
170         -4.70946994194182908929251719575431721522 7e-0036L,
171         -1.56282598978971872478619772155305961226 4e-0035L,
172         +9.31324774957768018850224267625371319520 5e-0036L,
173         -1.38426977616718318950175848639381926411 9e-0035L,
174         +7.06498693112535056352301101088624950432 8e-0036L,
175         -3.10963699824274155702706043065967084980 4e-0035L,
176         -3.32415021330884924833711842866896710468 0e-0035L,
177         -3.42715291319551615996993795226755133739 6e-0035L,
178         -2.11870230730160315420936523771864857639 9e-0035L,
179         -1.28922620524163922306886952100991781336 1e-0037L,
180         +2.12572273479933123944580199464514528558 7e-0035L,
181         -1.78164576278056195136525335403380464030 0e-0035L,
182         -2.49527608940873714527427941350461553713 8e-0035L,
183         +1.33842237929938963780969418369150531768 5e-0035L,
184         +1.91974786921147072717621236192269858601 7e-0035L,
185         +4.33025916939968369326060156455927059609 1e-0036L,
186         -3.41742981816219412415674365946079826375 8e-0035L,
187         -4.54412944084300330523721391865787218952 0e-0035L,
188         -1.33165852952743729897634069393684728664 7e-0036L,
189         +2.74838775935027549024224114338667394298 3e-0035L,
190         +4.50089871077663557180849219529189918189 7e-0035L,
191         -2.87259372740393348676633610275598616504 4e-0035L,
192 };
```

```
**********************************************************
    9104 Sat May 10 12:09:02 2014
new/usr/src/lib/libm/common/Q/_TBL_tanl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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/*
 * table of tanl(x) where x is 0.15625 + i*0.03125, i=0,1,...,74.
 * {0x3ffc4000,0,0,0} --> (inc 0x800) -->  {0x3ffe9000,0,0,0}
 *    0.15625              0.03125           0.78125  (pi/4 = 0.785395663...)
 */

#include "libm.h"

const long double _TBL_tanl_hi[] = {
        +1.57534107325271610685225774172410486 4870e-0001L,
        +1.61539784049521476309275240011046397 7418e-0001L,
        +1.65550519273933976213930912585052390 0470e-0001L,
        +1.69566445219766510150970606543750019 4264e-0001L,
        +1.73587694767981520844673411435361632 9985e-0001L,
        +1.77614401477446727631742926958688224 3819e-0001L,
        +1.81646699603321427658275896174353586 4882e-0001L,
        +1.85684724115634411626661227864986506 7149e-0001L,
        +1.89728610718059132891083370073033806 9829e-0001L,
        +1.93778495866891863516022397768269478 0440e-0001L,
        +1.97834516790238668808406375123979740 9303e-0001L,
        +2.01896811507417132884068993365766675 7769e-0001L,
        +2.05965518848578721087393288030358608 878e-0001L,
        +2.10040778474558980841517523224591186 2545e-0001L,
        +2.14122730896958664886066681415862468 3863e-0001L,
        +2.18211517498467432505882048149579608 4382e-0001L,
        +2.22307280553431330872288817587999582 9692e-0001L,
        +2.26410163248673837477671404503559509 9974e-0001L,
        +2.30520309704576141455447515537918175 3938e-0001L,
        +2.34637864996423678999367710561070268 268e-0001L,
        +2.38762975176025920268151063740939927 6566e-0001L,
        +2.42895787293616542401085943015660988 1174e-0001L,
        +2.47036449420041264663494732515803527 2170e-0001L,
```



```
        +2.51185110669240767399103890677434421 5246e-0001L,
        +2.55341921221036266504482236490473690 7938e-0001L,
        +2.63680596419996799854825994879467996 58e-0001L,
        +2.72053698658770883426564366771272722 0498e-0001L,
        +2.80462470145251403169604289185265025 6007e-0001L,
        +2.88908172440514726001588445464244816 3630e-0001L,
        +2.97392087269024589467194016024655490 0716e-0001L,
        +3.05915517353059264107238923196992957 9942e-0001L,
        +3.14479787272571516173438220225627225 7022e-0001L,
        +3.23086244351745520118300655717961986 7007e-0001L,
        +3.31736259573572767339429703010533437 5685e-0001L,
        +3.40431228523830387428227441890258768 7499e-0001L,
        +3.49172572365910352254712963684391221 0518e-0001L,
        +3.57961738848016998388395963179447117 9752e-0001L,
        +3.66800203344323422720604818553766135 9712e-0001L,
        +3.75689469931754840409245775687597725 4806e-0001L,
        +3.84631072504149223040856279658281650 6283e-0001L,
        +3.93626575925632758229413787101218077 9893e-0001L,
        +4.02677577225140211778593735990006725 0949e-0001L,
        +4.11785706834108475788849876384871241 5895e-0001L,
        +4.20952629869475822074794141450673947 1850e-0001L,
        +4.30180047464230049020329605447275244 3302e-0001L,
        +4.39469698147866240483663148479930951 0327e-0001L,
        +4.48823359279239708840555523924574033 1672e-0001L,
        +4.58242848534432366959189196524156718 4790e-0001L,
        +4.67730025452391799921342706961992622 9670e-0001L,
        +4.77286793041252261722404259010423735 5391e-0001L,
        +4.86915099448406324498717503568319587 5449e-0001L,
        +4.96616939697565625710560579072569320 0164e-0001L,
        +5.06394357496229812070822754707177160 1970e-0001L,
        +5.16249447117175144491775337936928691 1420e-0001L,
        +5.26184355357779144170613437951009367 7744e-0001L,
        +5.36201283581216031347578929239308312 6826e-0001L,
        +5.46302489843790513255179465780285354 4147e-0001L,
        +5.56767065580586445680177944135475990 792e-0001L,
        +5.87597367591443221394158863157897689 5206e-0001L,
        +6.08813740324380721412493974396376823 4939e-0001L,
        +6.30437673835884766852611429299775174 0101e-0001L,
        +6.52491897928807992723897736551626747 2227e-0001L,
        +6.75000485144242907663177949477722872 0541e-0001L,
        +6.97988963623599255149765723390013651 6119e-0001L,
        +7.21484440990904419989517883279594663 9042e-0001L,
        +7.45515740559391995136130164778137804 617e-0001L,
        +7.70113551344208705005983660052773197 5210e-0001L,
        +7.95310593568674185645601691747418354 8089e-0001L,
        +8.21141801589894121911423965374711742 5236e-0001L,
        +8.47644526446552654090788308807618723 5513e-0001L,
        +8.74858760554482349539671907932155557 2147e-0001L,
        +9.02827387452673502196174365253976320 8464e-0001L,
        +9.31596459944072461165202756573936407 4620e-0001L,
        +9.61215510494370416185300625946873526 7385e-0001L,
        +9.91737898363268680256857389929902356 0595e-0001L,
};

const long double _TBL_tanl_lo[] = {
        +4.17921438597668884925097920297266354 2033e-0036L,
        +1.20152844619102524683902465029839790 2579e-0035L,
        +1.12932348944953773808090178875623197 7300e-0035L,
        +2.14013527896493612581558175826764903 3136e-0037L,
        +4.43220574930018500104081945698886268 4951e-0036L,
        +6.13610097812013227133268420710074069 06e-0036L,
        -1.03255305957918084998739583215697661 3765e-0035L,
        -3.16002425992243700121585140419665237 6871e-0037L,
        +9.28806252898842819096379181833602491 3881e-0036L,
        -7.44697169579064470754694311935416772 1612e-0036L,
        -3.19411540676563317123296121438510107 4252e-0036L,
```

```
128         +8.6368241010002712959254872128337700930 90e-0036L,
129         +3.1022722367261591529858220884413584303 50e-0036L,
130         -5.8519064735893686944872024417180089097 53e-0036L,
131         +4.0100220701373069253385045978973360026 13e-0036L,
132         +1.0377277068846739338759708743734621943 21e-0035L,
133         -7.3732348604210605050990333196016580819 63e-0037L,
134         +1.0125641876152431788993249433426629087 33e-0035L,
135         -1.4093727127258765536015555741394389390 44e-0036L,
136         +8.3788270249227671513628823098346454481 53e-0036L,
137         +2.9738244784677708776774656460134774932 11e-0037L,
138         +5.4000993987839063702709198488392765750 83e-0036L,
139         -6.4625122424584154982627233249733886583 84e-0036L,
140         -2.3227620230613189257505036425710134659 85e-0035L,
141         -1.2589558871711939545565215792152598476 92e-0035L,
142         -2.3204479558051791545213334959995649058 99e-0035L,
143         -1.1490125523453291938344375580814843460 41e-0035L,
144         +1.4527518178711698336239450313119443938 71e-0035L,
145         +1.2335204198846725191888496884988148 95 3115e-0035L,
146         -2.8017160589195629915001892194644566184 91e-0036L,
147         -8.6523105517106080966339926122701875379 21e-0036L,
148         +1.2471727167484077725648311284018808470 54e-0035L,
149         -1.2397042496389302135839292473140245608 61e-0035L,
150         +5.1844629880686161682338162965291506447 37e-0036L,
151         -6.8564767234153913058575310957444425235 49e-0039L,
152         -9.7395535312954336733984543443150390022 45e-0036L,
153         +2.2662330164926606616382921267774015383 48e-0035L,
154         +2.3015027700523766283479236217045621217 97e-0035L,
155         +1.9488457473360570515383180074421149957 44e-0035L,
156         -1.9407503893356082593632637055691447527 8e-0035L,
157         +2.0196446608734582151184831630763147031 63e-0035L,
158         +1.6020158121569059148212088070830629845 50e-0035L,
159         -3.2924163925157433747432365078065462844 38e-0036L,
160         +8.6638139423516724903283812713917042830 86e-0036L,
161         +2.3666095815065990840939102172779947368 71e-0035L,
162         -1.4089500631010566440399008540577765966 20e-0035L,
163         -1.5147699209628490770131139236038035734 45e-0035L,
164         -2.2619737955986151054494624430443300739 03e-0035L,
165         -2.5532118821724020688664293900719809231 44e-0036L,
166         +1.4166270294371260896759982573350333821 40e-0035L,
167         +2.3427249317142491335892300798098508692 66e-0035L,
168         +1.7105579787824194827314922811552561464 38e-0036L,
169         -2.1488377149384067375874890241524646427 38e-0035L,
170         -4.2730075413304081440860776955739509433 51e-0035L,
171         -1.1875123178301471197422515490901830998 23e-0035L,
172         +4.8282717433850775602046156705662770214 63e-0036L,
173         +2.8882851313407091276565149486353493118 05e-0035L,
174         -4.5052330855803295586842720759044712288 64e-0035L,
175         +2.9316308953278386819469845101608839593 32e-0036L,
176         +2.6476984851186301144844699759399477913 90e-0035L,
177         +3.5893203208453811872540177365316183201 53e-0035L,
178         +3.1094095482625904593518474740324158518 43e-0035L,
179         +4.0832349108391255310168362697062489227 07e-0035L,
180         +2.6170814261859721742789727383114272230 03e-0035L,
181         +1.6856388838767364686255988716025670253 29e-0035L,
182         +3.3407090070441223621749965155170700740 49e-0035L,
183         +4.2724489676747696433358273315135139148 93e-0035L,
184         -1.0163370775024549829492877844265875543 12e-0035L,
185         -4.1648204724159408772656293740012651810 61e-0035L,
186         -1.2667029075294826838554134120285238793 13e-0035L,
187         -2.4982955237496767389764157730503099268 89e-0035L,
188         -2.2402448880357015285653223020105242166 07e-0035L,
189         +2.0726736766330522375123449578397134945 38e-0035L,
190         -5.6356205750738490116075473140845111489 18e-0036L,
191         +1.2897733987863244444039859257805917099 15e-0035L,
192 };
```

```
**********************************************************
    4550 Sat May 10 12:09:03 2014
new/usr/src/lib/libm/common/Q/__cosl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
 * __k_cosl(long double x, long double y)
 * kernel cos function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 *
 * Table look up algorithm
 *      1. by cos(-x) = cos(x), we may replace x by |x|
 *      2. if x < 25/128 = [0x3ffc4000, 0] = 0.15625 , then
 *           if x < 2^-57 (hx < 0x3fc60000 0), return 1.0 with inexact if x!= 0
 *           z = x*x;
 *           if x <= 1/128 = 2**-7 = 0.0078125
 *              cos(x)=1.0+z*(qq1+z*(qq2+z*(qq3+z*(qq4+z*qq5))))
 *           else
 *              cos(x)=1.0+z*(q1+ ... z*q8)
 *      3. else
 *              ht = (hx + 0x400)&0x7ffff800    (round x to a break point t)
 *              lt = 0
 *              i  = (hy-0x3ffc4000)>>11;       (i<=64)
 *              x' = (x - t)+y                  (|x'| ~<= 2^-7
 *         By
 *              cos(t+x')
 *                = cos(t)cos(x')-sin(t)sin(x')
 *                = cos(t)(1+z*(qq1+z*qq2))-[sin(t)]*x*(1+z*(pp1+z*pp2))
 *                = cos(t) + [cos(t)]*(z*(qq1+z*qq2))-
 *                              [sin(t)]*x*(1+z*(pp1+z*pp2))
 *
 *         Thus,
 *              let a= _TBL_cos_hi[i], b = _TBL_cos_lo[i], c= _TBL_sin_hi[i],
 *              x = (x-t)+y
 *              z = x*x;
 *              cos(t+x) = a+(b+ (-c*x*(1+z*(pp1+z*pp2))+a*(z*(qq1+z*qq2)))
```



```
 */

#include "libm.h"

extern const long double _TBL_cosl_hi[], _TBL_cosl_lo[], _TBL_sinl_hi[];
static const long double
        one     = 1.0L,
/*
 *                  3           11       -122.32
 * |sin(x) - (x+pp1*x +...+ pp5*x  )| <= 2        for |x|<1/64
 */
        pp1     = -1.6666666666666666666666666665867829408l0-0001L,
        pp2     = +8.3333333333333333333330037236609293175l0-0003L,
        pp3     = -1.9841269841269840760459034837783378047l0-0004L,
        pp4     = +2.7557319223619066413197231062109009494l3-0006L,
        pp5     = -2.5051983985709470190939984691350120576l3-0008L,
/*
 *                  2           16       -117.11
 * |cos(x) - (1+q1*x + ... + q8*x  )| <= 2        for |x|<= 0.15625
 */
        q1      = -4.9999999999999999999999999999756416975e-0001L,
        q2      = +4.1666666666666666666666666640060657258e-0002L,
        q3      = -1.3888888888888888888887770036393716963l7-0003L,
        q4      = +2.4801587301587301584944684630318140835l9-0005L,
        q5      = -2.7557319223985862763228192503560055428l1-0007L,
        q6      = +2.0876756987674242614419597607298540178l5-0009L,
        q7      = -1.1470744812396620890724521290107907747l6-0011L,
        q8      = +4.7777616473996515997306634222635310347l8-0014L,
/*
 *                  2           10       -123.84
 * |cos(x) - (1+qq1*x +...+ qq5*x  )| <= 2        for |x|<=1/128
 */
        qq1     = -4.9999999999999999999999999999378373641e-0001L,
        qq2     = +4.1666666666666666666666654783993277031l0-0002L,
        qq3     = -1.3888888888888888880582112306180516134l4-0003L,
        qq4     = +2.4801587301561053777715856589053031118l6-0005L,
        qq5     = -2.7557280997625263257364883766951570087l6-0007L;

#define i0      0

long double
__k_cosl(long double x, long double y) {
        long double a, t, z, w;
        int *pt = (int *) &t, *px = (int *) &x;
        int i, j, hx, ix;

        t = 1.0L;
        hx = px[i0];
        ix = hx & 0x7fffffff;
        if (ix < 0x3ffc4000) {
                if (ix < 0x3fc60000)
                        if ((i = (int) x) == 0)
                                return (one);   /* generate inexact */
                z = x * x;

                if (ix < 0x3ff80000)    /* 0.0078125 */
                        return one + z * (qq1 + z * (qq2 + z * (qq3 +
                                z * (qq4 + z * qq5))));
                else
                        return one + z * (q1 + z * (q2 + z * (q3 +
                                z * (q4 + z * (q5 + z * (q6 + z * (q7 +
                                z * q8)))))));
        }
        j = (ix + 0x400) & 0x7ffff800;
        i = (j - 0x3ffc4000) >> 11;
        pt[i0] = j;
```

```
128         if (hx > 0)
129                 x = y - (t - x);
130         else
131                 x = (-y) - (t + x);
132         a = _TBL_cosl_hi[i];
133         z = x * x;
134         t = z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5))));
135         w = x * (one + z * (pp1 + z * (pp2 + z * (pp3 + z * (pp4 + z * pp5)))));
136         t = _TBL_cosl_lo[i] - (_TBL_sinl_hi[i] * w - a * t);
137         return (a + t);
138 }
```

```
**********************************************************
   14578 Sat May 10 12:09:03 2014
new/usr/src/lib/libm/common/Q/__lgammal.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
 * long double __k_lgammal(long double x, int *signgamlp);
 * K.C. Ng, August, 1989.
 *
 * We choose [1.5,2.5] to be the primary interval. Our algorithms
 * are mainly derived from
 *
 *
 *                              zeta(2)-1    2    zeta(3)-1    3
 * lgamma(2+s) = s*(1-euler) + --------- * s  -  --------- * s  + ...
 *                                 2               3
 *
 *
 * Note 1. Since gamma(1+s)=s*gamma(s), hence
 *              lgamma(1+s) = log(s) + lgamma(s), or
 *              lgamma(s) = lgamma(1+s) - log(s).
 *         When s is really tiny (like roundoff), lgamma(1+s) ~ s(1-enler)
 *         Hence lgamma(s) ~ -log(s) for tiny s
 *
 */

#include "libm.h"
#include "longdouble.h"

static long double neg(long double, int *);
static long double poly(long double, const long double *, int);
static long double polytail(long double);
static long double primary(long double);

static const long double
c0 =     0.0L,
ch =     0.5L,
```



```
c1 =     1.0L,
c2 =     2.0L,
c3 =     3.0L,
c4 =     4.0L,
c5 =     5.0L,
c6 =     6.0L,
pi =     3.14159265358979323846264338327950288419 71L,
tiny =   1.0e-40L;

long double
__k_lgammal(long double x, int *signgamlp) {
        long double t,y;
        int i;

    /* purge off +-inf, NaN and negative arguments */
        if(!finitel(x)) return x*x;
        *signgamlp = 1;
        if(signbitl(x)) return(neg(x,signgamlp));

    /* for x < 8.0 */
        if(x<8.0L) {
            y = anintl(x);
            i = (int) y;
            switch(i) {
            case 0:
                if(x<1.0e-40L) return -logl(x); else
                return (primary(x)-log1pl(x))-logl(x);
            case 1:
                return primary(x-y)-logl(x);
            case 2:
                return primary(x-y);
            case 3:
                return primary(x-y)+logl(x-c1);
            case 4:
                return primary(x-y)+logl((x-c1)*(x-c2));
            case 5:
                return primary(x-y)+logl((x-c1)*(x-c2)*(x-c3));
            case 6:
                return primary(x-y)+logl((x-c1)*(x-c2)*(x-c3)*(x-c4));
            case 7:
                return primary(x-y)+logl((x-c1)*(x-c2)*(x-c3)*(x-c4)*(x-c5));
            case 8:
                return primary(x-y)+
                        logl((x-c1)*(x-c2)*(x-c3)*(x-c4)*(x-c5)*(x-c6));
            }
        }

    /* 8.0 <= x < 1.0e40 */
        if (x < 1.0e40L) {
            t = logl(x);
            return x*(t-c1)-(ch*t-polytail(c1/x));
        }

    /* 1.0e40 <= x <= inf */
        return x*(logl(x)-c1);
}

static const long double an1[] = {              /* 20 terms */
  -0.07721566490153286060651209008240243097 41L,
   3.22467033424113218236207583230130289059e-0001L,
  -6.73523010531980951332460538366829964120e-0002L,
   2.05808084277845478790009243292891022629 7e-0002L,
  -7.38555102867398526627305408608110212570 4e-0003L,
   2.89051033074152328575886730440962864872 7e-0003L,
  -1.19275391170326097658141433809626749855 5e-0003L,
   5.09669524743042456283195666285569782403 5e-0004L,
```

```
  -2.23154758453577797892679850208430012 3638e-0004L,
   9.94575127818638467027826803432215794 7635e-0005L,
  -4.49262367366554772664783847412514763 1082e-0005L,
   2.05072128061779681009699315428156116 8706e-0005L,
  -9.43948778561739655209239323404476731 3568e-0006L,
   4.37487290351605151068923417313979315 9340e-0006L,
  -2.03915667641364309104045982577602932 7487e-0006L,
   9.55577718131862147046656354380621152 3634e-0007L,
  -4.46834491970963063755853831348239898 9638e-0007L,
   2.21673808609004578177300447783105944 4178e-0007L,
  -7.47278340341838845586044584254384348 5916e-0008L,
   8.77731793092714992205678213270623892 1648e-0008L,
};

static const long double an2[] = {              /* 20 terms */
  -.07721566490153286060626927236981276 07018L,
   3.22467033424113218263555234906027911 8047e-0001L,
  -6.73523010531980936755564288313399481 8325e-0002L,
   2.05808084277845967688082220276214367 1813e-0002L,
  -7.38555102867282821601134315007784691 8930e-0003L,
   2.89051033076206060739956153690572785 3178e-0003L,
  -1.19275391141962326232818753275975636 8041e-0003L,
   5.09669527863645667825809113453225861 8614e-0004L,
  -2.23154730681753574305297519402289336 9135e-0004L,
   9.94577146163331328274426485398664387 7087e-0005L,
  -4.49250327945897203792687606125748948 1619e-0005L,
   2.05131141681208287549267865136939459 5613e-0005L,
  -9.41577822365955203915850761537462941 165e-0006L,
   4.45242882904514709872293981088650055 919e-0006L,
  -1.83502472798763257988695176065072269 5781e-0006L,
   1.37978308065854500957906071494638146 2565e-0006L,
   2.28263753210977515676973676874840217 5238e-0007L,
   1.00257737551590019136211971812814988 0168e-0006L,
   5.17702879426263831193999110643232000 2463e-0007L,
   3.12794724517484710412242644593783055 5755e-0007L,
};

static const long double an3[] = {              /* 20 terms */
  -.07721566490153282278706464177292206 90875L,
   3.22467033424115669988178895595991525 0365e-0001L,
  -6.73523010531227357137543105974497556 3170e-0002L,
   2.05808084292446458766284607133708380 9005e-0002L,
  -7.38555100867727165472360465395613179 1619e-0003L,
   2.89051053647978208619711027258383317 6602e-0003L,
  -1.19275226207685769274057156780825913 8697e-0003L,
   5.09680077114980528937113515512838070 7889e-0004L,
  -2.23100083668283133550505849240986012 3647e-0004L,
   9.96891217107393680387180396636059527 5047e-0005L,
  -4.41202779327746243544387946167256187 258e-0005L,
   2.28137411354145415106701663299863020 9049e-0005L,
  -4.02836129142862949182469655287954266 830e-0006L,
   1.47069492061951892459895684922653075 0139e-0005L,
   1.38168613761798719797528954558237771 3772e-0005L,
   2.01249353926577772894475998205497044 1601e-0005L,
   1.72391786420896549025156064468193367 5799e-0005L,
   1.20295403524378830013860876542512371 3395e-0005L,
   5.07985188755862309277629657703085093 8146e-0006L,
   1.22065794582415375155513859200660402 6282e-0006L,
};

static const long double an4[] = {              /* 21 terms */
  -.07721566490157322853502618166975403 92371L,
   3.22467033422175206069175134036521222 6097e-0001L,
  -6.73523010744009693977755991488196368 279e-0002L,
   2.05808077891303762690995414161158078 3216e-0002L,
  -7.38555756793150562117048370895055750 6819e-0003L,
```



```
   2.89045983841625432634084428978525488 3436e-0003L,
  -1.19305903620713676287735159696671845 5737e-0003L,
   5.08191470810037283661337135652956893 7869e-0004L,
  -2.28985501613360031313155300598254204 5338e-0004L,
   8.05345453798058587962033105383349851 1491e-0005L,
  -9.57462053210484582124349340585567243 8998e-0005L,
  -9.26908562820710715560144500119631771 5686e-0005L,
  -2.18327677985949046171619634476208220 180e-0004L,
  -3.13483430559757109645245499973726966 8868e-0004L,
  -3.97387889495193743701830598690139288 8619e-0004L,
  -3.95335241489922279916127556438648805 7119e-0004L,
  -3.13674093220403877936266090062121281 6511e-0004L,
  -1.88450225381963407394613082519607862 7664e-0004L,
  -8.19265579995892685358533254212363137 9301e-0005L,
  -2.29218375001057106289160507428174485 4436e-0005L,
  -3.22398062872971686492772426578140661 4294e-0006L,
};

static const long double ap1[] = {                      /* 19 terms */
  -0.07721566490153286060651209008240242 96961L,
   3.22467033424113218236207583323004795 6465e-0001L,
  -6.73523010531980951332460538296394377 7301e-0002L,
   2.05808084277845478790009212660625237 5465e-0002L,
  -7.38555102867398526627251823136502006 3941e-0003L,
   2.89051033074152328568170457079770736 423e-0003L,
  -1.19275391170326097128530422116599024 4515e-0003L,
   5.09669524743042087869601818883088697 2245e-0004L,
  -2.23154758453565400464763973784152602 5095e-0004L,
   9.94575127813720196063609880585231598 2919e-0005L,
  -4.49262367277760605358791946392904422 6280e-0005L,
   2.05072125870328948760370267075305376 5201e-0005L,
  -9.43948562656561698935275067249900802 1041e-0006L,
   4.37483816240399464513820041935684457 4219e-0006L,
  -2.03897949286255534857700694445100216 1496e-0006L,
   9.53676315238226354808698119137888510 2802e-0007L,
  -4.42611121433243404986359523191656401 4913e-0007L,
   1.91114884751294746423463384627028754 6882e-0007L,
  -5.78867394486192303815783908027230351 9671e-0008L,
};

static const long double ap2[] = {                      /* 19 terms */
  -0.07721566490153286060642862444935483 6087L,
   3.22467033424113218227194874426585544 0139e-0001L,
  -6.73523010531980946735612659900505167 6203e-0002L,
   2.05808084277845331571638981521349600 2588e-0002L,
  -7.38555102867365332306411842258009622 2959e-0003L,
   2.89051033073592357208800342484928900 6039e-0003L,
  -1.19275391162995236860618554394579068 8144e-0003L,
   5.09669523980671887536454758704322098 7666e-0004L,
  -2.23154752060061610899186712739208914 4886e-0004L,
   9.94574691389815112061232283305941600 8973e-0005L,
  -4.49259930746197700357022494305458572 9684e-0005L,
   2.05060989188916545359204650565175999 0090e-0005L,
  -9.43532986673419379654051524791716598 8579e-0006L,
   4.36226713852222323624101613658556514 4581e-0006L,
  -2.00855635665324657930049160149751023 0557e-0006L,
   8.96149810338720716110534711804284435 4395e-0007L,
  -3.61418722833021628223569288064883411 57741e-0007L,
   1.13697898824781686050042091501477775 3153e-0007L,
  -2.00053278638719666401928651489978269 1776e-0008L,
};

static const long double ap3[] = {                      /* 19 terms */
  -0.07721566490153285988852147079534885 6446L,
   3.22467033424113173336404861448422844 3077e-0001L,
  -6.73523010531967654166049514525903815 1576e-0002L,
```

```
   2.05808084277597546183776883901544427383 0e-0002L,
  -7.38555102834761572972861806666356660690 6e-0003L,
   2.89051032751795408337903200864308025667 6e-0003L,
  -1.19275388691947072800182113743943088260 3e-0003L,
   5.09669372889893223481490376914657748291 2e-0004L,
  -2.23154005504882766252859401096187425803 7e-0004L,
   9.94544621001864931149161999943883384372 3e-0005L,
  -4.49160820659806451919023624575386769775 0e-0005L,
   2.04793907132227101649806505285374646666 9e-0005L,
  -9.37682404652278600667754103663153679076 2e-0006L,
   4.25932982949814911158227720918915012734 7e-0006L,
  -1.86606477042159426670217628976421287342 8e-0006L,
   7.46206672113757959292812810453495713566 9e-0007L,
  -2.48354621752907773507400713845767872737 1e-0007L,
   5.91516657637816147329932467364914429757 4e-0008L,
  -7.33413964170698896696625233375960470190 5e-0009L,
};

static const long double ap4[] = {                      /* 19 terms */
  -0.07721566490153267855693132526372386736 75L,
   3.22467033424105143500884268572246834482 2e-0001L,
  -6.73523010530283200747943177216094849925 4e-0002L,
   2.05808084255348118364852936096744188991 2e-0002L,
  -7.38555100760290924202470680465987919924 4e-0003L,
   2.89051018247390725393982131224830347120 6e-0003L,
  -1.19275309842785677084789449758682561445 0e-0003L,
   5.09665963641881156806333921420369355080 4e-0004L,
  -2.23142114400435569116619425967500448363 9e-0004L,
   9.94207384234383213275433288188338762513 6e-0005L,
  -4.48380926197320453126325265505070120539 7e-0005L,
   2.03326014261028488831911665493199444717 3e-0005L,
  -9.15353954402664669987052819141044058579 6e-0006L,
   3.98846046992548272589414468869958499797 1e-0006L,
  -1.60969298008702917256795722185082597762 1e-0006L,
   5.63491637724997582539970669449668880348 8e-0007L,
  -1.56006546592951856354908320848259143769 6e-0007L,
   2.96135019386893532552696220901938782158 4e-0008L,
  -2.83460221519536813010464923450503315984 2e-0009L,
};

static long double
primary(long double s) {        /* assume |s|<=0.5 */
        int i;

        i = (int) (8.0L * (s + 0.5L));
        switch(i) {
        case 0: return ch*s+s*poly(s,an4,21);
        case 1: return ch*s+s*poly(s,an3,20);
        case 2: return ch*s+s*poly(s,an2,20);
        case 3: return ch*s+s*poly(s,an1,20);
        case 4: return ch*s+s*poly(s,ap1,19);
        case 5: return ch*s+s*poly(s,ap2,19);
        case 6: return ch*s+s*poly(s,ap3,19);
        case 7: return ch*s+s*poly(s,ap4,19);
        }
        /* NOTREACHED */
    return 0.0L;
}

static long double
poly(long double s, const long double *p, int n) {
        long double y;
        int i;
        y = p[n-1];
        for (i=n-2;i>=0;i--) y = p[i]+s*y;
        return y;
```



```
}

static const long double pt[] = {
   9.18938533204672741780329736405617680466 3e-0001L,
   8.33333333333333333333333333331286969123 e-0002L,
  -2.77777777777777777777777755319479603640 2e-0003L,
   7.93650793650793650792728307143358424817 6e-0004L,
  -5.95238095238095236235104216319263410829 7e-0004L,
   8.41758417508395661774286645578379460131 e-0004L,
  -1.91752691752526365118606641793468567564 9e-0003L,
   6.41025640939520316465929297314229319908 3e-0003L,
  -2.95506532724830330176359451401241843818 8e-0002L,
   1.79644283009906754294599861541189382288 6e-0001L,
  -1.39241346582972374248997431041111866291 9e+0000L,
   1.33998423803726765835265659796049202926 1e+0001L,
  -1.56470765760537366242578590427864572781 3e+0002L,
   2.15632380749921135612781396222306707930 0e+0003L,
  -3.33048642762622318464729983413704130756 9e+0004L,
   5.23553507201188921361136925414012351869 9e+0005L,
  -7.25816098460222071049198857343021259308 0e+0006L,
   7.31652693456968645964143888234032267335 7e+0007L,
  -3.80645027906490054883657178928489671147 3e+0008L,
};

static long double
polytail(long double s) {
        long double t,z;
        int i;
        z = s*s;
        t = pt[18];
        for (i=17;i>=1;i--) t = pt[i]+z*t;
        return pt[0]+s*t;
}

static long double
neg(long double z, int *signgamlp) {
        long double t,p;

     /*
      * written by K.C. Ng,  Feb 2, 1989.
      *
      * Since
      *         -z*G(-z)*G(z) = pi/sin(pi*z),
      * we have
      *         G(-z) = -pi/(sin(pi*z)*G(z)*z)
      *               =  pi/(sin(pi*(-z))*G(z)*z)
      * Algorithm
      *         z = |z|
      *         t = sinpi(z); ...note that when z>2**112, z is an int
      *         and hence t=0.
      *
      *         if(t==0.0) return 1.0/0.0;
      *         if(t< 0.0) *signgamlp = -1; else t= -t;
      *         if(z<1.0e-40)   ...tiny z
      *             return -log(z);
      *         else
      *             return log(pi/(t*z))-lgamma(z);
      *
      */

        t = sinpil(z);                  /* t := sin(pi*z) */
        if (t==c0)                      /* return   1.0/0.0 =  +INF */
            return c1/c0;

        z = -z;
        if(z<=tiny)
```

```
392             p = -logl(z);
393         else
394             p = logl(pi/(fabsl(t)*z))-__k_lgammal(z,signgamlp);
395         if(t<c0) *signgamlp = -1;
396         return p;
397 }
```

****
1193 Sat May 10 12:09:03 2014
new/usr/src/lib/libm/common/Q/__poly_libmq.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#include "libm.h"

long double
__poly_libmq(long double x, int n, const long double p[]) {
        long double t;
        int i;

        t = p[n - 1];
        for (i = n - 2; i >= 0; i--)
                t = p[i] + x * t;
        return (t);
}
```

```
**********************************************************
    2209 Sat May 10 12:09:03 2014
new/usr/src/lib/libm/common/Q/__rem_pio2l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

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 */

/*
 * __rem_pio2l(x,y)
 *
 * return the remainder of x rem pi/2 in y[0]+y[1] by calling __rem_pio2m
 */

#ifndef FDLIBM_BASED
#include "libm.h"
extern int __rem_pio2m(double *, double *, int, int, int, const int *);
#else                           /* FDLIBM_BASED */
#include "fdlibm.h"
#define __rem_pio2m     __kernel_rem_pio2
#endif                          /* FDLIBM_BASED */

#include "longdouble.h"

extern const int _TBL_ipio2l_inf[];

static const long double
        two24l = 16777216.0L,
        pio4   = 0.78539816339744830961566084581987572104 95L;

int
__rem_pio2l(long double x, long double *y) {
        long double z, w;
        double t[5], v[5];
        int e0, i, nx, n, sign;
        const int *ipio2;

        sign = signbitl(x);
        z = fabsl(x);
        if (z <= pio4) {
```



```
                y[0] = x;
                y[1] = 0;
                return (0);
        }
        e0 = ilogbl(z) - 23;
        z = scalbnl(z, -e0);
        for (i = 0; i < 5; i++) {
                t[i] = (double) ((int) (z));
                z = (z - (long double) t[i]) * two24l;
        }
        nx = 5;
        while (t[nx - 1] == 0.0)
                nx--;           /* skip zero term */
        ipio2 = _TBL_ipio2l_inf;
        n = __rem_pio2m(t, v, e0, nx, 3, (const int *) ipio2);
        z = (long double) v[2] + (long double) v[1];
        w = (long double) v[0];
        y[0] = z + w;
        y[1] = z - (y[0] - w);
        if (sign == 1) {
                y[0] = -y[0];
                y[1] = -y[1];
                return (-n);
        }
        return (n);
}
```

```
**********************************************************
    4783 Sat May 10 12:09:03 2014
new/usr/src/lib/libm/common/Q/__sincosl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

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 */

/*
 * long double __k_sincos(long double x, long double y, long double *c);
 * kernel sincosl function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 * return sinl(x) with *c = cosl(x)
 *
 * Table look up algorithm
 *      see __k_sinl and __k_cosl
 */

#include "libm.h"

extern const long double _TBL_sinl_hi[], _TBL_sinl_lo[],
        _TBL_cosl_hi[], _TBL_cosl_lo[];
static const long double
        one     = 1.0L,
/*
 *                    3           11       -122.32
 * |sin(x) - (x+pp1*x +...+ pp5*x  )| <= 2        for |x|<1/64
 */
        pp1     = -1.6666666666666666666666666666586782940810e-0001L,
        pp2     = +8.3333333333333333333330037236609293175 40e-0003L,
        pp3     = -1.9841269841269840760459034837783378 37804470e-0004L,
        pp4     = +2.7557319223619066413197231062109009 49413e-0006L,
        pp5     = -2.5051983985709470190939984691350120 57673e-0008L,
/*
 * |(sin(x) - (x+p1*x^3+...+p8*x^17))|
 * |------------------------------ | <= 2^-116.17 for |x|<0.1953125
 * |                x              |
 */
        p1      = -1.6666666666666666666666666666666211262297e-0001L,
```



```
        p2      = +8.3333333333333333333333333014978769085 41e-0003L,
        p3      = -1.9841269841269841269840413028811806219 22e-0004L,
        p4      = +2.7557319223985890641005873513072696210 93e-0006L,
        p5      = -2.5052108385441631293789069537655953938 73e-0008L,
        p6      = +1.6059043836432443750509982437785340742 73e-0010L,
        p7      = -7.6471627228006855169014561142708246226 99e-0013L,
        p8      = +2.8100464286619029617254288410688444626 03e-0015L,
/*
 *                  2           10       -123.84
 * |cos(x) - (1+qq1*x +...+ qq5*x  )| <= 2        for |x|<=1/128
 */
        qq1     = -4.9999999999999999999999999999999378373641e-0001L,
        qq2     = +4.1666666666666666666666665478399327703130e-0002L,
        qq3     = -1.3888888888888888888058211230618051613494e-0003L,
        qq4     = +2.4801587301561053777715856589053031118 66e-0005L,
        qq5     = -2.7557280997625263257364883766951570087 36e-0007L,
/*
 *                  2           16       -117.11
 * |cos(x) - (1+q1*x + ... + q8*x  )| <= 2        for |x|<= 0.15625
 */
        q1      = -4.9999999999999999999999999999999756416975e-0001L,
        q2      = +4.1666666666666666666666666640060665772 58e-0002L,
        q3      = -1.3888888888888888888888777003639371696 37e-0003L,
        q4      = +2.4801587301587301584944684630318140835 59e-0005L,
        q5      = -2.7557319223985862763228192503560055428 71e-0007L,
        q6      = +2.0876756987674242614419597607298540178 55e-0009L,
        q7      = -1.1470744812396620890724521290107907747 61e-0011L,
        q8      = +4.7777616473996515997306634222635310347 82e-0014L;

#define i0      0

long double
__k_sincosl(long double x, long double y, long double *c) {
        long double a1, a2, t, t1, t2, z, w;
        int *pt = (int *) &t, *px = (int *) &x;
        int i, j, hx, ix;

        t = 1.0L;
        hx = px[i0];
        ix = hx & 0x7fffffff;
        if (ix < 0x3ffc4000) {
                if (ix < 0x3fc60000)
                        if (((int) x) == 0) {
                                *c = one;
                                return (x);
                        }       /* generate inexact */
                z = x * x;

                if (ix < 0x3ff80000) {
                        *c = one + z * (qq1 + z * (qq2 + z * (qq3 +
                                z * (qq4 + z * qq5))));
                        t = z * (p1 + z * (p2 + z * (p3 + z * (p4 +
                                z * (p5 + z * p6)))));
                } else {
                        *c = one + z * (q1 + z * (q2 + z * (q3 + z * (q4 +
                                z * (q5 + z * (q6 + z * (q7 + z * q8)))))));
                        t = z * (p1 + z * (p2 + z * (p3 + z * (p4 + z * (p5 +
                                z * (p6 + z * (p7 + z * p8)))))));
                }

                t = y + x * t;
                return (x + t);
        }
        j = (ix + 0x400) & 0x7ffff800;
        i = (j - 0x3ffc4000) >> 11;
        pt[i0] = j;
```

```
128         if (hx > 0)
129                 x = y - (t - x);
130         else
131                 x = (-y) - (t + x);
132         a1 = _TBL_sinl_hi[i];
133         z = x * x;
134         t = z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5))));
135         w = x * (one + z * (pp1 + z * (pp2 + z * (pp3 + z * (pp4 + z * pp5)))));
136         a2 = _TBL_cosl_hi[i];
137         t2 = _TBL_cosl_lo[i] - (a1 * w - a2 * t);
138         *c = a2 + t2;
139         t1 = a2 * w + a1 * t;
140         t1 += _TBL_sinl_lo[i];
141         if (hx < 0)
142                 return (-a1 - t1);
143         else
144                 return (a1 + t1);
145 }
```

```
**********************************************************
    4705 Sat May 10 12:09:03 2014
new/usr/src/lib/libm/common/Q/__sinl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
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 */

/*
 * long double __k_sinl(long double x, long double y);
 * kernel sin function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 *
 * Table look up algorithm
 *      1. by sin(-x) = -sin(x), need only to consider positive x
 *      2. if x < 25/128 = [0x3ffc9000,0,0,0] = 0.1953125 , then
 *           if x < 2^-57 (hx < 0x3fc60000,0,0,0), return x (inexact if x!= 0)
 *           z = x*x;
 *           if x <= 1/64 = 2**-6
 *              sin(x) = x + (y+(x*z)*(p1 + z*p2))
 *           else
 *              sin(x) = x + (y+(x*z)*(p1 + z*(p2 + z*(p3 + z*p4))))
 *      3. else
 *              ht = (hx + 0x400)&0x7ffff800    (round x to a break point t)
 *              lt = 0
 *              i  = (hy-0x3ffc4000)>>11;       (i<=64)
 *              x' = (x - t)+y                  (|x'| ~<= 2^-7
 *         By
 *              sin(t+x')
 *                = sin(t)cos(x')+cos(t)sin(x')
 *                = sin(t)(1+z*(qq1+z*qq2))+[cos(t)]*x*(1+z*(pp1+z*pp2))
 *                = sin(t) + [sin(t)]*(z*(qq1+z*qq2))+
 *                               [cos(t)]*x*(1+z*(pp1+z*pp2))
 *
 *         Thus,
 *              let a= _TBL_sin_hi[i], b = _TBL_sin_lo[i], c= _TBL_cos_hi[i],
 *              x = (x-t)+y
 *              z = x*x;
 *              sin(t+x) = a+(b+ ((c*x)*(1+z*(pp1+z*pp2))+a*(z*(qq1+z*qq2)))
```



```
 */

#include "libm.h"

extern const long double _TBL_sinl_hi[], _TBL_sinl_lo[], _TBL_cosl_hi[];
static const long double
one     = 1.0L,
/*
 *                  3           11       -122.32
 * |sin(x) - (x+pp1*x +...+ pp5*x  )| <= 2        for |x|<1/64
 */
        pp1     = -1.666666666666666666666666666658678294081e-0001L,
        pp2     = +8.333333333333333333333300372366092931754e-0003L,
        pp3     = -1.984126984126984076045903483778337804470e-0004L,
        pp4     = +2.755731922361906641319723106210900949413e-0006L,
        pp5     = -2.505198398570947019093998469135012057673e-0008L,
/*
 * |(sin(x) - (x+p1*x^3+...+p8*x^17))|
 * |------------------------------- | <= 2^-116.17 for |x|<0.1953125
 * |                x               |
 */
        p1      = -1.666666666666666666666666666666211262297e-0001L,
        p2      = +8.333333333333333333333333014978769085410e-0003L,
        p3      = -1.984126984126984126984041302881180621922e-0004L,
        p4      = +2.755731922398589064100587351307269621093e-0006L,
        p5      = -2.505210838544163129378906953765595393873e-0008L,
        p6      = +1.605904383643244375050998243778534074273e-0010L,
        p7      = -7.647162722800685516901456114270824622699e-0013L,
        p8      = +2.810046428661902961725428841068844462603e-0015L,
/*
 *                  2           10        -123.84
 * |cos(x) - (1+qq1*x +...+ qq5*x  )| <= 2        for |x|<=1/128
 */
        qq1     = -4.999999999999999999999999999999378373641e-0001L,
        qq2     = +4.166666666666666666666654783993277031300e-0002L,
        qq3     = -1.388888888888888888058211230618051613494e-0003L,
        qq4     = +2.480158730156105377771585658905303111866e-0005L,
        qq5     = -2.755728099762526325736488376695157008736e-0007L;

#define i0      0

long double
__k_sinl(long double x, long double y) {
        long double a, t, z, w;
        int *pt = (int *) &t, *px = (int *) &x;
        int i, j, hx, ix;

        t = 1.0L;
        hx = px[i0];
        ix = hx & 0x7fffffff;
        if (ix < 0x3ffc9000) {
                *(3 - i0 + (int *) &t) = -1;    /* one-ulp */
                *(2 + (int *) &t) = -1; /* one-ulp */
                *(1 + (int *) &t) = -1; /* one-ulp */
                *(i0 + (int *) &t) -= 1;        /* one-ulp */
                if (ix < 0x3fc60000)
                        if (((int) (x * t)) < 1)
                                return (x);     /* inexact and underflow */
                z = x * x;
                t = z * (p1 + z * (p2 + z * (p3 + z * (p4 + z * (p5 +
                        z * (p6 + z * (p7 + z * p8)))))));
                t = y + x * t;
                return (x + t);
        }
        j = (ix + 0x400) & 0x7ffff800;
        i = (j - 0x3ffc4000) >> 11;
```

```
128         pt[i0] = j;
129         if (hx > 0)
130                 x = y - (t - x);
131         else
132                 x = (-y) - (t + x);
133         a = _TBL_sinl_hi[i];
134         z = x * x;
135         t = z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5))));
136         w = x * (one + z * (pp1 + z * (pp2 + z * (pp3 + z * (pp4 + z * pp5)))));
137         t = _TBL_cosl_hi[i] * w + a * t;
138         t += _TBL_sinl_lo[i];
139         if (hx < 0)
140                 return (-a - t);
141         else
142                 return (a + t);
143 }
```

```
**********************************************************
    5459 Sat May 10 12:09:03 2014
new/usr/src/lib/libm/common/Q/__tanl.c
14071:dece9aafe99a - fix build problems on sparc
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * long double __k_tanl(long double x; long double y, int k);
 * kernel tan/cotan function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 * Input k indicate -- tan if k=0; else -1/tan
 *
 * Table look up algorithm
 *      1. by tan(-x) = -tan(x), need only to consider positive x
 *      2. if x < 5/32 = [0x3ffc4000, 0] = 0.15625 , then
 *           if x < 2^-57 (hx < 0x3fc40000 0), set w=x with inexact if x!= 0
 *           else
 *              z = x*x;
 *              w = x + (y+(x*z)*(t1+z*(t2+z*(t3+z*(t4+z*(t5+z*t6))))))
 *         return (k==0)? w: 1/w;
 *      3. else
 *              ht = (hx + 0x400)&0x7ffff800    (round x to a break point t)
 *              lt = 0
 *              i  = (hy-0x3ffc4000)>>11;       (i<=64)
 *              x' = (x - t)+y                  (|x'| ~<= 2^-7)
 *         By
 *              tan(t+x')
 *                = (tan(t)+tan(x'))/(1-tan(x')tan(t))
 *         We have
 *                              sin(x')+tan(t)*(tan(t)*sin(x'))
 *               = tan(t) + ------------------------------    for k=0
 *                                 cos(x') - tan(t)*sin(x')
 *
 *                              cos(x') - tan(t)*sin(x')
 *               = - -----------------------------------    for k=1
 *                        tan(t) + tan(t)*(cos(x')-1) + sin(x')
```



```
 *
 *
 *         where        tan(t) is from the table,
 *                      sin(x') = x + pp1*x^3 + ...+ pp5*x^11
 *                      cos(x') = 1 + qq1*x^2 + ...+ qq5*x^10
 */

#include "libm.h"

extern const long double _TBL_tanl_hi[], _TBL_tanl_lo[];
static const long double
        one     = 1.0L,
/*
 *                      3           11       -122.32
 * |sin(x) - (x+pp1*x +...+ pp5*x  )| <= 2        for |x|<1/64
 */
        pp1     = -1.66666666666666666666666666665586782940810e-0001L,
        pp2     = +8.33333333333333333333300372366092931754 0e-0003L,
        pp3     = -1.98412698412698407604590348377833780 4470e-0004L,
        pp4     = +2.75573192236190664131972310621090094941 3e-0006L,
        pp5     = -2.50519839857094701909399846913501205767 3e-0008L,
/*
 *                      2           10        -123.84
 * |cos(x) - (1+qq1*x +...+ qq5*x  )| <= 2        for |x|<=1/128
 */
        qq1     = -4.99999999999999999999999999999378373641e-0001L,
        qq2     = +4.16666666666666666666665478399327703130e-0002L,
        qq3     = -1.38888888888888888880582112306180516134 94e-0003L,
        qq4     = +2.48015873015610537777158565890530311186 6e-0005L,
        qq5     = -2.75572809976252632573648837669515700873 6e-0007L,
/*
 * |tan(x) - (x+t1*x^3+...+t6*x^13)|
 * |------------------------------ | <= 2^-59.73 for |x|<0.15625
 * |               x               |
 */
        t1      = +3.33333333333333333333333333333423342490e-0001L,
        t2      = +1.33333333333333333333333333093838744537e-0001L,
        t3      = +5.39682539682539682539682790631868266225 0e-0002L,
        t4      = +2.18694885361552028218557697699441848691 1e-0002L,
        t5      = +8.86323552990219657335455451999115293624 6e-0003L,
        t6      = +3.59212803657248006465219142754399487879 0e-0003L,
        t7      = +1.45583438705145525785683380758190130547 4e-0003L,
        t8      = +5.90027440931859985782998325620172558747 7e-0004L,
        t9      = +2.39129115211726518150111696190112236293 7e-0004L,
        t10     = +9.69153316938272974239402417319498188237 5e-0005L,
        t11     = +3.92799473318641560322817818422578085995 1e-0005L,
        t12     = +1.58830001884832382422764006488333410128 8e-0005L,
        t13     = +6.91627122339680831116620228513172223172 3e-0006L;

#define i0      0

long double
__k_tanl(long double x, long double y, int k) {
        long double a, t, z, w = 0, s, c;
        int *pt = (int *) &t, *px = (int *) &x;
        int i, j, hx, ix;

        t = 1.0L;
        hx = px[i0];
        ix = hx & 0x7fffffff;
        if (ix < 0x3ffc4000) {
                *(3 - i0 + (int *) &t) = 1;     /* make t = one+ulp */
                if (ix < 0x3fc60000) {
                        if (((int) (x * t)) < 1)        /* generate inexact */
                                w = x;  /* generate underflow if subnormal */
                } else {
```

```
127                         z = x * x;
128                         if (ix < 0x3ff30000)    /* 2**-12 */
129                                 t = z * (t1 + z * (t2 + z * (t3 + z * t4)));
130                         else
131                                 t = z * (t1 + z * (t2 + z * (t3 + z * (t4 +
132                                         z * (t5 + z * (t6 + z * (t7 + z * (t8 +
133                                         z * (t9 + z * (t10 + z * (t11 +
134                                         z * (t12 + z * t13))))))))))));
135                         t = y + x * t;
136                         w = x + t;
137                 }
138                 return (k == 0 ? w : -one / w);
139         }
140         j = (ix + 0x400) & 0x7ffff800;
141         i = (j - 0x3ffc4000) >> 11;
142         pt[i0] = j;
143         if (hx > 0)
144                 x = y - (t - x);
145         else
146                 x = (-y) - (t + x);
147         a = _TBL_tanl_hi[i];
148         z = x * x;
149         /* cos(x)-1 */
150         t = z * (qq1 + z * (qq2 + z * (qq3 + z * (qq4 + z * qq5))));
151         /* sin(x) */
152         s = x * (one + z * (pp1 + z * (pp2 + z * (pp3 + z * (pp4 + z * pp5)))));
153         if (k == 0) {
154                 w = a * s;
155                 t = _TBL_tanl_lo[i] + (s + a * w) / (one - (w - t));
156                 return (hx < 0 ? -a - t : a + t);
157         } else {
158                 w = s + a * t;
159                 c = w + _TBL_tanl_lo[i];
160                 z = one - (a * s - t);
161                 return (hx >= 0 ? z / (-a - c) : z / (a + c));
162         }
163 }
```

****
1498 Sat May 10 12:09:03 2014
new/usr/src/lib/libm/common/Q/acoshl.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#if defined(ELFOBJ)
#pragma weak acoshl = __acoshl
#endif

#include "libm.h"

static const long double
        zero    = 0.0L,
        ln2     = 6.93147180559945309417232121458176568075e-0001L,
        one     = 1.0L,
        big     = 1.e+20L;

long double
acoshl(long double x) {
        long double t;

        if (isnanl(x))
                return (x + x);
        else if (x > big)
                return (logl(x) + ln2);
        else if (x > one) {
                t = sqrtl(x - one);
                return (log1pl(t * (t + sqrtl(x + one))));
        } else if (x == one)
                return (zero);
        else
                return ((x - x) / (x - x));
}
```

```
**********************************************************
    1830 Sat May 10 12:09:03 2014
new/usr/src/lib/libm/common/Q/acosl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

/*
 * arccosin function
 *                              _______
 *                             / 1 - x
 *      acos(x) = 2*atan2(    / -------- , 1 )
 *                          \/   1 + x
 *
 *                              _______
 *                             / 1 - x
 *              = 2*atan (    / -------- ) for non-exceptional x.
 *                          \/   1 + x
 *
 * Special cases:
 *      if x is NaN, return x itself;
 *      if |x|>1, return NaN with invalid signal.
 */

#pragma weak acosl = __acosl

#include "libm.h"

static const long double zero = 0.0L, one = 1.0L;

long double
acosl(long double x) {
        if (isnanl(x))
                return (x + x);
        else if (fabsl(x) < one)
                x = atanl(sqrtl((one - x) / (one + x)));
        else if (x == -one)
                x = atan2l(one, zero);  /* x <- PI */
        else if (x == one)
```



```
                x = zero;
        else {          /* |x| > 1  create invalid signal */
                return (zero / zero);
        }
        return (x + x);
}
```

```
**********************************************************
    1617 Sat May 10 12:09:04 2014
new/usr/src/lib/libm/common/Q/asinhl.c
libm/common/Q/asinhl.c
14071:dece9aafe99a - fix build problems on sparc
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak asinhl = __asinhl
#endif

#include "libm.h"

static const long double
        ln2     = 6.93147180559945309417232121458176568075e-0001L,
        one     = 1.0L,
        big     = 1.0e+20L,
        tiny    = 1.0e-20L;

long double
asinhl(long double x) {
        long double t, w;
        volatile long double dummy;

        w = fabsl(x);
        if (isnanl(x))
                return (x + x); /* x is NaN */
        if (w < tiny) {
#ifndef lint
                dummy = x + big;        /* inexact if x != 0 */
#endif
                return (x);     /* tiny x */
        } else if (w < big) {
                t = one / w;
                return (copysignl(log1pl(w + w / (t + sqrtl(one + t * t))), x));
        } else
                return (copysignl(logl(w) + ln2, x));
```



```
}
```

```
**********************************************************
    2037 Sat May 10 12:09:04 2014
new/usr/src/lib/libm/common/Q/asinl.c
libm/common/Q/asinl.c
14071:dece9aafe99a - fix build problems on sparc
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak asinl = __asinl
#endif

/*
 *      asinl(x) = atan2l(x,sqrt(1-x*x));
 *
 * For better accuracy, 1-x*x is computed as follows
 *      1-x*x                   if x <  0.5,
 *      2*(1-|x|)-(1-|x|)*(1-|x|) if x >= 0.5.
 *
 * Special cases:
 *      if x is NaN, return x itself;
 *      if |x|>1, return NaN with invalid signal.
 */

#include "libm.h"

static const long double zero = 0.0L, small = 1.0e-20L, half = 0.5L, one = 1.0L;
#ifndef lint
static const long double big = 1.0e+20L;
#endif

long double
asinl(long double x) {
        long double t, w;
        volatile long double dummy;

        w = fabsl(x);
        if (isnanl(x))
```



```
                return (x + x);
        else if (w <= half) {
                if (w < small) {
#ifndef lint
                        dummy = w + big;
                                                        /* inexact if w != 0 */
#endif
                        return (x);
                } else
                        return (atanl(x / sqrtl(one - x * x)));
        } else if (w < one) {
                t = one - w;
                w = t + t;
                return (atanl(x / sqrtl(w - t * t)));
        } else if (w == one)
                return (atan2l(x, zero));       /* asin(+-1) =  +- PI/2 */
        else
                return (zero / zero);           /* |x| > 1: invalid */
}
```

```
**********************************************************
    4154 Sat May 10 12:09:04 2014
new/usr/src/lib/libm/common/Q/atan2l.c
14071:dece9aafe99a - fix build problems on sparc
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
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 */

/*
 * atan2l(y,x)
 *
 * Method :
 *      1. Reduce y to positive by atan2(y,x)=-atan2(-y,x).
 *      2. Reduce x to positive by (if x and y are unexceptional):
 *              ARG (x+iy) = arctan(y/x)           ... if x > 0,
 *              ARG (x+iy) = pi - arctan[y/(-x)]   ... if x < 0,
 *
 * Special cases:
 *
 *      ATAN2((anything), NaN ) is NaN;
 *      ATAN2(NAN , (anything) ) is NaN;
 *      ATAN2(+-0, +(anything but NaN)) is +-0  ;
 *      ATAN2(+-0, -(anything but NaN)) is +-PI ;
 *      ATAN2(+-(anything but 0 and NaN), 0) is +-PI/2;
 *      ATAN2(+-(anything but INF and NaN), +INF) is +-0 ;
 *      ATAN2(+-(anything but INF and NaN), -INF) is +-PI;
 *      ATAN2(+-INF,+INF ) is +-PI/4 ;
 *      ATAN2(+-INF,-INF ) is +-3PI/4;
 *      ATAN2(+-INF, (anything but,0,NaN, and INF)) is +-PI/2;
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */

#pragma weak atan2l = __atan2l
```



```
#include "libm.h"
#include "longdouble.h"

static const long double
        zero    =  0.0L,
        tiny    =  1.0e-40L,
        one     =  1.0L,
        half    =  0.5L,
        PI3o4   =  2.3561944901923449288469825374596271631480L,
        PIo4    =  0.7853981633974483096156608458198757210491L,
        PIo2    =  1.5707963267948966192313216916397514420991L,
        PI      =  3.1415926535897932384626433832795028841971L,
        PI_lo   =  8.6718101301237810247970440260433519687620e-35L;

long double
atan2l(long double y, long double x) {
        long double t, z;
        int k, m, signy, signx;

        if (x != x || y != y)
                return (x + y); /* return NaN if x or y is NAN */
        signy = signbitl(y);
        signx = signbitl(x);
        if (x == one)
                return (atanl(y));
        m = signy + signx + signx;

        /* when y = 0 */
        if (y == zero)
                switch (m) {
                case 0:
                        return (y);     /* atan(+0,+anything) */
                case 1:
                        return (y);     /* atan(-0,+anything) */
                case 2:
                        return (PI + tiny);     /* atan(+0,-anything) */
                case 3:
                        return (-PI - tiny);    /* atan(-0,-anything) */
                }

        /* when x = 0 */
        if (x == zero)
                return (signy == 1 ? -PIo2 - tiny : PIo2 + tiny);

        /* when x is INF */
        if (!finitel(x)) {
                if (!finitel(y)) {
                        switch (m) {
                        case 0:
                                return (PIo4 + tiny);   /* atan(+INF,+INF) */
                        case 1:
                                return (-PIo4 - tiny);  /* atan(-INF,+INF) */
                        case 2:
                                return (PI3o4 + tiny);  /* atan(+INF,-INF) */
                        case 3:
                                return (-PI3o4 - tiny); /* atan(-INF,-INF) */
                        }
                } else {
                        switch (m) {
                        case 0:
                                return (zero);  /* atan(+...,+INF) */
                        case 1:
                                return (-zero); /* atan(-...,+INF) */
                        case 2:
                                return (PI + tiny);     /* atan(+...,-INF) */
                        case 3:
```

```
127                                 return (-PI - tiny);    /* atan(-...,-INF) */
128                         }
129                 }
130         }
131         /* when y is INF */
132         if (!finitel(y))
133                 return (signy == 1 ? -PIo2 - tiny : PIo2 + tiny);
134
135         /* compute y/x */
136         x = fabsl(x);
137         y = fabsl(y);
138         t = PI_lo;
139         k = (ilogbl(y) - ilogbl(x));
140
141         if (k > 120)
142                 z = PIo2 + half * t;
143         else if (m > 1 && k < -120)
144                 z = zero;
145         else
146                 z = atanl(y / x);
147
148         switch (m) {
149         case 0:
150                 return (z);     /* atan(+,+) */
151         case 1:
152                 return (-z);    /* atan(-,+) */
153         case 2:
154                 return (PI - (z - t));  /* atan(+,-) */
155         case 3:
156                 return ((z - t) - PI);  /* atan(-,-) */
157         }
158         /* NOTREACHED */
159     return 0.0L;
160 }
```

```
**********************************************************
    1265 Sat May 10 12:09:04 2014
new/usr/src/lib/libm/common/Q/atan2pil.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atan2pil = __atan2pil

#include "libm.h"

/*
 * atan2pil(y,x) = atan2l(y, x) / pi
 */

static const long double invpi = 3.183098861837906715377675267450287240689e-1L;

long double
atan2pil(long double y, long double x) {
        return (atan2l(y, x) * invpi);
}
```

```
**********************************************************
    1833 Sat May 10 12:09:04 2014
new/usr/src/lib/libm/common/Q/atanhl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atanhl = __atanhl

#include "libm.h"

/*
 *                    1              2x                          x
 *      atanhl(x) = --- * LOG(1 + -------) = 0.5 * log1pl(2 * --------)
 *                    2            1 - x                       1 - x
 * Note: to guarantee atanhl(-x) = -atanhl(x), we use
 *                   sign(x)             |x|
 *      atanhl(x) = ------- * log1pl(2*-------).
 *                     2               1 - |x|
 *
 * Special cases:
 *      atanhl(x) is NaN if |x| > 1 with signal;
 *      atanhl(NaN) is that NaN with no signal;
 *      atanhl(+-1) is +-INF with signal.
 *
 */

static const long double zero = 0.0L, half = 0.5L, one = 1.0L;

long double
atanhl(long double x) {
        long double t;

        t = fabsl(x);
        if (t == one)
                return (x / zero);
        t = t / (one - t);
        return (copysignl(half, x) * log1pl(t + t));
}
```

```
**********************************************************
    6575 Sat May 10 12:09:04 2014
new/usr/src/lib/libm/common/Q/atanl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak atanl = __atanl

/*
 * atanl(x)
 * Table look-up algorithm
 * By K.C. Ng, March 9, 1989
 *
 * Algorithm.
 *
 * The algorithm is based on atan(x)=atan(y)+atan((x-y)/(1+x*y)).
 * We use poly1(x) to approximate atan(x) for x in [0,1/8] with
 * error (relative)
 *      |(atan(x)-poly1(x))/x|<= 2^-115.94      long double
 *      |(atan(x)-poly1(x))/x|<= 2^-58.85       double
 *      |(atan(x)-poly1(x))/x|<= 2^-25.53       float
 * and use poly2(x) to approximate atan(x) for x in [0,1/65] with
 * error (absolute)
 *      |atan(x)-poly2(x)|<= 2^-122.15          long double
 *      |atan(x)-poly2(x)|<= 2^-64.79           double
 *      |atan(x)-poly2(x)|<= 2^-35.36           float
 * Here poly1 and poly2 are odd polynomial with the following form:
 *              x + x^3*(a1+x^2*(a2+...))
 *
 * (0). Purge off Inf and NaN and 0
 * (1). Reduce x to positive by atan(x) = -atan(-x).
 * (2). For x <= 1/8, use
 *      (2.1) if x < 2^(-prec/2-2), atan(x) =  x  with inexact
 *      (2.2) Otherwise
 *              atan(x) = poly1(x)
 * (3). For x >= 8 then
 *      (3.1) if x >= 2^(prec+2),   atan(x) = atan(inf) - pio2lo
 *      (3.2) if x >= 2^(prec/3+2), atan(x) = atan(inf) - 1/x
```



```
 *      (3.3) if x >  65,           atan(x) = atan(inf) - poly2(1/x)
 *      (3.4) Otherwise,            atan(x) = atan(inf) - poly1(1/x)
 *
 * (4). Now x is in (0.125, 8)
 *      Find y that match x to 4.5 bit after binary (easy).
 *      If iy is the high word of y, then
 *              single : j = (iy - 0x3e000000) >> 19
 *              double : j = (iy - 0x3fc00000) >> 16
 *              quad   : j = (iy - 0x3ffc0000) >> 12
 *
 *      Let s = (x-y)/(1+x*y). Then
 *      atan(x) = atan(y) + poly1(s)
 *              = _TBL_atanl_hi[j] + (_TBL_atanl_lo[j] + poly2(s) )
 *
 *      Note. |s| <= 1.5384615385e-02 = 1/65. Maxium occurs at x = 1.03125
 *
 */

#include "libm.h"

extern const long double _TBL_atanl_hi[], _TBL_atanl_lo[];
static const long double
        one     =   1.0L,
        p1      =  -3.33333333333333333333333333333331344526118e-0001L,
        p2      =   1.99999999999999999999999999899312776685 70e-0001L,
        p3      =  -1.42857142857142857142855360622130953090 1e-0001L,
        p4      =   1.11111111111111111109521984273713974741 8e-0001L,
        p5      =  -9.09090909090909082550360383524806112332 3e-0002L,
        p6      =   7.69230769230766405213074321470892525890 4e-0002L,
        p7      =  -6.66666666660213835187713228363717388266e-0002L,
        p8      =   5.88235294015243939909728335960866194950 4e-0002L,
        p9      =  -5.26315778044753399304661404050952966848 7e-0002L,
        p10     =   4.76189581687818493317585599088678843944 7e-0002L,
        p11     =  -4.34734500583227402268101972455353813592 2e-0002L,
        p12     =   3.98303191457963503750258920464775204273 6e-0002L,
        p13     =  -3.34820670446983057519665774941389489755 4e-0002L,
        q1      =  -3.33333333333333333333333333319527365018 6e-0001L,
        q2      =   1.99999999999999999999988146114392615808e-0001L,
        q3      =  -1.42857142857142857105760319435467111253e-0001L,
        q4      =   1.11111111111105373263048208994541544098e-0001L,
        q5      =  -9.09090909042183420916737325868102181644 1e-0002L,
        q6      =   7.69230537781369270685017176715070164453 9e-0002L,
        q7      =  -6.66089664439386149991473173430571790133 0e-0002L,
        pio2hi  =   1.57079632679489661923132169163975139874 0e+0000L,
        pio2lo  =   4.33590506506189051239852201302167598438 1e-0035L;

#define i0      0
#define i1      3

long double
atanl(long double x) {
        long double y, z, r, p, s;
        int *px = (int *) &x, *py = (int *) &y;
        int ix, iy, sign, j;

        ix = px[i0];
        sign = ix & 0x80000000;
        ix ^= sign;

        /* for |x| < 1/8 */
        if (ix < 0x3ffc0000) {
                if (ix < 0x3feb0000) {  /* when |x| < 2**(-prec/6-2) */
                        if (ix < 0x3fc50000) {  /* if |x| < 2**(-prec/2-2) */
                                s = one;
                                *(3 - i0 + (int *) &s) = -1;    /* s = 1-ulp */
                                *(1 + (int *) &s) = -1;
```

```
128                             *(2 + (int *) &s) = -1;
129                             *(i0 + (int *) &s) -= 1;
130                             if ((int) (s * x) < 1)
131                                     return (x);     /* raise inexact */
132                     }
133                     z = x * x;
134                     if (ix < 0x3fe20000) {  /* if |x| < 2**(-prec/4-1) */
135                             return (x + (x * z) * p1);
136                     } else {        /* if |x| < 2**(-prec/6-2) */
137                             return (x + (x * z) * (p1 + z * p2));
138                     }
139             }
140             z = x * x;
141             return (x + (x * z) * (p1 + z * (p2 + z * (p3 + z * (p4 +
142                     z * (p5 + z * (p6 + z * (p7 + z * (p8 + z * (p9 +
143                     z * (p10 + z * (p11 + z * (p12 + z * p13))))))))))));
144     }

146     /* for |x| >= 8.0 */
147     if (ix >= 0x40020000) {
148             px[i0] = ix;
149             if (ix < 0x40050400) {  /* x <  65 */
150                     r = one / x;
151                     z = r * r;
152                     /*
153                      * poly1
154                      */
155                     y = r * (one + z * (p1 + z * (p2 + z * (p3 +
156                             z * (p4 + z * (p5 + z * (p6 + z * (p7 +
157                             z * (p8 + z * (p9 + z * (p10 + z * (p11 +
158                             z * (p12 + z * p13))))))))))));
159                     y -= pio2lo;
160             } else if (ix < 0x40260000) {   /* x <  2**(prec/3+2) */
161                     r = one / x;
162                     z = r * r;
163                     /*
164                      * poly2
165                      */
166                     y = r * (one + z * (q1 + z * (q2 + z * (q3 + z * (q4 +
167                             z * (q5 + z * (q6 + z * q7)))))));
168                     y -= pio2lo;
169             } else if (ix < 0x40720000) {   /* x <  2**(prec+2) */
170                     y = one / x - pio2lo;
171             } else if (ix < 0x7fff0000) {   /* x <  inf */
172                     y = -pio2lo;
173             } else {                /* x is inf or NaN */
174                     if (((ix - 0x7fff0000) | px[1] | px[2] | px[i1]) != 0)
175                             return (x - x);
176                     y = -pio2lo;
177             }

179             if (sign == 0)
180                     return (pio2hi - y);
181             else
182                     return (y - pio2hi);
183     }

185     /* now x is between 1/8 and 8 */
186     px[i0] = ix;
187     iy = (ix + 0x00000800) & 0x7ffff000;
188     py[i0] = iy;
189     py[1] = py[2] = py[i1] = 0;
190     j = (iy - 0x3ffc0000) >> 12;

192     if (sign == 0)
193             s = (x - y) / (one + x * y);
```



```
194     else
195             s = (y - x) / (one + x * y);
196     z = s * s;
197     if (ix == iy)
198             p = s * (one + z * (q1 + z * (q2 + z * (q3 + z * q4))));
199     else
200             p = s * (one + z * (q1 + z * (q2 + z * (q3 + z * (q4 +
201                     z * (q5 + z * (q6 + z * q7)))))));
202     if (sign == 0) {
203             r = p + _TBL_atanl_lo[j];
204             return (r + _TBL_atanl_hi[j]);
205     } else {
206             r = p - _TBL_atanl_lo[j];
207             return (r - _TBL_atanl_hi[j]);
208     }
209 }
```

```
**********************************************************
    1680 Sat May 10 12:09:04 2014
new/usr/src/lib/libm/common/Q/cbrtl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak cbrtl = __cbrtl

#include "libm.h"
#include "longdouble.h"

#define n0      0

long double
cbrtl(long double x) {
        long double s, t, r, w, y;
        double dx, dy;
        int *py = (int *) &dy;
        int n, m, m3, sx;

        if (!finitel(x))
                return (x + x);
        if (iszerol(x))
                return (x);
        sx = signbitl(x);
        x = fabsl(x);
        n = ilogbl(x);
        m = n / 3;
        m3 = m + m + m;
        y = scalbnl(x, -m3);
        dx = (double) y;
        dy = cbrt(dx);
        py[1 - n0] += 2;
        if (py[1 - n0] == 0)
                py[n0] += 1;

        /* one step newton iteration to 113 bits with error < 0.667ulps */
        t = (long double) dy;
```



```
        t = scalbnl(t, m);
        s = t * t;
        r = x / s;
        w = t + t;
        r = (r - t) / (w + r);
        t += t * r;

        return (sx == 0 ? t : -t);
}
```

```
**********************************************************
    1264 Sat May 10 12:09:04 2014
new/usr/src/lib/libm/common/Q/copysignl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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28  */

30 #if defined(ELFOBJ)
31 #pragma weak copysignl = __copysignl
32 #endif

34 #include "libm.h"

36 long double
37 copysignl(long double x, long double y) {
38         int *px = (int *) &x;
39         int *py = (int *) &y;

41         px[HIXWORD] = (px[HIXWORD] & ~XSGNMSK) | (py[HIXWORD] & XSGNMSK);
42         return (x);
43 }
```

```
**********************************************************
    2933 Sat May 10 12:09:04 2014
new/usr/src/lib/libm/common/Q/coshl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
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 */

#pragma weak coshl = __coshl

#include "libm.h"
#include "longdouble.h"


/*
 * coshl(X)
 * RETURN THE HYPERBOLIC COSINE OF X
 *
 * Method :
 *      1. Replace x by |x| (coshl(x) = coshl(-x)).
 *      2.
 *                                                      [ expl(x) - 1 ]^2
 *          0        <= x <= 0.3465 : coshl(x) := 1 + -------------------
 *                                                         2*expl(x)
 *
 *                                                expl(x) + 1/expl(x)
 *          0.3465   <= x <= thresh : coshl(x) := -------------------
 *                                                        2
 *          thresh   <= x <= lnovft : coshl(x) := expl(x)/2
 *          lnovft   <= x <  INF    : coshl(x) := scalbnl(expl(x-1024*ln2),1023)
 *
 * here
 *      thr1            a number that is near one half of ln2.
 *      thr2            a number such that
 *                              expl(thresh)+expl(-thresh)=expl(thresh)
 *      lnovft:         logrithm of the overflow threshold
 *                      = MEP1*ln2 chopped to machine precision.
 *      ME              maximum exponent
 *      MEP1            maximum exponent plus 1
 *
```



```
 * Special cases:
 *      coshl(x) is |x| if x is +INF, -INF, or NaN.
 *      only coshl(0)=1 is exact for finite x.
 */

#define ME      16383
#define MEP1    16384
#define LNOVFT  1.13565234062941439494919310779707634284 5e+4L
                /* last 32 bits of LN2HI is zero */
#define LN2HI   6.9314718055994530941723195474958448502 03e-0001L
#define LN2LO   1.6670859208305522088904493304003797541 69e-0025L
#define THR1    0.3465L
#define THR2    45.L

static const long double
        half    = 0.5L,
        tinyl   = 7.5e-37L,
        one     = 1.0L,
        ln2hi   = LN2HI,
        ln2lo   = LN2LO,
        lnovftL = LNOVFT,
        thr1    = THR1,
        thr2    = THR2;

long double
coshl(long double x) {
        long double t, w;

        w = fabsl(x);
        if (!finitel(w))
                return (w + w);         /* x is INF or NaN */
        if (w < thr1) {
                t = w < tinyl ? w : expm1l(w);
                w = one + t;
                if (w != one)
                        w = one + (t * t) / (w + w);
                return (w);
        } else if (w < thr2) {
                t = expl(w);
                return (half * (t + one / t));
        } else if (w <= lnovftL)
                return (half * expl(w));
        else {
                return (scalbnl(expl((w - MEP1 * ln2hi) - MEP1 * ln2lo), ME));
        }
}
```

```
**********************************************************
    2670 Sat May 10 12:09:05 2014
new/usr/src/lib/libm/common/Q/cosl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * cosl(x)
 * Table look-up algorithm by K.C. Ng, November, 1989.
 *
 * kernel function:
 *      __k_sinl        ... sin function on [-pi/4,pi/4]
 *      __k_cosl        ... cos function on [-pi/4,pi/4]
 *      __rem_pio2l     ... argument reduction routine
 *
 * Method.
 *      Let S and C denote the sin and cos respectively on [-PI/4, +PI/4].
 *      1. Assume the argument x is reduced to y1+y2 = x-k*pi/2 in
 *         [-pi/2 , +pi/2], and let n = k mod 4.
 *      2. Let S=S(y1+y2), C=C(y1+y2). Depending on n, we have
 *
 *          n        sin(x)      cos(x)        tan(x)
 *     ----------------------------------------------------------
 *          0          S           C             S/C
 *          1          C          -S            -C/S
 *          2         -S          -C             S/C
 *          3         -C           S            -C/S
 *     ----------------------------------------------------------
 *
 * Special cases:
 *      Let trig be any of sin, cos, or tan.
 *      trig(+-INF)  is NaN, with signals;
 *      trig(NaN)    is that NaN;
 *
 * Accuracy:
 *      computer TRIG(x) returns trig(x) nearly rounded.
 */
```



```
#pragma weak cosl = __cosl

#include "libm.h"
#include "longdouble.h"

long double
cosl(long double x) {
        long double y[2], z = 0.0L;
        int n, ix;

        ix = *(int *) &x;                       /* High word of x */

        ix &= 0x7fffffff;
        if (ix <= 0x3ffe9220)                   /* |x| ~< pi/4 */
                return (__k_cosl(x, z));
        else if (ix >= 0x7fff0000)              /* trig(Inf or NaN) is NaN */
                return (x - x);
        else {                                  /* argument reduction needed */
                n = __rem_pio2l(x, y);
                switch (n & 3) {
                case 0:
                        return (__k_cosl(y[0], y[1]));
                case 1:
                        return (-__k_sinl(y[0], y[1]));
                case 2:
                        return (-__k_cosl(y[0], y[1]));
                case 3:
                        return (__k_sinl(y[0], y[1]));
                }
        }
        /* NOTREACHED */
    return 0.0L;
}
```

```
**********************************************************
   13590 Sat May 10 12:09:05 2014
new/usr/src/lib/libm/common/Q/erfl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
 * long double function erf,erfc (long double x)
 * K.C. Ng, September, 1989.
 *                          x
 *                   2      |\
 *     erf(x)  =  ---------  | exp(-t*t)dt
 *                sqrt(pi) \|
 *                         0
 *
 *     erfc(x) =  1-erf(x)
 *
 * method:
 *      Since erf(-x) = -erf(x), we assume x>=0.
 *      For x near 0, we have the expansion
 *
 *          erf(x) = (2/sqrt(pi))*(x - x^3/3 + x^5/10 - x^7/42 + ....).
 *
 *      Since 2/sqrt(pi) = 1.128379167095512573896158903121545171688,
 *      we use x + x*P(x^2) to approximate erf(x). This formula will
 *      guarantee the error less than one ulp where x is not too far
 *      away from 0. We note that erf(x)=x at x = 0.6174..... After
 *      some experiment, we choose the following approximation on
 *      interval [0,0.84375].
 *
 *      For x in [0,0.84375]
 *                 2             2       4              40
 *         P =  P(x ) = (p0 + p1 * x + p2 * x + ... + p20 * x  )
 *
 *         erf(x)  = x + x*P
 *         erfc(x) = 1 - erf(x)          if x<=0.25
 *                 = 0.5 + ((0.5-x)-x*P)  if x in [0.25,0.84375]
 *      precision: |P(x^2)-(erf(x)-x)/x| <= 2**-122.50
```



```
 *
 *      For x in [0.84375,1.25], let s = x - 1, and
 *      c = 0.84506291151 rounded to single (24 bits)
 *         erf(x)  = c  + P1(s)/Q1(s)
 *         erfc(x) = (1-c)  - P1(s)/Q1(s)
 *      precision: |P1/Q1 - (erf(x)-c)| <= 2**-118.41
 *
 *
 *      For x in [1.25,1.75], let s = x - 1.5, and
 *      c = 0.95478588343 rounded to single (24 bits)
 *         erf(x)  = c  + P2(s)/Q2(s)
 *         erfc(x) = (1-c)  - P2(s)/Q2(s)
 *      precision: |P1/Q1 - (erf(x)-c)| <= 2**-123.83
 *
 *
 *      For x in [1.75,16/3]
 *         erfc(x) = exp(-x*x)*(1/x)*R1(1/x)/S1(1/x)
 *         erf(x)  = 1 - erfc(x)
 *      precision: absolute error of R1/S1 is bounded by 2**-124.03
 *
 *      For x in [16/3,107]
 *         erfc(x) = exp(-x*x)*(1/x)*R2(1/x)/S2(1/x)
 *         erf(x)  = 1 - erfc(x) (if x>=9 simple return erf(x)=1 with inexact)
 *      precision: absolute error of R2/S2 is bounded by 2**-120.07
 *
 *      Else if inf > x >= 107
 *         erf(x)  = 1 with inexact
 *         erfc(x) = 0 with underflow
 *
 *      Special case:
 *         erf(inf)  = 1
 *         erfc(inf) = 0
 */

#pragma weak erfl = __erfl
#pragma weak erfcl = __erfcl

#include "libm.h"
#include "longdouble.h"

static const long double
        tiny        = 1e-40L,
        nearunfl    = 1e-4000L,
        half        = 0.5L,
        one         = 1.0L,
        onehalf     = 1.5L,
        L16_3       = 16.0L/3.0L;
/*
 * Coefficients for even polynomial P for erf(x)=x+x*P(x^2) on [0,0.84375]
 */
static const long double P[] = {        /* 21 coeffs */
   1.28379167095512573896158903121545171556e-0001L,
  -3.76126389031837524632052967707181559460 3e-0001L,
   1.12837916709551257389615890312154517 15556e-0001L,
  -2.68661706451312517594323548334462504 6092e-0002L,
   5.22397762544218784211184665298045456 8389e-0003L,
  -8.54832702345085283254662627103862724 358e-0004L,
   1.20553329817896642510216471590223197 6672e-0004L,
  -1.49256503584062509767494490502789783 8996e-0005L,
   1.64621143658892473360464884917293669 2024e-0006L,
  -1.63658446912349197681583470479973351 4987e-0007L,
   1.48071928158789744530252900714477073 9305e-0008L,
  -1.22905553017078284304646798646472204 7175e-0009L,
   9.42275906432030735755395494576065434 1633e-0011L,
  -6.71136684665343903616210510499143338 0926e-0012L,
   4.46322409034189316510027538069384311 6240e-0013L,
```

```
  -2.7835134525826582454226356625597791623l2e-0014L,
   1.6342274125869601952513468788637546615l46e-0015L,
  -9.0607826728895777227657114556231178027l95e-0017L,
   4.7413418012662468734121592138936136023l54e-0018L,
  -2.2724175964978261883748466365343173812l03e-0019L,
   8.0690887337160684624968356589285669209l33e-0021L,
};

/*
 * Rational erf(x) = ((float)0.84506291151) + P1(x-1)/Q1(x-1) on [0.84375,1.25]
 */
static const long double C1   = (long double)((float)0.84506291151);
static const long double P1[] = {       /*  12 top coeffs */
  -2.3621185607526599556543649173907419303l16e-0003L,
   4.1296233796244200340789266106507599791l46e-0001L,
  -3.9738575054035472831094179231826699769l04e-0002L,
   4.3575031840840224397635675130780367551l83e-0002L,
   8.0155936233884213712476766837541714569l50e-0002L,
  -1.0344593104033524866854672217767784746l02e-0002L,
   5.6718502953810466796753557190177208213l83e-0003L,
   1.2192625632327639983514521949687811743l18e-0003L,
   5.3908334815810334230203207342010654759l98e-0004L,
  -1.9788539128151154950531190235178055283l00e-0004L,
   6.1842345139536001183350178857064205524l87e-0005L,
  -5.3318027116978108610175185158162718082l86e-0006L,
};
static const long double Q1[] = {       /*  12 bottom coeffs with leading 1.0 hi
   9.0815062960648821952801783710762319665l5e-0001L,
   6.8210495319682040976043921836506876425l20e-0001L,
   4.0678691782335395023150559707432718228l38e-0001L,
   1.7023322354631676581814472306388109557l7e-0001L,
   7.4980983776905539342664230887086142193l56e-0002L,
   2.0501543969181786970569272343663727603l10e-0002L,
   7.0129885340319998990547823338519059393l79e-0003L,
   1.1499047870144003546498434512345707310l76e-0003L,
   3.1856202550112994761960394912051597186l20e-0004L,
   1.2734050721530087754263761933741058405l17e-0005L,
   4.7538669999594329719567812281484029714l54e-0006L,
  -1.0022876021116600260539817285495402006l83e-0006L,
};
/*
 * Rational erf(x) = ((float)0.95478588343) + P2(x-1.5)/Q2(x-1.5)
 * on [1.25,1.75]
 */
static const long double C2   = (long double)((float)0.95478588343);
static const long double P2[] = {       /*  12 top coeffs */
   1.1319263048644467301351261645947858635l2e-0002L,
   1.2736179969677541515443300551862103228l32e-0001L,
  -8.1699807346675125198978169071902811434l23e-0002L,
   9.5122674860903211978336342717879442717l46e-0002L,
  -2.3942515698048721600052749997359143681l70e-0002L,
   1.1087686602275286675252523331845202229l05e-0002L,
   3.5274354929339024146620433143732774942l21e-0004L,
   4.9461162733419534635843190066694746259l71e-0004L,
  -4.2898519425131447146002857690224209624l18e-0005L,
   8.3047198413419527058747816360020851199l78e-0005L,
  -1.0404602261773093387819022522828499031l89e-0005L,
   2.1229133315849214703813275836720444340l87e-0006L,
};
static const long double Q2[] = {       /*  13 bottom coeffs with leading 1.0 hi
   7.4488157373069927491687276910420038332l50e-0001L,
   7.1618138502360082944847443124301221880l43e-0001L,
   3.6031347565842257661449227274056412361l21e-0001L,
   1.9558116091337664780805507951945358526l53e-0001L,
   7.2530599637162259724796938137878107112l33e-0002L,
   2.7523912537574214242127702215412383249l78e-0002L,
```



```
   7.6776548520852402574390506734465468280l05e-0003L,
   2.1411022445555096873464970603266300610l69e-0003L,
   4.3421230138309570939495633391306743642l71e-0004L,
   8.6645878955700433485309919972722121503l16e-0005L,
   1.1092015825117520870601674293970337019l88e-0005L,
   1.3578343757818310627133470000309843643l11e-0006L,
   4.9577462805943849972730903850606800164l51e-0008L,
};
/*
 * erfc(x) = exp(-x*x)/x * R1(1/x)/S1(1/x) on [1.75, 16/3]
 */
static const long double R1[] = {       /*  14 top coeffs */
   4.6301951226543150163707057676215506029l48e+0006L,
   1.2579495217464948307006542044886757136l28e+0007L,
   1.7041538227202602728147434973761816257l07e+0007L,
   1.5026005687060618723815775395373157399l43e+0007L,
   9.5437107934319952848270244453873339228l61e+0006L,
   4.5893448085840910116522381649359495224l27e+0006L,
   1.7146606629417457911909070719206718442l89e+0006L,
   5.0348021477687988943076722561924662838l67e+0005L,
   1.1622864004435546705531521104471268507l25e+0005L,
   2.0866438345489016813627573080586603991l37e+0004L,
   2.8397931618681403059070043928903487773l38e+0003L,
   2.7866872416584236017782586944986556807l78e+0002L,
   1.7791778371026956024258974526239857864l64e+0001L,
   5.6418958354774707690436146238191444347l31e-0001L,
};
static const long double S1[] = {       /* 15 bottom coeffs with leading 1.0 hid
   4.6301951226543315295956068962875968431l10e+0006L,
   1.7804110933455120243247810842205090550l58e+0007L,
   3.2501130970518007037071086237157768482l83e+0007L,
   3.7378570991767550509121937121234891157l55e+0007L,
   3.0297874975165788214591740558707811685l93e+0007L,
   1.8338506199653847650057696321032057772l27e+0007L,
   8.5627199997369157222103912226391865864l98e+0006L,
   3.1396845620746589713155455397600081369l73e+0006L,
   9.1064213137313848800277036274543669309l45e+0005L,
   2.0851083423842665086132671360031949200l01e+0005L,
   3.7231262726931203407304914164495392906l00e+0004L,
   5.0491698785673440461456953607844369298l02e+0003L,
   4.9442745327480107676701507300359209389l9e+0002L,
   3.1535106088182139298298402491622689714l12e+0001L,
   1.0e00L,
};

/*
 * erfc(x) = exp(-x*x)/x * R2(1/x)/S2(1/x) on [16/3, 107]
 */
static const long double R2[] = {       /*  15 top coeffs in reverse order!!*/
   2.4472880122543029667963265875371369316l69e+0005L,
   8.7685925671898618966533699127165387390l16e+0005L,
   1.5522931525817800657614979080057795249l53e+0006L,
   1.7920759248359429358642316575045925967l29e+0006L,
   1.5040014631558973449475002220526948358l75e+0006L,
   9.6994855632689141180123018601601301993l35e+0005L,
   4.9614499336618079698634350133647960377l00e+0005L,
   2.0487265446934740280611767647162282737l91e+0005L,
   6.8915329643309497224790610905518968866l35e+0004L,
   1.8880147090103075077196404790582323798l5e+0004L,
   4.1896920649889577450547348096424956445l02e+0003L,
   7.3623464874270480682129688896427417346l21e+0002L,
   9.9803597142114114230076410565808131162l07e+0001L,
   9.4269108951353791811071919621934851741l59e+0000L,
   5.6418958354775628694807945156236012804l29e-0001L,
};
static const long double S2[] = {       /* 16 coefficients */
```

```
   2.44728220360190297124600471679060468688 80e+0005L,
   1.15300985275938530936775946093480848 9833e+0006L,
   2.60858064961263913154896626507866338484 9e+0006L,
   3.76667391734662330885020279239056902 5740e+0006L,
   3.89056625513838391078992492054133537 0691e+0006L,
   3.05288207390074620761316625999415052 7732e+0006L,
   1.88557451997038098846024104724851941 8407e+0006L,
   9.36972203475994318585145084681144501 2922e+0005L,
   3.79227835053668611144486975262449244 3659e+0005L,
   1.25775060695011579996536600177309405 8720e+0005L,
   3.41083060024236937064560863464362035 5058e+0004L,
   7.51398446974234313485132686317506727 1240e+0003L,
   1.31329632059319000255477999813869550 7840e+0003L,
   1.77397270088762915700632633369689651 6769e+0002L,
   1.67087645182258680042200901388045709 4162e+0001L,
   1.000L,
};

long double erfl(x)
long double x;
{
        long double s,y,t;

        if(!finitel(x)) {
            if(x!=x) return x+x;        /* NaN */
            return copysignl(one,x);    /* return +-1.0 is x=Inf */
        }

        y = fabsl(x);
        if(y <= 0.84375L) {
            if(y<=tiny) return x+P[0]*x;
            s = y*y;
            t = __poly_libmq(s,21,P);
            return  x+x*t;
        }
        if(y<=1.25L) {
            s = y-one;
            t = C1+__poly_libmq(s,12,P1)/(one+s*__poly_libmq(s,12,Q1));
            return (signbitl(x))? -t: t;
        } else if(y<=1.75L) {
            s = y-onehalf;
            t = C2+__poly_libmq(s,12,P2)/(one+s*__poly_libmq(s,13,Q2));
            return (signbitl(x))? -t: t;
        }
        if(y<=9.0L) t = erfcl(y); else t = tiny;
        return (signbitl(x))? t-one: one-t;
}

long double erfcl(x)
long double x;
{
        long double s,y,t;

        if(!finitel(x)) {
            if(x!=x) return x+x;        /* NaN */
            /* return 2.0 if x= -inf; 0.0 if x= +inf */
            if (x < 0.0L) return 2.0L; else return 0.0L;
        }

        if(x <= 0.84375L) {
            if(x<=0.25) return one-erfl(x);
            s = x*x;
            t = half-x;
            t = t - x*__poly_libmq(s,21,P);
            return  half+t;
        }
```



```
        if(x<=1.25L) {
            s = x-one;
            t = one-C1;
            return t - __poly_libmq(s,12,P1)/(one+s*__poly_libmq(s,12,Q1));
        } else if(x<=1.75L) {
            s = x-onehalf;
            t = one-C2;
            return t - __poly_libmq(s,12,P2)/(one+s*__poly_libmq(s,13,Q2));
        }
        if(x>=107.0L) return nearunfl*nearunfl;         /* underflow */
        else if(x >= L16_3) {
            y = __poly_libmq(x,15,R2);
            t = y/__poly_libmq(x,16,S2);
        } else {
            y = __poly_libmq(x,14,R1);
            t = y/__poly_libmq(x,15,S1);
        }
        /*
         * Note that exp(-x*x+d) = exp(-x*x)*exp(d), so to compute
         * exp(-x*x) with a small relative error, we need to compute
         * -x*x with a small absolute error.  To this end, we set y
         * equal to the leading part of x but with enough trailing
         * zeros that y*y can be computed exactly and we rewrite x*x
         * as y*y + (x-y)*(x+y), distributing the latter expression
         * across the exponential.
         *
         * We could construct y in a portable way by setting
         *
         *   int i = (int)(x * ptwo);
         *   y = (long double)i * 1/ptwo;
         *
         * where ptwo is some power of two large enough to make x-y
         * small but not so large that the conversion to int overflows.
         * When long double arithmetic is slow, however, the following
         * non-portable code is preferable.
         */
        y = x;
        *(2+(int*)&y) = *(3+(int*)&y) = 0;
        t *= expl(-y*y)*expl(-(x-y)*(x+y));
        return  t;
}
```

```
**********************************************************
    2878 Sat May 10 12:09:05 2014
new/usr/src/lib/libm/common/Q/exp10l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
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 */

#pragma weak exp10l = __exp10l

#include "libm.h"
#include "longdouble.h"

/*
 * exp10l(x)
 *      n = nint(x*(log10/log2)) ;
 *      exp10(x) = 10**x = exp(x*ln(10)) = exp(n*ln2+(x*ln10-n*ln2))
 *               = 2**n*exp(ln10*(x-n*log2/log10)))
 *      If x is an integer <= M then use repeat multiplication. For
 *      10**M is the largest representable integer, where
 *              M = 10          single precision (24 bits)
 *              M = 22          double precision (53 bits)
 *              M = 48          quadruple precision (113 bits)
 */

#define TINY    1.0e-20L        /* single: 1e-5, double: 1e-10, quad: 1e-20 */
#define LG10OVT 4933.L          /* single:  39, double:  309, quad:  4933 */
#define LG10UFT -4966.L         /* single: -45, double: -323, quad: -4966 */
#define M       48
                        /* logt2hi : last 32 bits is zero for quad prec */
#define LOGT2HI 0.30102999566398119521373889472420986034688L
#define LOGT2LO 2.83166421308946816789666437195 3e-31L

static const long double
        zero    = 0.0L,
        tiny    = TINY * TINY,
        one     = 1.0L,
        lg10    = 3.32192809488736234787031942948939017586 5e+0000L,
        ln10    = 2.30258509299404568401799145468436420760 1e+0000L,
        logt2hi = LOGT2HI,
```



```
        logt2lo = LOGT2LO,
        lg10ovt = LG10OVT,
        lg10uft = LG10UFT;

long double
exp10l(long double x) {
        long double t, tenp;
        int k;

        if (!finitel(x)) {
                if (isnanl(x) || x > zero)
                        return (x + x);
                else
                        return (zero);
        }
        if (fabsl(x) < tiny)
                return (one + x);
        if (x <= lg10ovt)
                if (x >= lg10uft) {
                        k = (int) x;
                        tenp = 10.0L;
                                /* x is a small +integer */
                        if (0 <= k && k <= M && (long double) k == x) {
                                t = one;
                                if (k & 1)
                                        t *= tenp;
                                k >>= 1;
                                while (k) {
                                        tenp *= tenp;
                                        if (k & 1)
                                                t *= tenp;
                                        k >>= 1;
                                }
                                return (t);
                        }
                        t = anintl(x * lg10);
                        return (scalbnl(expl(ln10 * ((x - t * logt2hi) -
                                t * logt2lo)), (int) t));
                } else
                        return (scalbnl(one, -50000));  /* underflow */
        else
                        return (scalbnl(one, 50000));   /* overflow  */
}
```

```
**********************************************************
    2095 Sat May 10 12:09:05 2014
new/usr/src/lib/libm/common/Q/exp2l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak exp2l = __exp2l

#include "libm.h"
#include "longdouble.h"

/*
 *      exp2l(x) = 2**x = 2**((x-anint(x))+anint(x))
 *               = 2**anint(x)*2**(x-anint(x))
 *               = 2**anint(x)*exp((x-anint(x))*ln2)
 */

#define TINY    1.0e-20L        /* single: 1e-5, double: 1e-10, quad: 1e-20 */
#define OVFLEXP 16400           /* single: 130,  double  1030,  quad: 16400 */
#define UNFLEXP -16520          /* single:-155,  double -1080,  quad:-16520 */

static const long double
        zero = 0.0L,
        tiny = TINY * TINY,
        half = 0.5L,
        ln2 = 6.9314718055994530941723212145817656807550e-0001L,
        one = 1.0L;

static const int
        ovflexp = OVFLEXP,
        unflexp = UNFLEXP;

long double
exp2l(long double x) {
        long double t;

        if (!finitel(x)) {
                if (isnanl(x) || x > zero)
```



```
                        return (x + x);
                else
                        return (zero);
        }
        t = fabsl(x);
        if (t < half) {
                if (t < tiny)
                        return (one + x);
                else
                        return (expl(ln2 * x));
        }
        t = anintl(x);
        if (t < ovflexp) {
                if (t >= unflexp)
                        return (scalbnl(expl(ln2 * (x - t)), (int) t));
                else
                        return (scalbnl(one, unflexp)); /* underflow */
        } else
                return (scalbnl(one, ovflexp)); /* overflow  */
}
```

```
**********************************************************
    3930 Sat May 10 12:09:05 2014
new/usr/src/lib/libm/common/Q/expl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
 * expl(x)
 * Table driven method
 * Written by K.C. Ng, November 1988.
 * Algorithm :
 *      1. Argument Reduction: given the input x, find r and integer k
 *         and j such that
 *                    x = (32k+j)*ln2 + r,  |r| <= (1/64)*ln2 .
 *
 *      2. expl(x) = 2^k * (2^(j/32) + 2^(j/32)*expm1(r))
 *         Note:
 *         a. expm1(r) = (2r)/(2-R), R = r - r^2*(t1 + t2*r^2)
 *         b. 2^(j/32) is represented as
 *                      _TBL_expl_hi[j]+_TBL_expl_lo[j]
 *         where
 *              _TBL_expl_hi[j] = 2^(j/32) rounded
 *              _TBL_expl_lo[j] = 2^(j/32) - _TBL_expl_hi[j].
 *
 * Special cases:
 *      expl(INF) is INF, expl(NaN) is NaN;
 *      expl(-INF)=  0;
 *      for finite argument, only expl(0)=1 is exact.
 *
 * Accuracy:
 *      according to an error analysis, the error is always less than
 *      an ulp (unit in the last place).
 *
 * Misc. info.
 *      For 113 bit long double
 *              if x >  1.13565234062941439494919310779707634284 5e+4
 *      then expl(x) overflow;
 *              if x < -1.14334627433362978788372438434526215034 1e+4
 *      then expl(x) underflow
 *
 * Constants:
 * Only decimal values are given. We assume that the compiler will convert
 * from decimal to binary accurately enough to produce the correct
 * hexadecimal values.
 */

#pragma weak expl = __expl

#include "libm.h"

extern const long double _TBL_expl_hi[], _TBL_expl_lo[];

static const long double
one             =  1.0L,
two             =  2.0L,
ln2_64          =  1.08304246962491454596442518977840089856 8e-2L,
ovflthreshold   =  1.13565234062941439494919310779707634284 5e+4L,
unflthreshold   = -1.14334627433362978788372438434526215034 1e+4L,
invln2_32       =  4.61662413084468290355175897920605483976 5e+1L,
ln2_32hi        =  2.16608493924982909192884985859245151568 8e-2L,
ln2_32lo        =  5.20964350259547565278265415750118673177 9e-27L;

/* rational approximation coeffs for [-(ln2)/64,(ln2)/64] */
static const long double
t1 =   1.66666666666666666666666666660876387437e-1L,
t2 =  -2.77777777777777777777770781209317347875 6e-3L,
t3 =   6.61375661375661348207428093287422120242 4e-5L,
t4 =  -1.65343915339213995416960982274223585112 0e-6L,
t5 =   4.17531485176953975138785211661097379605 3e-8L;

long double
expl(long double x) {
        int *px = (int *) &x, ix, j, k, m;
        long double t, r;

        ix = px[0];                             /* high word of x */
        if (ix >= 0x7fff0000)
                return (x + x);                 /* NaN of +inf */
        if (((unsigned) ix) >= 0xffff0000)
                return (-one / x);              /* NaN or -inf */
        if ((ix & 0x7fffffff) < 0x3fc30000) {
                if ((int) x < 1)
                        return (one + x);       /* |x|<2^-60 */
        }
        if (ix > 0) {
                if (x > ovflthreshold)
                        return (scalbnl(x, 20000));
                k = (int) (invln2_32 * (x + ln2_64));
        } else {
                if (x < unflthreshold)
                        return (scalbnl(-x, -40000));
                k = (int) (invln2_32 * (x - ln2_64));
        }
        j  = k&0x1f;
        m  = k>>5;
        t  = (long double) k;
        x  = (x - t * ln2_32hi) - t * ln2_32lo;
        t  = x * x;
        r  = (x - t * (t1 + t * (t2 + t * (t3 + t * (t4 + t * t5))))) - two;
        x  = _TBL_expl_hi[j] - ((_TBL_expl_hi[j] * (x + x)) / r -
                _TBL_expl_lo[j]);
        return (scalbnl(x, m));
}
```

```
**********************************************************
    6023 Sat May 10 12:09:05 2014
new/usr/src/lib/libm/common/Q/expm1l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak expm1l = __expm1l
#endif
#if !defined(__sparc)
#error Unsupported architecture
#endif

/*
 * expm1l(x)
 *
 * Table driven method
 * Written by K.C. Ng, June 1995.
 * Algorithm :
 *      1. expm1(x) = x if x<2**-114
 *      2. if |x| <= 0.0625 = 1/16, use approximation
 *              expm1(x) = x + x*P/(2-P)
 * where
 *      P = x - z*(P1+z*(P2+z*(P3+z*(P4+z*(P5+z*P6+z*P7))))), z = x*x;
 * (this formula is derived from
 *      2-P+x = R = x*(exp(x)+1)/(exp(x)-1) ~ 2 + x*x/6 - x^4/360 + ...)
 *
 * P1 =   1.66666666666666666666666666666638500528074603030e-0001
 * P2 =  -2.77777777777777777777777759668391122822266551158e-0003
 * P3 =   6.61375661375661375657437408890138814721051293054e-0005
 * P4 =  -1.65343915343915303310185228411892601606669528828e-0006
 * P5 =   4.17535139755122945763580609663414647067443411178e-0008
 * P6 =  -1.05683795988668526689182102605260986731620026832e-0009
 * P7 =   2.67544168821852702827123344217198187229611470514e-0011
 *
 * Accuracy: |R-x*(exp(x)+1)/(exp(x)-1)|<=2**-119.13
 *
 *      3. For 1/16 < |x| < 1.125, choose x(+-i) ~ +-(i+4.5)/64, i=0,..,67
```



```
 *         since
 *              exp(x) = exp(xi+(x-xi))= exp(xi)*exp((x-xi))
 *         we have
 *              expm1(x) = expm1(xi)+(exp(xi))*(expm1(x-xi))
 *         where
 *              |s=x-xi| <= 1/128
 *         and
 *      expm1(s)=2s/(2-R), R= s-s^2*(T1+s^2*(T2+s^2*(T3+s^2*(T4+s^2*T5))))
 *
 * T1 =   1.66666666666666666666666666660876387437e-1L,
 * T2 =  -2.77777777777777777777770781209317347875 6e-3L,
 * T3 =   6.61375661375661348207428093287422120 2424e-5L,
 * T4 =  -1.65343915339213995416960982274223585112 0e-6L,
 * T5 =   4.17531485176953975138785211661097379605 3e-8L;
 *
 *      4. For |x| >= 1.125, return exp(x)-1.
 *         (see algorithm for exp)
 *
 * Special cases:
 *      expm1l(INF) is INF, expm1l(NaN) is NaN;
 *      expm1l(-INF)= -1;
 *      for finite argument, only expm1l(0)=0 is exact.
 *
 * Accuracy:
 *      according to an error analysis, the error is always less than
 *      2 ulp (unit in the last place).
 *
 * Misc. info.
 *      For 113 bit long double
 *              if x >  1.13565234062941439494919310779707634284 5e+4
 *      then expm1l(x) overflow;
 *
 * Constants:
 * Only decimal values are given. We assume that the compiler will convert
 * from decimal to binary accurately enough to produce the correct
 * hexadecimal values.
 */

#include "libm.h"

extern const long double _TBL_expl_hi[], _TBL_expl_lo[];
extern const long double _TBL_expm1lx[], _TBL_expm1l[];

static const long double
        zero            = +0.0L,
        one             = +1.0L,
        two             = +2.0L,
        ln2_64          = +1.08304246962491454596442518977840089856 8e-2L,
        ovflthreshold   = +1.13565234062941439494919310779707634284 5e+4L,
        invln2_32       = +4.61662413084468290355175897920605483976 5e+1L,
        ln2_32hi        = +2.16608493924982909192884985859245151568 8e-2L,
        ln2_32lo        = +5.20964350259547565278265415750118673177 9e-27L,
        huge            = +1.0e4000L,
        tiny            = +1.0e-4000L,
        P1 = +1.66666666666666666666666666638500528074603030e-0001L,
        P2 = -2.77777777777777777777777759668391122822266551158e-0003L,
        P3 = +6.61375661375661375657437408890138814721051293054e-0005L,
        P4 = -1.65343915343915303310185228411892601606669528828e-0006L,
        P5 = +4.17535139755122945763580609663414647067443411178e-0008L,
        P6 = -1.05683795988668526689182102605260986731620026832e-0009L,
        P7 = +2.67544168821852702827123344217198187229611470514e-0011L,
/* rational approximation coeffs for [-(ln2)/64,(ln2)/64] */
        T1 = +1.66666666666666666666666666660876387437e-1L,
        T2 = -2.77777777777777777777770781209317347875 6e-3L,
        T3 = +6.61375661375661348207428093287422120 2424e-5L,
        T4 = -1.65343915339213995416960982274223585112 0e-6L,
```

```
128         T5 = +4.17531485176953975138785211661097379605 3e-8L;
129
130 long double
131 expm1l(long double x) {
132         int hx, ix, j, k, m;
133         long double t, r, s, w;
134
135         hx = ((int *) &x)[HIXWORD];
136         ix = hx & ~0x80000000;
137         if (ix >= 0x7fff0000) {
138                 if (x != x)
139                         return (x + x); /* NaN */
140                 if (x < zero)
141                         return (-one);  /* -inf */
142                 return (x);     /* +inf */
143         }
144         if (ix < 0x3fff4000) {  /* |x| < 1.25 */
145                 if (ix < 0x3ffb0000) {  /* |x| < 0.0625 */
146                         if (ix < 0x3f8d0000) {
147                                 if ((int) x == 0)
148                                         return (x);     /* |x|<2^-114 */
149                         }
150                         t = x * x;
151                         r = (x - t * (P1 + t * (P2 + t * (P3 + t * (P4 + t *
152                                 (P5 + t * (P6 + t * P7)))))));
153                         return (x + (x * r) / (two - r));
154                 }
155                 /* compute i = [64*x] */
156                 m = 0x4009 - (ix >> 16);
157                 j = ((ix & 0x0000ffff) | 0x10000) >> m; /* j=4,...,67 */
158                 if (hx < 0)
159                         j += 82;                        /* negative */
160                 s = x - _TBL_expm1lx[j];
161                 t = s * s;
162                 r = s - t * (T1 + t * (T2 + t * (T3 + t * (T4 + t * T5))));
163                 r = (s + s) / (two - r);
164                 w = _TBL_expm1l[j];
165                 return (w + (w + one) * r);
166         }
167         if (hx > 0) {
168                 if (x > ovflthreshold)
169                         return (huge * huge);
170                 k = (int) (invln2_32 * (x + ln2_64));
171         } else {
172                 if (x < -80.0)
173                         return (tiny - x / x);
174                 k = (int) (invln2_32 * (x - ln2_64));
175         }
176         j = k & 0x1f;
177         m = k >> 5;
178         t = (long double) k;
179         x = (x - t * ln2_32hi) - t * ln2_32lo;
180         t = x * x;
181         r = (x - t * (T1 + t * (T2 + t * (T3 + t * (T4 + t * T5))))) - two;
182         x = _TBL_expl_hi[j] - ((_TBL_expl_hi[j] * (x + x)) / r -
183                 _TBL_expl_lo[j]);
184         return (scalbnl(x, m) - one);
185 }
```

****
1142 Sat May 10 12:09:05 2014
new/usr/src/lib/libm/common/Q/fabsl.c
patch01 - 693 import Sun Devpro Math Library
****

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#pragma weak fabsl = __fabsl

#include "libm.h"

long double
fabsl(long double x) {
        int *px = (int *) &x;

        px[0] &= 0x7fffffff;
        return (x);
}
```

```
**********************************************************
    1473 Sat May 10 12:09:05 2014
new/usr/src/lib/libm/common/Q/finitel.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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#if defined(ELFOBJ)
#pragma weak finitel = __finitel
#endif

#include "libm.h"

#if defined(__sparc)
int
finitel(long double x) {
        int *px = (int *) &x;
        return ((px[0] & ~0x80000000) < 0x7fff0000);
}
#elif defined(__x86)
int
finitel(long double x) {
        int *px = (int *) &x, t = px[2] & 0x7fff;
#if defined(HANDLE_UNSUPPORTED)
        return (t != 0x7fff && ((px[1] & 0x80000000) != 0 || t == 0));
#else
        return (t != 0x7fff);
#endif
}
#endif  /* defined(__sparc) || defined(__x86) */
```

```
**********************************************************
    1849 Sat May 10 12:09:05 2014
new/usr/src/lib/libm/common/Q/floorl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
 * ceill(x)     return the biggest integral value below x
 * floorl(x)    return the least integral value above x
 *
 * NOTE: aintl(x), anintl(x), ceill(x), floorl(x), and rintl(x) return result
 * with the same sign as x's,  including 0.0.
 */

#pragma weak ceill = __ceill
#pragma weak floorl = __floorl

#include "libm.h"
#include "longdouble.h"

static const long double qone = 1.0L;

long double
ceill(long double x) {
        long double t;

        if (!finitel(x))
                return (x + x);
        t = rintl(x);
        if (t >= x)                     /* already ceil(x) */
                return (t);
        else                            /* t < x case: return t+1  */
                return (copysignl(t + qone, x));
}

long double
floorl(long double x) {
        long double t;
```



```
        if (!finitel(x))
                return (x + x);
        t = rintl(x);
        if (t <= x)
                return (t);             /* already floor(x) */
        else                            /* x < t case: return t-1  */
            return (copysignl(t - qone, x));
}
```

****
5771 Sat May 10 12:09:06 2014
new/usr/src/lib/libm/common/Q/fmodl.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#pragma weak fmodl = __fmodl

#include "libm.h"

static const int
        is = -0x7fffffff - 1,
        im = 0x0000ffff,
        iu = 0x00010000;

static const long double
        zero = 0.0L,
        one = 1.0L;

#ifdef __LITTLE_ENDIAN
#define __H0(x) *(3 + (int *) &x)
#define __H1(x) *(2 + (int *) &x)
#define __H2(x) *(1 + (int *) &x)
#define __H3(x) *(0 + (int *) &x)
#else
#define __H0(x) *(0 + (int *) &x)
#define __H1(x) *(1 + (int *) &x)
#define __H2(x) *(2 + (int *) &x)
#define __H3(x) *(3 + (int *) &x)
#endif

long double
fmodl(long double x, long double y) {
        long double a, b;
        int n, ix, iy, k, sx;
        int hx;
        int x0, y0, z0, carry;
        unsigned x1, x2, x3, y1, y2, y3, z1, z2, z3;
```



```
        hx = __H0(x);
        x1 = __H1(x);
        x2 = __H2(x);
        x3 = __H3(x);
        y0 = __H0(y);
        y1 = __H1(y);
        y2 = __H2(y);
        y3 = __H3(y);

        sx = hx & 0x80000000;
        x0 = hx ^ sx;
        y0 &= 0x7fffffff;

        /* purge off exception values */
        if (x0 >= 0x7fff0000 || /* !finitel(x) */
            (y0 > 0x7fff0000) || (y0 == 0x7fff0000 && ((y1 | y2 | y3) != 0)) ||
            (y0 | y1 | y2 | y3) == 0)   /* isnanl(y) || y = 0 */
                return ((x * y) / (x * y));
        a = fabsl(x);
        b = fabsl(y);
        if (a <= b) {
                if (a < b)
                        return (x);
                else
                        return (zero * x);
        }
        /* determine ix = ilogbl(x) */
        if (x0 < iu) {          /* subnormal x */
                ix = -16382;
                while (x0 == 0) {
                        ix -= 16;
                        x0 = x1 >> 16;
                        x1 = (x1 << 16) | (x2 >> 16);
                        x2 = (x2 << 16) | (x3 >> 16);
                        x3 = (x3 << 16);
                }
                while (x0 < iu) {
                        ix -= 1;
                        x0 = (x0 << 1) | (x1 >> 31);
                        x1 = (x1 << 1) | (x2 >> 31);
                        x2 = (x2 << 1) | (x3 >> 31);
                        x3 <<= 1;
                }
        } else {
                ix = (x0 >> 16) - 16383;
                x0 = iu | (x0 & im);
        }

        /* determine iy = ilogbl(y) */
        if (y0 < iu) {          /* subnormal y */
                iy = -16382;
                while (y0 == 0) {
                        iy -= 16;
                        y0 = y1 >> 16;
                        y1 = (y1 << 16) | (y2 >> 16);
                        y2 = (y2 << 16) | (y3 >> 16);
                        y3 = (y3 << 16);
                }
                while (y0 < iu) {
                        iy -= 1;
                        y0 = (y0 << 1) | (y1 >> 31);
                        y1 = (y1 << 1) | (y2 >> 31);
                        y2 = (y2 << 1) | (y3 >> 31);
                        y3 <<= 1;
                }
```

```
128         } else {
129                 iy = (y0 >> 16) - 16383;
130                 y0 = iu | (y0 & im);
131         }

133         /* fix point fmod */
134         n = ix - iy;
135         while (n--) {
136                 while (x0 == 0 && n >= 16) {
137                         n -= 16;
138                         x0 = x1 >> 16;
139                         x1 = (x1 << 16) | (x2 >> 16);
140                         x2 = (x2 << 16) | (x3 >> 16);
141                         x3 = (x3 << 16);
142                 }
143                 while (x0 < iu && n >= 1) {
144                         n -= 1;
145                         x0 = (x0 << 1) | (x1 >> 31);
146                         x1 = (x1 << 1) | (x2 >> 31);
147                         x2 = (x2 << 1) | (x3 >> 31);
148                         x3 = (x3 << 1);
149                 }
150                 carry = 0;
151                 z3 = x3 - y3;
152                 carry = (z3 > x3);
153                 if (carry == 0) {
154                         z2 = x2 - y2;
155                         carry = (z2 > x2);
156                 } else {
157                         z2 = x2 - y2 - 1;
158                         carry = (z2 >= x2);
159                 }
160                 if (carry == 0) {
161                         z1 = x1 - y1;
162                         carry = (z1 > x1);
163                 } else {
164                         z1 = x1 - y1 - 1;
165                         carry = (z1 >= x1);
166                 }
167                 z0 = x0 - y0 - carry;
168                 if (z0 < 0) {   /* double x */
169                         x0 = x0 + x0 + ((x1 & is) != 0);
170                         x1 = x1 + x1 + ((x2 & is) != 0);
171                         x2 = x2 + x2 + ((x3 & is) != 0);
172                         x3 = x3 + x3;
173                 } else {
174                         if (z0 == 0) {
175                                 if ((z1 | z2 | z3) == 0) {      /* 0: done */
176                                         __H0(a) = hx & is;
177                                         __H1(a) = __H2(a) = __H3(a) = 0;
178                                         return (a);
179                                 }
180                         }
181                         /* x = z << 1 */
182                         z0 = z0 + z0 + ((z1 & is) != 0);
183                         z1 = z1 + z1 + ((z2 & is) != 0);
184                         z2 = z2 + z2 + ((z3 & is) != 0);
185                         z3 = z3 + z3;
186                         x0 = z0;
187                         x1 = z1;
188                         x2 = z2;
189                         x3 = z3;
190                 }
191         }

193         carry = 0;
```



```
194         z3 = x3 - y3;
195         carry = (z3 > x3);
196         if (carry == 0) {
197                 z2 = x2 - y2;
198                 carry = (z2 > x2);
199         } else {
200                 z2 = x2 - y2 - 1;
201                 carry = (z2 >= x2);
202         }
203         if (carry == 0) {
204                 z1 = x1 - y1;
205                 carry = (z1 > x1);
206         } else {
207                 z1 = x1 - y1 - 1;
208                 carry = (z1 >= x1);
209         }
210         z0 = x0 - y0 - carry;
211         if (z0 >= 0) {
212                 x0 = z0;
213                 x1 = z1;
214                 x2 = z2;
215                 x3 = z3;
216         }
217         /* convert back to floating value and restore the sign */
218         if ((x0 | x1 | x2 | x3) == 0) {
219                 __H0(a) = hx & is;
220                 __H1(a) = __H2(a) = __H3(a) = 0;
221                 return (a);
222         }
223         while (x0 < iu) {
224                 if (x0 == 0) {
225                         iy -= 16;
226                         x0 = x1 >> 16;
227                         x1 = (x1 << 16) | (x2 >> 16);
228                         x2 = (x2 << 16) | (x3 >> 16);
229                         x3 = (x3 << 16);
230                 } else {
231                         x0 = x0 + x0 + ((x1 & is) != 0);
232                         x1 = x1 + x1 + ((x2 & is) != 0);
233                         x2 = x2 + x2 + ((x3 & is) != 0);
234                         x3 = x3 + x3;
235                         iy -= 1;
236                 }
237         }

239         /* normalize output */
240         if (iy >= -16382) {
241                 __H0(a) = sx | (x0 - iu) | ((iy + 16383) << 16);
242                 __H1(a) = x1;
243                 __H2(a) = x2;
244                 __H3(a) = x3;
245         } else {                /* subnormal output */
246                 n = -16382 - iy;
247                 k = n & 31;
248                 if (k != 0) {
249                         if (k <= 16) {
250                                 x3 = (x2 << (32 - k)) | (x3 >> k);
251                                 x2 = (x1 << (32 - k)) | (x2 >> k);
252                                 x1 = (x0 << (32 - k)) | (x1 >> k);
253                                 x0 >>= k;
254                         } else {
255                                 x3 = (x2 << (32 - k)) | (x3 >> k);
256                                 x2 = (x1 << (32 - k)) | (x2 >> k);
257                                 x1 = (x0 << (32 - k)) | (x1 >> k);
258                                 x0 = 0;
259                         }
```

```
260                 }
261                 while (n >= 32) {
262                         n -= 32;
263                         x3 = x2;
264                         x2 = x1;
265                         x1 = x0;
266                         x0 = 0;
267                 }
268                 __H0(a) = x0 | sx;
269                 __H1(a) = x1;
270                 __H2(a) = x2;
271                 __H3(a) = x3;
272                 a *= one;
273         }
274         return (a);
275 }
```

```
**********************************************************
    1321 Sat May 10 12:09:06 2014
new/usr/src/lib/libm/common/Q/gammal.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak gammal = __gammal

/*
 * long double gammal(long double x);
 */

#include "libm.h"
#include "longdouble.h"

extern int signgam;
extern int signgaml;

long double
gammal(long double x) {
        long double y = __k_lgammal(x, &signgaml);

        signgam = signgaml;     /* SUSv3 requires the setting of signgam */
        return (y);
}
```

```
**********************************************************
    1233 Sat May 10 12:09:06 2014
new/usr/src/lib/libm/common/Q/gammal_r.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

/*
 * long double gammal_r(long double x, int *signgamlp);
 */

#pragma weak gammal_r = __gammal_r

#include "libm.h"
#include "longdouble.h"

long double
gammal_r(long double x, int *signgamlp) {
        return (__k_lgammal(x, signgamlp));
}
```

```
**********************************************************
    3902 Sat May 10 12:09:06 2014
new/usr/src/lib/libm/common/Q/hypotl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak hypotl = __hypotl

/*
 * long double hypotl(long double x, long double y);
 * Method :
 *      If z=x*x+y*y has error less than sqrt(2)/2 ulp than sqrt(z) has
 *      error less than 1 ulp.
 *      So, compute sqrt(x*x+y*y) with some care as follows:
 *      Assume x>y>0;
 *      1. save and set rounding to round-to-nearest
 *      2. if x > 2y  use
 *              x1*x1+(y*y+(x2*(x+x2))) for x*x+y*y
 *      where x1 = x with lower 64 bits cleared, x2 = x-x1; else
 *      3. if x <= 2y use
 *              t1*y1+((x-y)*(x-y)+(t1*y2+t2*y))
 *      where t1 = 2x with lower 64 bits cleared, t2 = 2x-t1, y1= y with
 *      lower 64 bits chopped, y2 = y-y1.
 *
 *      NOTE: DO NOT remove parenthsis!
 *
 * Special cases:
 *      hypot(x,y) is INF if x or y is +INF or -INF; else
 *      hypot(x,y) is NAN if x or y is NAN.
 *
 * Accuracy:
 *      hypot(x,y) returns sqrt(x^2+y^2) with error less than 1 ulps (units
 *      in the last place)
 */

#include "libm.h"
#include "longdouble.h"
```



```
extern enum fp_direction_type __swapRD(enum fp_direction_type);

static const long double zero = 0.0L, one = 1.0L;

long double
hypotl(long double x, long double y) {
        int n0, n1, n2, n3;
        long double t1, t2, y1, y2, w;
        int *px = (int *) &x, *py = (int *) &y;
        int *pt1 = (int *) &t1, *py1 = (int *) &y1;
        enum fp_direction_type rd;
        int j, k, nx, ny, nz;

        if ((*(int *) &one) != 0) {     /* determine word ordering */
                n0 = 0;
                n1 = 1;
                n2 = 2;
                n3 = 3;
        } else {
                n0 = 3;
                n1 = 2;
                n2 = 1;
                n3 = 0;
        }

        px[n0] &= 0x7fffffff;   /* clear sign bit of x and y */
        py[n0] &= 0x7fffffff;
        k = 0x7fff0000;
        nx = px[n0] & k;        /* exponent of x and y */
        ny = py[n0] & k;
        if (ny > nx) {
                w = x;
                x = y;
                y = w;
                nz = ny;
                ny = nx;
                nx = nz;
        }                       /* force x > y */
        if ((nx - ny) >= 0x00730000)
                return (x + y); /* x/y >= 2**116 */
        if (nx < 0x5ff30000 && ny > 0x205b0000) {       /* medium x,y */
                /* save and set RD to Rounding to nearest */
                rd = __swapRD(fp_nearest);
                w = x - y;
                if (w > y) {
                        pt1[n0] = px[n0];
                        pt1[n1] = px[n1];
                        pt1[n2] = pt1[n3] = 0;
                        t2 = x - t1;
                        x = sqrtl(t1 * t1 - (y * (-y) - t2 * (x + t1)));
                } else {
                        x = x + x;
                        py1[n0] = py[n0];
                        py1[n1] = py[n1];
                        py1[n2] = py1[n3] = 0;
                        y2 = y - y1;
                        pt1[n0] = px[n0];
                        pt1[n1] = px[n1];
                        pt1[n2] = pt1[n3] = 0;
                        t2 = x - t1;
                        x = sqrtl(t1 * y1 - (w * (-w) - (t2 * y1 + y2 * x)));
                }
                if (rd != fp_nearest)
                        (void) __swapRD(rd);    /* restore rounding mode */
                return (x);
        } else {
```

```
128                 if (nx == k || ny == k) {       /* x or y is INF or NaN */
129                         if (isinfl(x))
130                                 t2 = x;
131                         else if (isinfl(y))
132                                 t2 = y;
133                         else
134                                 t2 = x + y;     /* invalid if x or y is sNaN */
135                         return (t2);
136                 }
137                 if (ny == 0) {
138                         if (y == zero || x == zero)
139                                 return (x + y);
140                         t1 = scalbnl(one, 16381);
141                         x *= t1;
142                         y *= t1;
143                         return (scalbnl(one, -16381) * hypotl(x, y));
144                 }
145                 j = nx - 0x3fff0000;
146                 px[n0] -= j;
147                 py[n0] -= j;
148                 pt1[n0] = nx;
149                 pt1[n1] = pt1[n2] = pt1[n3] = 0;
150                 return (t1 * hypotl(x, y));
151         }
152 }
```

```
**********************************************************
    2759 Sat May 10 12:09:06 2014
new/usr/src/lib/libm/common/Q/ieee_funcl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak isinfl = __isinfl
#pragma weak isnormall = __isnormall
#pragma weak issubnormall = __issubnormall
#pragma weak iszerol = __iszerol
#pragma weak signbitl = __signbitl
#endif

#include "libm.h"

#if defined(__sparc)
int
isinfl(long double x) {
        int *px = (int *) &x;
        return ((px[0] & ~0x80000000) == 0x7fff0000 && px[1] == 0 &&
                px[2] == 0 && px[3] == 0);
}

int
isnormall(long double x) {
        int *px = (int *) &x;
        return ((unsigned) ((px[0] & 0x7fff0000) - 0x10000) < 0x7ffe0000);
}

int
issubnormall(long double x) {
        int *px = (int *) &x;
        px[0] &= ~0x80000000;
        return (px[0] < 0x00010000 && (px[0] | px[1] | px[2] | px[3]) != 0);
}
```



```
int
iszerol(long double x) {
        int *px = (int *) &x;
        return (((px[0] & ~0x80000000) | px[1] | px[2] | px[3]) == 0);
}

int
signbitl(long double x) {
        unsigned *px = (unsigned *) &x;
        return (px[0] >> 31);
}
#elif defined(__x86)
int
isinfl(long double x) {
        int *px = (int *) &x;
#if defined(HANDLE_UNSUPPORTED)
        return ((px[2] & 0x7fff) == 0x7fff &&
                ((px[1] ^ 0x80000000) | px[0]) == 0);
#else
        return ((px[2] & 0x7fff) == 0x7fff &&
                ((px[1] & ~0x80000000) | px[0]) == 0);
#endif
}

int
isnormall(long double x) {
        int *px = (int *) &x;
#if defined(HANDLE_UNSUPPORTED)
        return ((unsigned) ((px[2] & 0x7fff) - 1) < 0x7ffe &&
                (px[1] & 0x80000000) != 0);
#else
        return ((unsigned) ((px[2] & 0x7fff) - 1) < 0x7ffe);
#endif
}

int
issubnormall(long double x) {
        int *px = (int *) &x;
        return ((px[2] & 0x7fff) == 0 && (px[0] | px[1]) != 0);
}

int
iszerol(long double x) {
        int *px = (int *) &x;
        return (((px[2] & 0x7fff) | px[0] | px[1]) == 0);
}

int
signbitl(long double x) {
        unsigned *px = (unsigned *) &x;
        return ((px[2] >> 15) & 1);
}
#endif  /* defined(__sparc) || defined(__x86) */
```

```
**********************************************************
    2479 Sat May 10 12:09:06 2014
new/usr/src/lib/libm/common/Q/ilogbl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

#if defined(ELFOBJ)
#pragma weak ilogbl = __ilogbl
#endif

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */

#if defined(__sparc)
#define ISNORMALL(k, x) (k != 0x7fff)                   /* assuming k != 0 */
#define X86PDNRM(k, x)
#define XSCALE_OFFSET   0x406f                          /* 0x3fff + 112 */
static const long double xscale = 5192296858534827628530496329220096.0L;
                                                                /* 2^112 */
#elif defined(__x86)
/*
 * if pseudo-denormal, replace by the equivalent normal
 */
#define X86PDNRM(k, x)  if (k == 0 && (((int *) &x)[1] & 0x80000000) != 0) \
                                ((int *) &x)[2] |= k = 1
#if defined(HANDLE_UNSUPPORTED)                         /* assuming k != 0 */
#define ISNORMALL(k, x) (k != 0x7fff && (((int *) &x)[1] & 0x80000000) != 0)
#else
#define ISNORMALL(k, x) (k != 0x7fff)
#endif
#define XSCALE_OFFSET   0x403e                          /* 0x3fff + 63 */
static const long double xscale = 9223372036854775808.0L;       /* 2^63 */
#endif

static int
raise_invalid(int v) {  /* SUSv3 requires ilogbl(0,+/-Inf,NaN) raise invalid */
#ifndef lint
```



```
        if ((__xpg6 & _C99SUSv3_ilogb_0InfNaN_raises_invalid) != 0) {
                static const double zero = 0.0;
                volatile double dummy;

                dummy = zero / zero;
        }
#endif
        return (v);
}

int
ilogbl(long double x) {
        int k = XBIASED_EXP(x);

        X86PDNRM(k, x);
        if (k == 0) {
                if (ISZEROL(x))
                        return (raise_invalid(0x80000001));
                else {
                        x *= xscale;            /* scale up by 2^112 or 2^63 */
                        return (XBIASED_EXP(x) - XSCALE_OFFSET);
                }
        } else if (ISNORMALL(k, x))
                return (k - 0x3fff);
        else
                return (raise_invalid(0x7fffffff));
}
```

```
**********************************************************
    1608 Sat May 10 12:09:06 2014
new/usr/src/lib/libm/common/Q/isnanl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak isnanl = __isnanl
#endif

#include "libm.h"

#if defined(__sparc)
int
isnanl(long double x) {
        int *px = (int *) &x;
        return ((px[0] & ~0x80000000) >= 0x7fff0000 &&
                ((px[0] & ~0xffff0000) | px[1] | px[2] | px[3]) != 0);
}
#elif defined(__x86)
int
isnanl(long double x) {
        int *px = (int *) &x, t = px[2] & 0x7fff;
#if defined(HANDLE_UNSUPPORTED)
        return (t == 0x7fff && ((px[1] & ~0x80000000) | px[0]) != 0 ||
                t != 0 && (px[1] & 0x80000000) == 0);
#else
        return (t == 0x7fff && ((px[1] & ~0x80000000) | px[0]) != 0);
#endif
}
#endif  /* defined(__sparc) || defined(__x86) */
```

```
**********************************************************
   27858 Sat May 10 12:09:06 2014
new/usr/src/lib/libm/common/Q/j0l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
 * Floating point Bessel's function of the first and second kinds
 * of order zero: j0(x),y0(x);
 *
 * Special cases:
 *      y0(0)=y1(0)=yn(n,0) = -inf with division by zero signal;
 *      y0(-ve)=y1(-ve)=yn(n,-ve) are NaN with invalid signal.
 */

#pragma weak j0l = __j0l
#pragma weak y0l = __y0l

#include "libm.h"
#include "longdouble.h"

#define GENERIC long double
static const GENERIC
zero    = 0.0L,
small   = 1.0e-9L,
tiny    = 1.0e-38L,
one     = 1.0L,
five    = 5.0L,
eight   = 8.0L,
invsqrtpi= 5.64189583547756286948079451560772585844le-0001L,
tpi     = 0.63661977236758134307553505349005744 8L;

static GENERIC pzero(GENERIC);
static GENERIC qzero(GENERIC);

static GENERIC r0[7] = {
  -2.4999999999999999999999999999999998934492e-0001L,
   1.2726579273600497863276184511337637148 80e-0002L,
```



```
  -2.6944997637129632769006366934006596008 98e-0004L,
   2.7248774750589775769032340709196164478 83e-0006L,
  -1.4326171032143302369674774953930763202 81e-0008L,
   3.8232488040800791687066835405137922244 71e-0011L,
  -4.1831742775679836473375685042863136650 65e-0014L,
};
static GENERIC s0[7] = {
   1.0e0L,
   1.1593682905598008546895261954628846663 95e-0002L,
   6.6293975973949733830097438761699467725 59e-0005L,
   2.4267799813940544063054311425017350943 40e-0007L,
   6.0976634912485110690944004696354497498 83e-0010L,
   1.0170191333409292202387474132160522240 36e-0012L,
   9.0125931793061975795183745819693712784 81e-0016L,
};

GENERIC
j0l(x) GENERIC x;{
        GENERIC z, s,c,ss,cc,r,u,v;
        int i;

        if(isnanl(x)) return x+x;
        x = fabsl(x);
        if(x > 1.28L){
                if(!finitel(x)) return zero;
                s = sinl(x);
                c = cosl(x);
        /*
         * j0(x) = sqrt(2/(pi*x))*(p0(x)*cos(x0)-q0(x)*sin(x0))
         * where x0 = x-pi/4
         *      Better formula:
         *              cos(x0) = cos(x)cos(pi/4)+sin(x)sin(pi/4)
         *                      = 1/sqrt(2) * (cos(x) + sin(x))
         *              sin(x0) = sin(x)cos(pi/4)-cos(x)sin(pi/4)
         *                      = 1/sqrt(2) * (sin(x) - cos(x))
         * To avoid cancellation, use
         *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
         * to compute the worse one.
         */
                if(x>1.0e2450L) {       /* x+x may overflow */
                        ss = s-c;
                        cc = s+c;
                } else if(signbitl(s)!=signbitl(c)) {
                        ss = s - c;
                        cc = -cosl(x+x)/ss;
                } else {
                        cc = s + c;
                        ss = -cosl(x+x)/cc;
                }
        /*
         * j0(x) = 1/sqrt(pi) * (P(0,x)*cc - Q(0,x)*ss) / sqrt(x)
         * y0(x) = 1/sqrt(pi) * (P(0,x)*ss + Q(0,x)*cc) / sqrt(x)
         */
                if(x>1.0e120L) return (invsqrtpi*cc)/sqrtl(x);
                u = pzero(x); v = qzero(x);
                return invsqrtpi*(u*cc-v*ss)/sqrtl(x);
        }
        if(x<=small) {
            if(x<=tiny) return one-x;
            else return one-x*x*0.25L;
        }
        z = x*x;
        r = r0[6]; s = s0[6];
        for(i=5;i>=0;i--) {
            r = r*z + r0[i];
            s = s*z + s0[i];
```

```
128         }
129         return(one+z*(r/s));
130 }

132 static const GENERIC u0[8] = {
133   -7.38042951086872252743439279484830163122 0e-0002L,
134    1.76685555962594079185753694930198181651 3e-0001L,
135   -1.38647072270104792323555325124016283940 8e-0002L,
136    3.52014924272481157863697081163122486261 5e-0004L,
137   -3.97859966324379004985364227562495187002 5e-0006L,
138    2.22880115263957224547222556806915479763 e-0008L,
139   -6.12124676429878501865859717949883731617 7e-0011L,
140    6.67710362972267883347596581052558739659 6e-0014L,
141 };
142 static const GENERIC v0[8] = {
143    1.0e0L,
144    1.24716441653911131157167676612776712797 0e-0002L,
145    7.82914474963979150005290028148936744357 6e-0005L,
146    3.24712654042224533051121832101336033660 6e-0007L,
147    9.75051672478949967856706257254956844786 9e-0010L,
148    2.15671322317359121225054339025845809877 6e-0012L,
149    3.32216956159789000423148243123645275262 4e-0015L,
150    2.82121329531400092425222648630572680509 3e-0018L,
151 };

153 GENERIC
154 y0l(x) GENERIC x;{
155         GENERIC z, s,c,ss,cc,u,v;
156         int i;
157         volatile GENERIC d;

159         if(isnanl(x)) return x+x;
160         if(x <= zero){
161                 if(x==zero)
162                     d= -one/(x-x);
163                 else
164                     d = zero/(x-x);
165         }
166 #ifdef lint
167         d = d;
168 #endif
169         if(x > 1.28L){
170                 if(!finitel(x)) return zero;
171                 s = sinl(x);
172                 c = cosl(x);
173         /*
174          * j0(x) = sqrt(2/(pi*x))*(p0(x)*cos(x0)-q0(x)*sin(x0))
175          * where x0 = x-pi/4
176          *      Better formula:
177          *              cos(x0) = cos(x)cos(pi/4)+sin(x)sin(pi/4)
178          *                      = 1/sqrt(2) * (cos(x) + sin(x))
179          *              sin(x0) = sin(x)cos(pi/4)-cos(x)sin(pi/4)
180          *                      = 1/sqrt(2) * (sin(x) - cos(x))
181          * To avoid cancellation, use
182          *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
183          * to compute the worse one.
184          */
185                 if(x>1.0e2450L) {       /* x+x may overflow */
186                         ss = s-c;
187                         cc = s+c;
188                 } else if(signbitl(s)!=signbitl(c)) {
189                         ss = s - c;
190                         cc = -cosl(x+x)/ss;
191                 } else {
192                         cc = s + c;
193                         ss = -cosl(x+x)/cc;
```



```
194                 }
195         /*
196          * j0(x) = 1/sqrt(pi*x) * (P(0,x)*cc - Q(0,x)*ss)
197          * y0(x) = 1/sqrt(pi*x) * (P(0,x)*ss + Q(0,x)*cc)
198          */
199                 if(x>1.0e120L) return (invsqrtpi*ss)/sqrtl(x);
200                 return invsqrtpi*(pzero(x)*ss+qzero(x)*cc)/sqrtl(x);

202         }
203         if(x<=tiny) {
204             return(u0[0] + tpi*logl(x));
205         }
206         z = x*x;
207         u = u0[7]; v = v0[7];
208         for(i=6;i>=0;i--){
209             u = u*z + u0[i];
210             v = v*z + v0[i];
211         }
212         return(u/v + tpi*(j0l(x)*logl(x)));
213 }

215 static const GENERIC pr0[12] = {        /* [16 -- inf] */
216    9.99999999999999999999999999999999997515e-0001L,
217    1.06598161537727337642536582396755059835 8e+0003L,
218    4.39099120092758897830637471898424071913 0e+0005L,
219    9.07208621860798671184706940733932136310 3e+0007L,
220    1.02255288617737536740840850104646167152 8e+0010L,
221    6.42076691224365824157063585408959726903 1e+0011L,
222    2.20645172512693391359108021108124226690 8e+0013L,
223    3.92836959681689507736370547874334629836 8e+0014L,
224    3.25815992887412459728670111972142876596 e+0015L,
225    1.02571580813418897886067913014068510134 8e+0016L,
226    7.53717087479572125579600168702403128068 5e+0015L,
227   -1.57941390145015733230774558600420768779 6e+0014L,
228 };
229 static const GENERIC ps0[11] = {
230    1.0e0L,
231    1.06605192787727337642536582396755051268 7e+0003L,
232    4.39173964716838159239917380432926635303 8e+0005L,
233    9.07516226180134367180565829412388886788 4e+0007L,
234    1.02318611851990475181958191207598599505 8e+0010L,
235    6.42786186041422374634051537651273027506 1e+0011L,
236    2.21086150323782358973548130362799340623 5e+0013L,
237    3.94324733578429290591595684090181817798 9e+0014L,
238    3.28372097677754514215020011064727000448 1e+0015L,
239    1.04534691881275404890364564153872898675 9e+0016L,
240    8.04345546806561890075059958429119368046 3e+0015L,
241 };
242 static const GENERIC pr1[12] = {        /* [8 -- 16] */
243    9.99999999999999999999978442270110868361 8e-0001L,
244    6.79609853294833420775548869277790706289 4e+0002L,
245    1.84003611260572216882453075879716983604 2e+0005L,
246    2.59849048319191663726489434063584759812 2e+0007L,
247    2.10577486324270702552573024947205457852 3e+0009L,
248    1.01582204423054242666631499779694497955 9e+0011L,
249    2.93155745700811043676407769994418907187 5e+0012L,
250    4.96288512112545763365525922417932280882 4e+0013L,
251    4.70542405514822326915543059856351566279 e+0014L,
252    2.29443985491074722915205608091042700111 0e+0015L,
253    4.90553184313748669150095001932247545862 9e+0015L,
254    3.18754316971033921879344254284573599456 5e+0015L,
255 };
256 static const GENERIC ps1[14] = {
257    1.0e0L,
258    6.79680165794833420775457157606675818028 8e+0002L,
259    1.84051289120130056732542105982667636644 7e+0005L,
```

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   2.59977702831291897530625216712769507522 1e+0007L,
   2.10758257271047636846811284634244892537e+0009L,
   1.01727579469415610897578276388979940348e+0011L,
   2.93848764519246384542805975545476231601 1e+0012L,
   4.98251216473555705452104291618231792446 6e+0013L,
   4.73763990015370327479267746826456436143 7e+0014L,
   2.32339871912374274352424952827509710064 6e+0015L,
   5.03341910706921057786890979789698441939 1e+0015L,
   3.40903610593106860960131707675980471605 9e+0015L,
   7.50565536435267973758574514775352166216 6e+0013L,
  -9.97683715398368825078019824829710911831 3e+0012L,
};
static const GENERIC pr2[12] = {        /* [5 -- 8 ] */
   9.99999999999999993785723678927736632022 0e-0001L,
   3.69284876526864957165160242037635884921 4e+0002L,
   5.37302206753547657692671590005776098541 0e+0004L,
   4.03873889119131496997150403505721943072 5e+0006L,
   1.72828570630694052339738556665976264699 9e+0008L,
   4.37540081964588991115868873720605478853 4e+0009L,
   6.59895041820491240837559121778208856707 6e+0010L,
   5.82718203918323849248027540152007279378 3e+0011L,
   2.88422264291349239088757241499949097584 4e+0012L,
   7.37327887379776772193283783062868863277 5e+0012L,
   8.33829545756897376120507796439796923048 9e+0012L,
   2.91138318346728834577230881720980692214 3e+0012L,
};
static const GENERIC ps2[14] = {
   1.0e0L,
   3.69355189026864947728889626717199321310 2e+0002L,
   5.37560788099836150247471513382806851429 7e+0004L,
   4.04247776402410824974499886257278636732 8e+0006L,
   1.73106983873701695668583958867013293951 3e+0008L,
   4.38714767404989877873822658935491417728 e+0009L,
   6.62805865962065376534955694056771525816 5e+0010L,
   5.86965990416417774047168585636732216066 4e+0011L,
   2.91983944562281701705897755963896943638 3e+0012L,
   7.53531489769667140262820371861230925390 7e+0012L,
   8.69635556145293377577330985974861065893 5e+0012L,
   3.21615510314153722117360155769708321625 7e+0012L,
   4.75685708106894224824688015921378908636 3e+0010L,
  -3.49635661966660803223107486648147282406 7e+0009L,
};
static const GENERIC pr3[13] = {        /* [3.5 -- 5 ] */
   9.99999999999991669310728561239819658824 7e-0001L,
   2.26397592128291772119442532048497433694 5e+0002L,
   1.99435838674424584888949276278148419996 6e+0004L,
   8.98006745843054224355996249383166132316 8e+0005L,
   2.28221378752137266370556775642008755350 8e+0007L,
   3.40978437488906361825028866990837513592 3e+0008L,
   3.02438085740144858925434351758981171110 8e+0009L,
   1.57111036804674024689507172144308228637 9e+0010L,
   4.60318702024360463215368530046316059376 8e+0010L,
   7.08719645340971271944954928066405879340 3e+0010L,
   5.04619602177634635680368740964423906504 1e+0010L,
   1.28775843908016576570915427661885479933 2e+0010L,
   5.90067977341502343378784665809681359078 4e+0008L,
};
static const GENERIC ps3[13] = {
   1.0e0L,
   2.26467904628285506132860461923177474711 6e+0002L,
   1.99593952398894455375565325538981210344 8e+0004L,
   8.99385314470634872703838996749018323682 0e+0005L,
   2.28832609963458884390698998370479546877 3e+0007L,
   3.42496710025524088516924095680479011828 2e+0008L,
   3.04631179797246399136802375964002891001 6e+0009L,
   1.58961496193282681279022247970079722400 3e+0010L,
```



```
   4.69240662452774481649708913932507393992 7e+0010L,
   7.32048649590200891286646284907310832394 8e+0010L,
   5.34594597282897828993530959774298136099 4e+0010L,
   1.44403309191042375412130991509224717100 8e+0010L,
   7.98771468511531466837895727382483361052 5e+0008L,
};
static const GENERIC pr4[13] = {        /* [2.5 , 3.5] */
   9.99999999986736677961118722747757712260 e-0001L,
   1.45382498070380055903787312356837884566 3e+0002L,
   8.09732721643068228826761044700650866103 2e+0003L,
   2.27384725203826437023116968638019266213 5e+0005L,
   3.56105672804621111135475999897698544962 2e+0006L,
   3.24493358880009637843462702936980378599 e+0007L,
   1.74011239286071795037621003890847679258 8e+0008L,
   5.42617018745589328519787856388157926952 4e+0008L,
   9.49010748645436232100437733602052628137 1e+0008L,
   8.68887243942847004980171412107000531380 6e+0008L,
   3.67331585316643722281191065690012321551 5e+0008L,
   5.57777047035930330516487744633969327023 9e+0007L,
   1.54043864203168964130819788018129186571 4e+0006L,
};
static const GENERIC ps4[13] = {        /* [2.5 , 3.5] */
   1.0e0L,
   1.45452810569815943977303595195913179981 6e+0002L,
   8.10744221520039239717217990043498785961 8e+0003L,
   2.27939039377824288757417709660632899414 0e+0005L,
   3.57625162559225200842478111177093413584 4e+0006L,
   3.26790949905693263140594205867093381386 3e+0007L,
   1.76002151533080553749977823809970464880 5e+0008L,
   5.52555378766735398124206022258746572672 9e+0008L,
   9.76987029591282045788938408267126932851 1e+0008L,
   9.11058207100477427922690562962401800845 4e+0008L,
   3.98185767862195559937196768034391845434 5e+0008L,
   6.48240468623076939907319296166769703670 6e+0007L,
   2.21004694309587840244353546032939178229 8e+0006L,
};
static const GENERIC pr5[13] = {        /* [1.777..., 2.5] */
   9.99999999911498610795181787114465588069 9e-0001L,
   9.25258373604858834256834457031543594761 4e+0001L,
   3.21872675785607871521463150240738626463 7e+0003L,
   5.55400996462111165647958850586257704083 1e+0004L,
   5.26999311564366433825319694452351029017 5e+0005L,
   2.87461377377843069119291219061822054457 5e+0006L,
   9.13353815110365835387414691961344243603 5e+0006L,
   1.67306704141033892282519301307735424919 3e+0007L,
   1.70691387384839801174479028920015184049 8e+0007L,
   9.06776658385328853455160023557674761867 9e+0006L,
   2.21674673345788456853269535503633865587 2e+0006L,
   1.94575388080287254123570381272234451405 e+0005L,
   3.13237441292194807153919563888533095174 9e+0003L,
};
static const GENERIC ps5[13] = {        /* [1.777..., 2.5] */
   1.0e0L,
   9.25961498386218111888383167099034005298 2e+0001L,
   3.22512527546290338484212407513260929030 4e+0003L,
   5.57570536282910154529276005594185524649 2e+0004L,
   5.30604986303708785549617012195844849252 2e+0005L,
   2.90706075887350956430972990310901859721 5e+0006L,
   9.29805920658499589829825782713120853928 9e+0006L,
   1.72039107100696317683610802655654706298 0e+0007L,
   1.78261481292286519047939450948794192061 2e+0007L,
   9.70801638960527315353645203283987995015 5e+0006L,
   2.47649508468817009648021564096217514002 7e+0006L,
   2.36320066036558575966807779019460491718 7e+0005L,
   4.80323956984819607712120357570435693673 1e+0003L,
};
```

```
static const GENERIC pr6[13] = {        /* [1.28, 1.777...] */
   9.99999996977709549599860692552432255955 6e-0001L,
   5.82548671946619443050328382409687221921 6e+0001L,
   1.24815549163775728191518482496537990538 0e+0003L,
   1.30209319984235860932133841707171047761 5e+0004L,
   7.35383580418629278284096199981054301603 9e+0004L,
   2.35647166111368618054919509255575134175 7e+0005L,
   4.35055326742900958163298706094278084710 1e+0005L,
   4.58876266187660063871915982665238941823 5e+0005L,
   2.67579639854852343654422104522529012861 1e+0005L,
   8.07764955710897138829829291998844994046 4e+0004L,
   1.11764045922130687351906874166405457377 6e+0004L,
   5.54440007239681469517578751155775788558 5e+0002L,
   5.07255054119148049843128908990582291071 8e+0000L,
};
static const GENERIC ps6[13] = {        /* [1.28, 1.777...] */
   1.0e0L,
   5.83251792535716505063907584818361306329 1e+0001L,
   1.25214436474359212817125610436497646689 8e+0003L,
   1.31030023434221681357911802241558574077 2e+0004L,
   7.43466769703812197817292154032863632923 e+0004L,
   2.39870659558771916572646900240400461471 1e+0005L,
   4.47273751762510315700486937242748060251 1e+0005L,
   4.78631352333776197529417142906703772361 1e+0005L,
   2.85116187287273122847253606186536537019 2e+0005L,
   8.89164826989914841233191802180138581558 6e+0004L,
   1.29709748953535151757297812358475104228 7e+0004L,
   7.09676164054597575620218414340046981261 8e+0002L,
   8.37804933859023332597770240173334082035 1e+0000L,
};
static const GENERIC sixteen = 16.0L;
static const GENERIC huge    = 1.0e30L;

static GENERIC pzero(x)
GENERIC x;
{
        GENERIC s,r,t,z;
        int i;
        if(x>huge) return one;
        t = one/x; z = t*t;
        if(x>sixteen) {
            r = z*pr0[11]+pr0[10]; s = ps0[10];
            for(i=9;i>=0;i--) {
                r = z*r + pr0[i];
                s = z*s + ps0[i];
            }
        } else if (x > eight){
            r = pr1[11]; s = ps1[11]+z*(ps1[12]+z*ps1[13]);
            for(i=10;i>=0;i--) {
                r = z*r + pr1[i];
                s = z*s + ps1[i];
            }
        } else if (x > five){   /* x > 5.0 */
            r = pr2[11]; s = ps2[11]+z*(ps2[12]+z*ps2[13]);
            for(i=10;i>=0;i--) {
                r = z*r + pr2[i];
                s = z*s + ps2[i];
            }
        } else if( x>3.5L) {
            r = pr3[12]; s = ps3[12];
            for(i=11;i>=0;i--) {
                r = z*r + pr3[i];
                s = z*s + ps3[i];
            }
        } else if( x>2.5L) {
            r = pr4[12]; s = ps4[12];
```



```
            for(i=11;i>=0;i--) {
                r = z*r + pr4[i];
                s = z*s + ps4[i];
            }
        } else if( x> (1.0L/0.5625L)){
            r = pr5[12]; s = ps5[12];
            for(i=11;i>=0;i--) {
                r = z*r + pr5[i];
                s = z*s + ps5[i];
            }
        } else {        /* assume x > 1.28 */
            r = pr6[12]; s = ps6[12];
            for(i=11;i>=0;i--) {
                r = z*r + pr6[i];
                s = z*s + ps6[i];
            }
        }
        return r/s;
}


static const GENERIC qr0[12] = {        /* [16, inf] */
  -1.24999999999999999999999999999999972972e-0001L,
  -1.42517959554567057741439576250399159689 7e+0002L,
  -6.31249964562597084553446025793622240721 9e+0004L,
  -1.41137432645720838431512124369881444684 8e+0007L,
  -1.73503421275887358141098475786078725284 2e+0009L,
  -1.19977764751278948942182634248505528068 0e+0011L,
  -4.59602533408165571449986040969910037364 4e+0012L,
  -9.26252562820128410779292447703165339918 7e+0013L,
  -8.85839472868503924534439884218066286763 9e+0014L,
  -3.26752795368753488762374062270950597211 3e+0015L,
  -2.66422297118631196758712934702945006201 9e+0015L,
   3.44246406072398786958518009534450410020 4e+0014L,
};
static const GENERIC qs0[11] = {
   1.0e0L,
   1.14072961393653646193151661000318568788 1e+0003L,
   5.05666551044229935100919818649008580358 0e+0005L,
   1.13204176382564278794394165052271819911 5e+0008L,
   1.39457011187258160639262067821424647976 7e+0010L,
   9.67794521815226478953443107956374437842 1e+0011L,
   3.73114032785153682822514305889634850209 6e+0013L,
   7.61278595106486929172284668102088167641 0e+0014L,
   7.47607701640676489173019100481186397594 0e+0015L,
   2.95124648261359203542150342710039383170 9e+0016L,
   3.10836180369181171113685458707430203490 1e+0016L,
};
static const GENERIC qr1[12] = {        /* [8, 16 ] */
  -1.24999999999999999999979490103834338181 57e-0001L,
  -9.05121516639382264063675224489512412693 4e+0001L,
  -2.62078270342814883767117903190420830394 7e+0004L,
  -3.97557126155350445776617797450878579088 4e+0006L,
  -3.47902933075931130627007221807407499409 0e+0008L,
  -1.82395500812426857303621674618623982908 9e+0010L,
  -5.76593269711180137576515602922156866443 5e+0011L,
  -1.07984368079874259295400219241793477911 4e+0013L,
  -1.14689363050459273908220576461158133289 7e+0014L,
  -6.36701605968389846493610444728288070418 2e+0014L,
  -1.58310904196121349046445911190348420909 8e+0015L,
  -1.23014955576424247310312865013579563941 2e+0015L,
};
static const GENERIC qs1[14] = {
   1.0e0L,
   7.24683150811505811243857984777801445843 2e+0002L,
   2.10085418443916851839938378630692703761 1e+0005L,
```

```
    3.19263641883795150743018828594099423512 2e+0007L,
    2.80155844338335467453844346112443421615 2e+0009L,
    1.47502699766437373929348392725065346748 7e+0011L,
    4.69448682491395460855236382179992714531 8e+0012L,
    8.89035010091920025083843870960154733402 1e+0013L,
    9.62684442908290514487470106876046975206 7e+0014L,
    5.54111074460046077352826386268752164214 0e+0015L,
    1.48650049478945255672747032923212309656 3e+0016L,
    1.41584010484595940036543077373209389921 0e+0016L,
    1.78086609524151741808131256723968233648 3e+0015L,
   -2.35923091738488935788763154407999012949 4e+0014L,
};
static const GENERIC qr2[12] = {        /* [5, 8] */
   -1.24999999999999953193774436252772718161 4e-0001L,
   -4.94437389735696977483937597723924157396 6e+0001L,
   -7.72844917543346528531426165007845047390 9e+0003L,
   -6.26257432961275234633690143465122070590 3e+0005L,
   -2.90094822022094330602723521742438067273 2e+0007L,
   -7.98871964763419277046391715756287411953 5e+0008L,
   -1.31822817192718138954776002662635701237 5e+0010L,
   -1.28243977398302924530926327194542492819 6e+0011L,
   -7.05092557082781804018614994025791884513 8e+0011L,
   -2.02175188257387199000420561687420268442 9e+0012L,
   -2.59293996240066855238433390057381263565 8e+0012L,
   -1.03826710951889126284060151493297285032 6e+0012L,
};
static const GENERIC qs2[14] = {
    1.0e0L,
    3.96135849288557000320278402289424895211 6e+0002L,
    6.20578873886470188282875263458651092696 8e+0004L,
    5.04571560393267028655067381301176440674 9e+0006L,
    2.34924861136265832353343389430968751429 e+0008L,
    6.52024452441582863591768355372188006391 1e+0009L,
    1.08911121122350771933706715988628188772 2e+0011L,
    1.08040600090535986795877940941490301861 0e+0012L,
    6.13564528089551470351415468062376956214 8e+0012L,
    1.86243304024662587424586715136864366821 5e+0013L,
    2.66778080578664888884077788702193708994 e+0013L,
    1.39440110728908777476530071180931311282 4e+0013L,
    1.09324750061632037556289829715672244548 4e+0012L,
   -7.22887553037892872282660421649149378077 5e+0010L,
};
static const GENERIC qr3[13] = {        /* [3.5 5] */
   -1.24999999999947306774842037957848166107 5e-0001L,
   -3.04454904863528935191357432480325097799 8e+0001L,
   -2.89008114064976907849669300352468144086 9e+0003L,
   -1.40492245681720223587934327533052910768 4e+0005L,
   -3.86274661438557344351817740361734928186 9e+0006L,
   -6.25751730911024904920113370891115504768 9e+0007L,
   -6.03145133092083991698707978272732347752 0e+0008L,
   -3.41154240517383061145402576575585438234 6e+0009L,
   -1.08939247814972667213301449872302152609 9e+0010L,
   -1.82493407842021094129014090341595678272 6e+0010L,
   -1.40078027830435871042348107048693953113 9e+0010L,
   -3.71648413606491736392663571674377109209 3e+0009L,
   -1.39759107529642552997043489095490433158 0e+0008L,
};
static const GENERIC qs3[13] = {
    1.0e0L,
    2.44149861390496204939100018701494585804 2e+0002L,
    2.32618888207237071150016422234151433704 3e+0004L,
    1.13713821312123133849497710465923957816 5e+0006L,
    3.15291807073566272872299845260536425351 7e+0007L,
    5.17287799342650725931427048844401359510 8e+0008L,
    5.08308643973166980745596107885647077411 5e+0009L,
    2.96184273206643412311932552113947690994 1e+0010L,
```



```
    9.91218586686244073582978185608135315139 0e+0010L,
    1.79356056125162223443056418156729798359 8e+0011L,
    1.57709011934122812252526510849794040307 3e+0011L,
    5.50991030678016619433388999998546368163 6e+0010L,
    4.76169113407887449120232018151793675814 1e+0009L,
};
static const GENERIC qr4[13] = {        /* [2.5 3.5] */
   -1.24999999992856773433974504349070534083 5e-0001L,
   -1.96720174873141906305160162443556552848 1e+0001L,
   -1.18632914671456223640709974061552817070 7e+0003L,
   -3.60773695922294181035630149115245793406 0e+0004L,
   -6.11920071797810490493282846857519426712 5e+0005L,
   -6.03784778115835822667030507865220558638 4e+0006L,
   -3.50355815333614035970053672039356598474 0e+0007L,
   -1.18019647826822571875721852374678730977 3e+0008L,
   -2.22186023208513491584142636350516968052 8e+0008L,
   -2.17337250545274758529617676170174623676 0e+0008L,
   -9.64936486506123755851773053950656801396 3e+0007L,
   -1.46542922784793303454603964009486265038 5e+0007L,
   -3.08300319792026208517058186624666338060 7e+0005L,
};
static const GENERIC qs4[13] = {        /* [2.5 3.5] */
    1.0e0L,
    1.57962077373225914275261414213998685405 5e+0002L,
    9.58137222032913873320387950375368505496 8e+0003L,
    2.93959867237910809577611413101082588530 8e+0005L,
    5.05218304931454221863034181869258844816 8e+0006L,
    5.08349769559520663943383932633897198014 9e+0007L,
    3.03638536180055338804971901400509920651 6e+0008L,
    1.06782648145275340991056378516166149213 7e+0009L,
    2.14564412555711804472074177512531966927 2e+0009L,
    2.32411561595971994936394667349155221679 9e+0009L,
    1.22326296211207075796695985561984701114 6e+0009L,
    2.56976555331849542373847858594711027070 9e+0008L,
    1.35474474429922712789790578773263656550 4e+0007L,
};
static const GENERIC qr5[13] = {        /* [1.777.., 2.5] */
   -1.24999999593663969763768042817457606997 1e-0001L,
   -1.26084605537131145348589192342648906831 5e+0001L,
   -4.77239846754446748080117433029014157889 5e+0002L,
   -8.93985259990298486613760833996490599724 e+0003L,
   -9.18407078714954205097954222644613424319 7e+0004L,
   -5.40603894501827445836263789773928043517 1e+0005L,
   -1.84589654470519026101865372867817108441 8e+0006L,
   -3.61361699068080950187866757065330807154 7e+0006L,
   -3.90878297813569325225255772041434862377 9e+0006L,
   -2.17371102251732392710913817058844276817 6e+0006L,
   -5.43125313067991848583640854900785624449 5e+0005L,
   -4.59109854645268451008259158727594076595 9e+0004L,
   -5.24471136416820780683552005779229646578 e+0002L,
};
static const GENERIC qs5[13] = {        /* [1.777.., 2.5] */
    1.0e0L,
    1.01453621085129087835089275097247486144 7e+0002L,
    3.87554751068713531406443416009613968107 6e+0003L,
    7.36191312267007981495525928199561773258 0e+0004L,
    7.72028894421877112658108653958529314636 e+0005L,
    4.68152955444675249640443143360830655803 8e+0006L,
    1.66788262194050392545503125230836774582 0e+0007L,
    3.46940315376139988188827262085530515624 1e+0007L,
    4.09699204796421071186708938471994786301 9e+0007L,
    2.59680475582921744931153073595956063055 4e+0007L,
    7.98393377469788923815446506401941076384 5e+0006L,
    9.81813381697990081908724242528075793815 2e+0005L,
    3.06108393086869439601354153567074544356 0e+0004L,
};
```

```
static const GENERIC qr6[13] = {        /* [1.28, 1.777..] */
  -1.24999988157728900180713728282492908277 1e-0001L,
  -7.99827351005311075961081059411953361928 2e+0000L,
  -1.87248195533517254336908961771565632719 e+0002L,
  -2.12211678672630080507987400330379964681 2e+0003L,
  -1.29385028583952928250317826348477347845 7e+0004L,
  -4.44502474226631618103335419226252935609 3e+0004L,
  -8.73016137833435776766834446735650534707 0e+0004L,
  -9.70622289517207844280144497250531505473 6e+0004L,
  -5.89632551825985827016553151361819532104 1e+0004L,
  -1.82317203436810882227642082707466883223 3e+0004L,
  -2.50930417863505592663883304033747238717 5e+0003L,
  -1.15660896571577923731676982894172996409 9e+0002L,
  -7.02800578965073139688734682639778521044 2e-0001L,
};
static const GENERIC qs6[13] = {        /* [1.28, 1.777..] */
    1.0e0L,
    6.45721108505806484560126132127772107590 0e+0001L,
    1.53400521658801121034282455513600868295 0e+0003L,
    1.77721799917644178259335766046237909717 1e+0004L,
    1.11837265264246946809108481026323119969 6e+0005L,
    4.01524243385846181314236574838647360529 4e+0005L,
    8.37708104551709864544861651438828049767 3e+0005L,
    1.01149502000801035257539800960416428733 7e+0006L,
    6.88672207529043056865222787520020895597 0e+0005L,
    2.50473518994802147204715714861317195653 7e+0005L,
    4.40813892017104484694100184435200981706 2e+0004L,
    3.10557217807211514567305722853640854884 e+0003L,
    5.58829482111891611343739650457381703367 8e+0001L,
};
static GENERIC qzero(x)
GENERIC x;
{
        GENERIC s,r,t,z;
        int i;
        if(x>huge) return -0.125L/x;
        t = one/x; z = t*t;
        if(x>sixteen) {
            r = z*qr0[11]+qr0[10]; s = qs0[10];
            for(i=9;i>=0;i--) {
                r = z*r + qr0[i];
                s = z*s + qs0[i];
            }
        } else if(x>eight) {
            r = qr1[11]; s = qs1[11]+z*(qs1[12]+z*qs1[13]);
            for(i=10;i>=0;i--) {
                r = z*r + qr1[i];
                s = z*s + qs1[i];
            }
        } else if(x>five){  /* assume x > 5.0 */
            r = qr2[11]; s = qs2[11]+z*(qs2[12]+z*qs2[13]);
            for(i=10;i>=0;i--) {
                r = z*r + qr2[i];
                s = z*s + qs2[i];
            }
        } else if(x>3.5L) {
            r = qr3[12]; s = qs3[12];
            for(i=11;i>=0;i--) {
                r = z*r + qr3[i];
                s = z*s + qs3[i];
            }
        } else if(x>2.5L) {
            r = qr4[12]; s = qs4[12];
            for(i=11;i>=0;i--) {
                r = z*r + qr4[i];
```



```
                s = z*s + qs4[i];
            }
        } else if(x> (1.0L/0.5625L)) {
            r = qr5[12]; s = qs5[12];
            for(i=11;i>=0;i--) {
                r = z*r + qr5[i];
                s = z*s + qs5[i];
            }
        } else {        /* assume x > 1.28 */
            r = qr6[12]; s = qs6[12];
            for(i=11;i>=0;i--) {
                r = z*r + qr6[i];
                s = z*s + qs6[i];
            }
        }
        return t*(r/s);
}
```

```
**********************************************************
   28177 Sat May 10 12:09:07 2014
new/usr/src/lib/libm/common/Q/j1l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

/*
 * floating point Bessel's function of the first and second kinds
 * of order zero: j1(x),y1(x);
 *
 * Special cases:
 *      y0(0)=y1(0)=yn(n,0) = -inf with division by zero signal;
 *      y0(-ve)=y1(-ve)=yn(n,-ve) are NaN with invalid signal.
 */

#pragma weak j1l = __j1l
#pragma weak y1l = __y1l

#include "libm.h"
#include "longdouble.h"

#define GENERIC long double
static const GENERIC
zero    = 0.0L,
small   = 1.0e-9L,
tiny    = 1.0e-38L,
one     = 1.0L,
five    = 5.0L,
invsqrtpi= 5.64189583547756286948079451560772585844le-0001L,
tpi     = 0.63661977236758134307553505349005744 8L;

static GENERIC pone(GENERIC);
static GENERIC qone(GENERIC);

static const GENERIC r0[7] = {
  -6.24999999999999999999999999999999627320e-0002L,
   1.94060672719404171620538461849464 1565464e-0003L,
  -3.00563042315573370185648146998645904 3883e-0005L,
```



```
   2.34558621940391866746834104736957216 9358e-0007L,
  -9.97680928588525358752901010913333666 9724e-0010L,
   2.21874325836362394607895878377510747 3381e-0012L,
  -2.07107965621870060476765092410357804 6280e-0015L,
};
static const GENERIC s0[7] = {
   1.0e0L,
   1.06169590315619992073805127707500305 9555e-0002L,
   5.52186051311118037156695117939886269 2060e-0005L,
   1.82421436741375419352410787708497944 1407e-0007L,
   4.09895777843957683481883819803902935 3925e-0010L,
   6.04773507969966389853240090925264056 197e-0013L,
   4.67904472887883619724792327951204703 5041e-0016L,
};

GENERIC
j1l(x) GENERIC x;{
        GENERIC z, d, s,c,ss,cc,r;
        int i, sgn;

        if(!finitel(x)) return one/x;
        sgn = signbitl(x);
        x = fabsl(x);
        if(x > 1.28L){
                s = sinl(x);
                c = cosl(x);
        /*
         * j1(x) = sqrt(2/(pi*x))*(p1(x)*cos(x0)-q1(x)*sin(x0))
         * where x0 = x-3pi/4
         *      Better formula:
         *              cos(x0) = cos(x)cos(3pi/4)+sin(x)sin(3pi/4)
         *                      =  1/sqrt(2) * (sin(x) - cos(x))
         *              sin(x0) = sin(x)cos(3pi/4)-cos(x)sin(3pi/4)
         *                      = -1/sqrt(2) * (cos(x) + sin(x))
         * To avoid cancellation, use
         *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
         * to compute the worse one.
         */
                if(x>1.0e2450L) {       /* x+x may overflow */
                        ss = -s-c;
                        cc =  s-c;
                } else if(signbitl(s)!=signbitl(c)) {
                        cc = s - c;
                        ss = cosl(x+x)/cc;
                } else {
                        ss = -s-c;
                        cc = cosl(x+x)/ss;
                }
        /*
         * j1(x) = 1/sqrt(pi*x) * (P(1,x)*cc - Q(1,x)*ss)
         * y1(x) = 1/sqrt(pi*x) * (P(1,x)*ss + Q(1,x)*cc)
         */
                if(x>1.0e120L) return (invsqrtpi*cc)/sqrtl(x);
                d =  invsqrtpi*(pone(x)*cc-qone(x)*ss)/sqrtl(x);
                if(sgn==0) return d; else return -d;
        }
        if(x<=small) {
            if(x<=tiny) d = 0.5L*x;
            else d =  x*(0.5L-x*x*0.125L);
            if(sgn==0) return d; else return -d;
        }
        z = x*x;
            r = r0[6];
            s = s0[6];
            for(i=5;i>=0;i--) {
                r = r*z + r0[i];
```

```
128                 s = s*z + s0[i];
129             }
130         d = x*0.5L+x*(z*(r/s));
131         if(sgn==0) return d; else return -d;
132 }

133 static const GENERIC u0[7] = {
134   -1.960570906462389484060557273467558703503e-0001L,
135    5.166389353148318460304315890665450006495e-0002L,
136   -2.229699464105910913337190798743451115604e-0003L,
137    3.625437034548863342715657067759078267158e-0005L,
138   -2.689902826993117212255524537353883987171e-0007L,
139    9.304570592456930912969387719010256018466e-0010L,
140   -1.234878126794286433183213479975003461 31e-0012L,
141 };
142 static const GENERIC v0[8] = {
143    1.0e0L,
144    1.369394302535807332517110204820556695644e-0002L,
145    9.508438148097659501433367062605935379588e-0005L,
146    4.399007309420092056052714797296467565655e-0007L,
147    1.488083087443756398305819693177715000787e-0009L,
148    3.751609832625793536245746965768587624922e-0012L,
149    6.680926434086257291872903276124244131448e-0015L,
150    6.676602383908906988160099057991121446058e-0018L,
151 };

152 GENERIC
153 y1l(x) GENERIC x;{
154         GENERIC z, s,c,ss,cc,u,v;
155         int i;

156         if(isnanl(x)) return x+x;
157         if(x <= zero){
158                 if(x==zero)
159                     return -one/zero;
160                 else
161                     return zero/zero;
162         }
163         if(x > 1.28L){
164                 if(!finitel(x)) return zero;
165                 s = sinl(x);
166                 c = cosl(x);
167         /*
168          * j1(x) = sqrt(2/(pi*x))*(p1(x)*cos(x0)-q1(x)*sin(x0))
169          * where x0 = x-3pi/4
170          *      Better formula:
171          *              cos(x0) = cos(x)cos(3pi/4)+sin(x)sin(3pi/4)
172          *                      =  1/sqrt(2) * (sin(x) - cos(x))
173          *              sin(x0) = sin(x)cos(3pi/4)-cos(x)sin(3pi/4)
174          *                      = -1/sqrt(2) * (cos(x) + sin(x))
175          * To avoid cancellation, use
176          *              sin(x) +- cos(x) = -cos(2x)/(sin(x) -+ cos(x))
177          * to compute the worse one.
178          */
179                 if(x>1.0e2450L) {       /* x+x may overflow */
180                         ss = -s-c;
181                         cc =  s-c;
182                 } else if(signbitl(s)!=signbitl(c)) {
183                         cc = s - c;
184                         ss = cosl(x+x)/cc;
185                 } else {
186                         ss = -s-c;
187                         cc = cosl(x+x)/ss;
188                 }
189         /*
190          * j1(x) = 1/sqrt(pi*x) * (P(1,x)*cc - Q(1,x)*ss)
```



```
191          * y1(x) = 1/sqrt(pi*x) * (P(1,x)*ss + Q(1,x)*cc)
192          */
193                 if(x>1.0e91L) return (invsqrtpi*ss)/sqrtl(x);
194                 return invsqrtpi*(pone(x)*ss+qone(x)*cc)/sqrtl(x);
195         }
196         if(x<=tiny) {
197             return(-tpi/x);
198         }
199         z = x*x;
200             u = u0[6]; v = v0[6]+z*v0[7];
201             for(i=5;i>=0;i--){
202                 u = u*z + u0[i];
203                 v = v*z + v0[i];
204             }
205         return(x*(u/v) + tpi*(j1l(x)*logl(x)-one/x));
206 }

207 static const GENERIC pr0[12] = {
208    1.0000000000000000000000000000000000267e+0000L,
209    1.060717875045891455602180843276758003035e+0003L,
210    4.344347542892127024446687712181105852335e+0005L,
211    8.915680220724007016377924252717410457094e+0007L,
212    9.969502259938406062809873257569171272819e+0009L,
213    6.200290193138613035646510338707386316595e+0011L,
214    2.105978548788015119851815854422247330118e+0013L,
215    3.696635772784601239371730810311998368948e+0014L,
216    3.015913097920694682057958412534134515156e+0015L,
217    9.370298471339353098123277427328592725921e+0015L,
218    7.190349005196335967340799265074029443057e+0015L,
219    2.736097786240689996880391074927552517982e+0014L,
220 };
221 static const GENERIC ps0[11] = {
222    1.0e0L,
223    1.060600687545891455602180843276758095107e+0003L,
224    4.343106093416975589147153906505338900961e+0005L,
225    8.910605869002176566582072242244353399059e+0007L,
226    9.959122058635087888690713917622056540190e+0009L,
227    6.188744967234948231792482949171041843894e+0011L,
228    2.098863976953783506401759873801990304907e+0013L,
229    3.672870357018063196746729751479938908450e+0014L,
230    2.975538419246824921049011529574385888420e+0015L,
231    9.063657659995043205018686029284479837091e+0015L,
232    6.401953344314747916729366441508892711691e+0015L,
233 };
234 static const GENERIC pr1[12] = {
235    1.0000000000000000000000002366752413066098 4e+0000L,
236    6.746154419979618754354803488126452971204e+0002L,
237    1.811210781083390154857018330296145970502e+0005L,
238    2.533098390379924268038005329095287842244e+0007L,
239    2.029683619805342145252338570875424600729e+0009L,
240    9.660859662192711465301069401598929980319e+0010L,
241    2.743396238644831519934098967716621316316e+0012L,
242    4.553097354140854377931023170263455246288e+0013L,
243    4.210245069852219757476169864974870720374e+0014L,
244    1.987334056229596485076645967176169801727e+0015L,
245    4.067120052787096893838970455751338930462e+0015L,
246    2.486539606380406398310845264910691398133e+0015L,
247 };
248 static const GENERIC ps1[14] = {
249    1.0e0L,
250    6.744982544979618754355808680196859521782e+0002L,
251    1.810421795396966762032155290441364740350e+0005L,
252    2.530986460644310651529583759699988435573e+0007L,
253    2.026743276048023121360249288818290224145e+0009L,
254    9.637461924407405935245269407052641341836e+0010L,
255    2.732378628423766417402292797028314160831e+0012L,
```

```
    4.52234527496052712435484436401218427848 8e+0013L,
    4.16065066834174313268533575841546985654 5e+0014L,
    1.94373024298885820824349242489243590121 1e+0015L,
    3.88022853269212798990113161859806745000 1e+0015L,
    2.17802081616115461584100017368330299972 8e+0015L,
   -8.99406266684222555155434669817160063417 3e+0013L,
    1.36852036850885125349576480693461957499 0e+0013L,
};
static const GENERIC pr2[12] = {
    1.00000000000000000069386516218403962372 82e+0000L,
    3.65841629185040498140710107703794814469 8e+0002L,
    5.26707377217035654770979467060281244753 7e+0004L,
    3.91201210122683746301492521073589462044 2e+0006L,
    1.65129564897410395719387492871418076562 5e+0008L,
    4.11490114448079760997248499814214678349 9e+0009L,
    6.09252430976603668154298057252633514767 2e+0010L,
    5.26391317807128261671924996907413457057 7e+0011L,
    2.53840858112432422336734102053808133099 4e+0012L,
    6.28860792936029102789512698301536567764 8e+0012L,
    6.84833004821114841904705507538652594528 0e+0012L,
    2.29030964683886794142317816399142324469 0e+0012L,
};
static const GENERIC ps2[14] = {
    1.0e0L,
    3.65724441685040508645941016576231986185 6e+0002L,
    5.26280235842502324399238707586123730631 2e+0004L,
    3.90589681395991964813629586166148384836 4e+0006L,
    1.64679190779146122074269484210820277276 3e+0008L,
    4.09613280306425602222495412020820143734 4e+0009L,
    6.04666519591595044754442944573068023675 9e+0010L,
    5.19806173978199131341405221232865329516 8e+0011L,
    2.48423385181433396640152762642125427979 6e+0012L,
    6.04786880692531587933965153943431525594 0e+0012L,
    6.33310383125409165250164256729410181335 4e+0012L,
    1.87514309875428499446760993692468502496 8e+0012L,
   -5.23833092056339269296541276250881360153 4e+0010L,
    4.65688860943936472542778919838377925995 7e+0009L,
};
static const GENERIC pr3[13] = {
    1.00000000000000093368873180680561378428 97e+0000L,
    2.24271994272845958848805157200283572918 3e+0002L,
    1.95545061138202655026625773733109569109 2e+0004L,
    8.70714329399361989939540056240917559073 9e+0005L,
    2.18626789448700456594832428901095450531 6e+0007L,
    3.22432851054195779236069158566750286468 8e+0008L,
    2.82105735515138059733179289688274136489 7e+0009L,
    1.44537138729542240436558479379602897984 0e+0010L,
    4.18174316066989135778301100265665810786 4e+0010L,
    6.38737108876799311932553613779453551392 2e+0010L,
    4.57561999941271607806407058776741643639 6e+0010L,
    1.22841565121163916062028444169050355084 2e+0010L,
    7.24217034987556305343605053215311288207 2e+0008L,
};
static const GENERIC ps3[13] = {
    1.0e0L,
    2.24154806772852955104980461048606140107 0e+0002L,
    1.95283821679555214513213793293123718130 7e+0004L,
    8.68457492649318574462812734106997457552 6e+0005L,
    2.17635771067037962940853412819852189164 e+0007L,
    3.19995868235613297731925878316712210056 7e+0008L,
    2.78621893152533468784467521991420187257 0e+0009L,
    1.41628377695174154963141757231791603976 7e+0010L,
    4.04296265927156794873567683460934884292 2e+0010L,
    6.02816846264669451008384722296844402161 e+0010L,
    4.11841022679464141383388760658008528111 1e+0010L,
    9.91873573629703843074416125333820223026 3e+0009L,
```



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    4.09296719823809802321912448743713033203 8e+0008L,
};
static const GENERIC pr4[13] = {
    1.00000000000150922097815739904205955339 0e+0000L,
    1.43755186837814785113349999632378260778 7e+0002L,
    7.91133553741817729604151806140450542800 4e+0003L,
    2.19371093911531721471651890893575610480 4e+0005L,
    3.39066249513673096251348979653827498438 2e+0006L,
    3.04865534792934889100607060929388427478 9e+0007L,
    1.61378163348949660635404516152745097519 5e+0008L,
    4.97508983503723027711015615003848215998 8e+0008L,
    8.63604708701511540388090441833956632326 4e+0008L,
    7.91820291232836614011067122307694910150 9e+0008L,
    3.42329466579898473343965031172279485329 4e+0008L,
    5.62190495344196396104050393478266261362 1e+0007L,
    2.08630354331024026075867040450948449979 3e+0006L,
};
static const GENERIC ps4[13] = {
    1.0e0L,
    1.43637999338453237167049331959184736230 4e+0002L,
    7.89464715478543067806105384884743665949 9e+0003L,
    2.18465975339209752900898174155087858617 4e+0005L,
    3.36610908330546517680351373814704949936 1e+0006L,
    3.01191154596899681769766586658722634318 6e+0007L,
    1.58226291377968985131676014845941485301 e+0008L,
    4.81926880949493791921793858953013820177 0e+0008L,
    8.20135576299045067970283712343252715483 0e+0008L,
    7.26823209398251093741746421282341425212 e+0008L,
    2.95091190901557293326213132393403648046 2e+0008L,
    4.24283992430593442301085896654062121939 6e+0007L,
    1.06438762044509077918211766633040518686 6e+0006L,
};
static const GENERIC pr5[13] = {
    1.00000000010243480524117142725384735386 1e+0000L,
    9.12933225708362925906050224902596323482 1e+0001L,
    3.13223848358695303757611937750455719141 3e+0003L,
    5.32978252826930797127894312245417110786 1e+0004L,
    4.98846015718411779069287300210305294414 5e+0005L,
    2.68660207161578681614701033425604746937 8e+0006L,
    8.44541852602896119770379908701268301831 e+0006L,
    1.53657535864614115747572588990790082739 0e+0007L,
    1.56840581823652382179686277058654481194 5e+0007L,
    8.45087623988877010238761866736230217354 7e+0006L,
    2.15441490013956732842402682716320344607 7e+0006L,
    2.10565692656504389888846025480806235220 5e+0005L,
    4.73916501102339650702213430373686281297 5e+0003L,
};
static const GENERIC ps5[13] = {
    1.0e0L,
    9.11761350959532747650915267339470384779 3e+0001L,
    3.12169797248401563930127922928177079514 7e+0003L,
    5.29444722273589356804091187383457644025 5e+0004L,
    4.93036888219277233579825668411088788280 7e+0005L,
    2.63485468564116529830216743579835743776 8e+0006L,
    8.18546277540032639355589615703181828091 8e+0006L,
    1.46241742308021519260966864266303066708 6e+0007L,
    1.45062499398585167598286084415395489601 5e+0007L,
    7.46046764756199528321908656716200611386 4e+0006L,
    1.75421098140561247886922714257905633896 5e+0006L,
    1.46328672115527197152626491452474669959 6e+0005L,
    2.15589472579670201534121111657982703945 9e+0003L,
};
static const GENERIC pr6[13] = {
    1.00000000356485554674173592031574315712 9e+0000L,
    5.73400393486254045811942350990951028836 6e+0001L,
    1.20957249193585048608655969229179688797 6e+0003L,
```

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392    1.24339839142228124793367477916366028683 8e+0004L,
393    6.93099675518143793725822099860170827878 7e+0004L,
394    2.19806765953275759864672224996676762009 9e+0005L,
395    4.03365943271205863393317911582057685845 5e+0005L,
396    4.25775965721900802701604720657457435867 8e+0005L,
397    2.51191739587600434948072127744576391638 9e+0005L,
398    7.81375615307062365417873165138188195355 2e+0004L,
399    1.15206917338112788138558809290586435289 1e+0004L,
400    6.54858078280408855377781603755152339808 2e+0002L,
401    8.66872537011690613232754276612793849688 0e+0000L,
402 };
403 static const GENERIC ps6[13] = {
404    1.0e0L,
405    5.72228523635711456649922152573628620518 4e+0001L,
406    1.20301084287831793544458295062033957050 6e+0003L,
407    1.23005833537858355015582550217243537120 8e+0004L,
408    6.80099855060786128886530043864808989441 2e+0004L,
409    2.13076782959930426298776934753685088592 1e+0005L,
410    3.84048346664391668175993697299215531002 6e+0005L,
411    3.94743237345922554286181914810808116039 3e+0005L,
412    2.23781623939308111148158843445783852673 8e+0005L,
413    6.54582049512441972339894627379092154077 4e+0004L,
414    8.72956363032089274150072621327883473719 6e+0003L,
415    4.13076266029189475345017479419699881370 9e+0002L,
416    3.48036889867268464513033578601507559559 8e+0000L,
417 };
418 static const GENERIC sixteen = 16.0L;
419 static const GENERIC eight   = 8.0L;
420 static const GENERIC huge    = 1.0e30L;

422 static GENERIC pone(x)
423 GENERIC x;
424 {
425         GENERIC s,r,t,z;
426         int i;
427         if(x>huge) return one;
428         t = one/x; z = t*t;
429         if(x>sixteen) {
430             r = z*pr0[11]+pr0[10]; s = ps0[10];
431             for(i=9;i>=0;i--) {
432                 r = z*r + pr0[i];
433                 s = z*s + ps0[i];
434             }
435         } else if(x>eight) {
436             r = pr1[11]; s = ps1[11]+z*(ps1[12]+z*ps1[13]);
437             for(i=10;i>=0;i--) {
438                 r = z*r + pr1[i];
439                 s = z*s + ps1[i];
440             }
441         } else if(x>five) {
442             r = pr2[11]; s = ps2[11]+z*(ps2[12]+z*ps2[13]);
443             for(i=10;i>=0;i--) {
444                 r = z*r + pr2[i];
445                 s = z*s + ps2[i];
446             }
447         } else if( x>3.5L) {
448             r = pr3[12]; s = ps3[12];
449             for(i=11;i>=0;i--) {
450                 r = z*r + pr3[i];
451                 s = z*s + ps3[i];
452             }
453         } else if( x>2.5L) {
454             r = pr4[12]; s = ps4[12];
455             for(i=11;i>=0;i--) {
456                 r = z*r + pr4[i];
457                 s = z*s + ps4[i];
```



```
458             }
459         } else if( x> (1.0L/0.5625L)){
460             r = pr5[12]; s = ps5[12];
461             for(i=11;i>=0;i--) {
462                 r = z*r + pr5[i];
463                 s = z*s + ps5[i];
464             }
465         } else {        /* assume x > 1.28 */
466             r = pr6[12]; s = ps6[12];
467             for(i=11;i>=0;i--) {
468                 r = z*r + pr6[i];
469                 s = z*s + ps6[i];
470             }
471         }
472         return r/s;
473 }


476 static const GENERIC qr0[12] = {
477    3.74999999999999999999999999999999971033e-0001L,
478    4.25672603523705060160768227743309426222 6e+0002L,
479    1.87597649081287848919240997894540106606 6e+0005L,
480    4.17031426804804191427360368031774559279 0e+0007L,
481    5.09275013254385581729345111897455574655 1e+0009L,
482    3.49474967627848865410350579579413948340 4e+0011L,
483    1.32706214825743731699766781709669417370 9e+0013L,
484    2.64899313827342722690750374206655115049 0e+0014L,
485    2.51169566590954741222243049447399812768 4e+0015L,
486    9.27469450666228904322431049916470230609 6e+0015L,
487    8.15090417066366382933132030291179289200 2e+0015L,
488   -5.00191873370766235577203782962038876512 2e+0014L,
489 };
490 static const GENERIC qs0[11] = {
491    1.0e0L,
492    1.13540038022988016042871527398215576009 3e+0003L,
493    5.00570118387712616432676554551659074436 0e+0005L,
494    1.11344420011371216798433760393304010298 7e+0008L,
495    1.36107481992522306277871756569903947112 4e+0010L,
496    9.35575098580284948443893390532598280965 3e+0011L,
497    3.56346278600898882500396554385799808482 8e+0013L,
498    7.15514511390009416364872686380380291045 4e+0014L,
499    6.87126683583447275805555901385184365411 3e+0015L,
500    2.62203089922673671264497498815734523409 2e+0016L,
501    2.60291272917287633065007702170613970774 6e+0016L,
502 };
503 static const GENERIC qr1[12] = {
504    3.74999999999999999999776245820728440580 6e-0001L,
505    2.69788399888170683992925551749818998048 5e+0002L,
506    7.75519592578102848938693887047383441101 9e+0004L,
507    1.16677776210401777198211072895528968355 e+0007L,
508    1.01150477298432116832001008452026106936 2e+0009L,
509    5.24600770357415685357775457172020555001 0e+0010L,
510    1.63769254988559268316611655169126653764 7e+0012L,
511    3.02230362369818566991299031092503938249 5e+0013L,
512    3.15476992729065568484610703026590998794 6e+0014L,
513    1.71581991344155477008973093480812336092 1e+0015L,
514    4.16504435575973262227353444513173618851 0e+0015L,
515    3.15138142087417470564310038170808628759 6e+0015L,
516 };
517 static const GENERIC qs1[14] = {
518    1.0e0L,
519    7.19709170535121823978563317240827698282 8e+0002L,
520    2.07001279959954868554488304129760986105 5e+0005L,
521    3.11701481531765622187184015277845875451 6e+0007L,
522    2.70571967890255497486332587702590297172 7e+0009L,
523    1.40611361472734572692506064875086726409 8e+0011L,
```

```
   4.40377753606713132036300597863167481735 9e+0012L,
   8.17072569020932228306149938670316724289 4e+0013L,
   8.60945884497549528922779412696443121056 6e+0014L,
   4.76676636701547348125728060069495292020 4e+0015L,
   1.20228658794334219486355794088811564165 0e+0016L,
   1.01247432830620090952506393606175602412 0e+0016L,
   6.18355202267891785827322287961582407070 3e+0014L,
  -9.75673154855822699757373740098822572274 0e+0013L,
};
static const GENERIC qr2[12] = {
   3.74999999999999948124564726222699429318 9e-0001L,
   1.47136680728977135449118114016735902673 5e+0002L,
   2.27943248676844822014208096284352695125 0e+0004L,
   1.82894304852377122516380404335695828589 3e+0006L,
   8.37982838864782313583222059641772501083 7e+0007L,
   2.27981402933504402458539367127837802205 3e+0009L,
   3.71165395225711812083281778527146644142 0e+0010L,
   3.55765091451855454991673057255310504806 8e+0011L,
   1.92458348314609589625977432949893416065 0e+0012L,
   5.42438625606373639075956708829188714027 8e+0012L,
   6.83932562124177678620650970467174684173 7e+0012L,
   2.70216956314400116629168645230543631397 1e+0012L,
};
static const GENERIC qs2[14] = {
   1.0e0L,
   3.92637919443938813570321193389520319108 9e+0002L,
   6.08914880410659829748833606300760931227 6e+0004L,
   4.89354616297327858371137635604161415064 5e+0006L,
   2.24757111911449784504638880181383221940 4e+0008L,
   6.13763566335017775129046933420075787264 5e+0009L,
   1.00511501978410285642449351952499895367 8e+0011L,
   9.72566446201450383286015138460467724062 0e+0011L,
   5.34552510048551111614863419284443463607 2e+0012L,
   1.54994400739894669172086273817395699477 9e+0013L,
   2.06714844117895262571030212416326476036 2e+0013L,
   9.40156540264196361129511948724259546230 1e+0012L,
   3.54821708862239827474883728776970937438 5e+0011L,
  -2.93447034171904712007650993843241735236 5e+0010L,
};
static const GENERIC qr3[13] = {
   3.74999999999941272408457983329745147209 1e-0001L,
   9.05847858029170621242297849293843558252 7e+0001L,
   8.52405603316103875046108366671172438117 1e+0003L,
   4.10596715862910942775343459223631014730 e+0005L,
   1.11832660337853134825978309197262333365 7e+0007L,
   1.79463668340357891852806490471413232934 3e+0008L,
   1.71431415746363595955613323600436889672 4e+0009L,
   9.62209203223608484657206725726766145603 0e+0009L,
   3.05775952448585915995776285878076835502 0e+0010L,
   5.12930678075479853160962145441593889002 0e+0010L,
   3.99912200279496107068063619434631604135 2e+0010L,
   1.12229845464349348598972156435810034538 8e+0010L,
   5.60398198764598970966883096852236258222 1e+0008L,
};
static const GENERIC qs3[13] = {
   1.0e0L,
   2.41832866307657816983615517005363441992 2e+0002L,
   2.27962020590012104258752354128127287552 0e+0004L,
   1.10098422258572952147012901499221709279 4e+0006L,
   3.01074322367924709100426251628665451628 2e+0007L,
   4.86092554282736781728961926521559943399 6e+0008L,
   4.68666811103534869198271586430783958124 3e+0009L,
   2.66870178840510201742721470594673089407 4e+0010L,
   8.67739574610680264039058094483665058490 3e+0010L,
   1.51193645557495179065849879594510664303 6e+0011L,
   1.26084560443262347800201869687360835309 3e+0011L,
```



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   4.05269227841985385391144023160086458980 5e+0010L,
   2.96551651921222606498326782224332969472 9e+0009L,
};
static const GENERIC qr4[13] = {
   3.74999999991923416415466975440123072618 e-0001L,
   5.84421858077681986479116825348505510185 8e+0001L,
   3.48927351409291298267566941137143567022 0e+0003L,
   1.05052363777457568450966343001899547959 4e+0005L,
   1.76454917205970156550071731979278011528 9e+0006L,
   1.72553243884413379502806310268149737115 4e+0007L,
   9.93811484735977853996514024759017633487 4e+0007L,
   3.33171080818459554539688377020077284231 4e+0008L,
   6.27197055764188151160956044487279728269 8e+0008L,
   6.18852979867735707502077492390373791328 5e+0008L,
   2.82190530274284997450998216787788501162 9e+0008L,
   4.61546735864691197677329025698432981489 6e+0007L,
   1.34814060873154646739668580269338069327 5e+0006L,
};
static const GENERIC qs4[13] = {
   1.0e0L,
   1.56119266311234518526141829638990213337 2e+0002L,
   9.34667803114409827054722542312421308307 2e+0003L,
   2.82585124648229354783802384760170475159 0e+0005L,
   4.77657271162215609171090289112491155629 3e+0006L,
   4.71510695371713540297793804800626785930 2e+0007L,
   2.75396235089431131643965222761120903519 3e+0008L,
   9.42850143461546320776896478750041157522 3e+0008L,
   1.83265085877520678708823689645414157261 7e+0009L,
   1.90169737893974322694892087429659524225 7e+0009L,
   9.43332226854293780627188599226380812725 e+0008L,
   1.80852054060867160868028452079885858737 0e+0008L,
   7.98334233173666275315721744691946239800 8e+0006L,
};
static const GENERIC qr5[13] = {
      3.74999999533136443702898885051519044671 9e-0001L,
      3.73935638176655988267751459304162754791 1e+0001L,
      1.39956250062941352935526546291281980255 1e+0003L,
      2.59415405309894792534533221806221011175 3e+0004L,
      2.64014987929740864039416397939459431837 1e+0005L,
      1.54247185487319914203188909359144939799 5e+0006L,
      5.24227286897205337406757209899233542589 5e+0006L,
      1.02583448776941022132963307142604483993 5e+0007L,
      1.11655392423944894014223057906012420962 2e+0007L,
      6.31807606559591017637491630352588465351 4e+0006L,
      1.64121808616864040852763973591551288178 5e+0006L,
      1.52236979352917864416881388291213470644 e+0005L,
      2.52653054106229720091418006020866958405 5e+0003L,
};
static const GENERIC qs5[13] = {
      1.0e0L,
      9.99896073593507538039754565901628750666 0e+0001L,
      3.75876741784204374268647506054041673756 2e+0003L,
      7.01365280695230652012195974251978078165 3e+0004L,
      7.20894980881861509924652961621173044685 0e+0005L,
      4.27275392710961445541783618607220200925 2e+0006L,
      1.48252441135647069933612981411102543470 3e+0007L,
      2.98875036666567823342527923762770080347 3e+0007L,
      3.39695789026108049269470915055361918506 5e+0007L,
      2.05065248773859300411157809115630454038 6e+0007L,
      5.90050412081173254761651155594627945131 6e+0006L,
      6.56339140926016089702449808227318346834 7e+0005L,
      1.69262984501279020534896673147718704141 9e+0004L,
};
static const GENERIC qr6[13] = {
    3.74999986151666413315756687085897542129 6e-0001L,
    2.36786375674776486312079743159947346891 8e+0001L,
```

```
656     5.476715802114976248882067325630793143777e+0002L,
657     6.143190357869842894025012945444096170251e+0003L,
658     3.716250534677997850513733595140463851730e+0004L,
659     1.270883463823876752138326905022875657430e+0005L,
660     2.495301449636814481646371665429083801388e+0005L,
661     2.789578988212952248340486296254398601942e+0005L,
662     1.718247946911109055931819087137397324634e+0005L,
663     5.458973214011665714330326732204106364229e+0004L,
664     7.912102686687948786048943339759596652813e+0003L,
665     4.077961006160866935722030715149087938091e+0002L,
666     3.765206972770245085551057237882528510428e+0000L,
667 };
668 static const GENERIC qs6[13] = {
669     1.0e0L,
670     6.341646532940517305641893852673926809601e+0001L,
671     1.477058277414040790932597537920671025359e+0003L,
672     1.674406564031044491436044253393536487604e+0004L,
673     1.028516501369755949895050806908994650768e+0005L,
674     3.593620042532885295087463507733285434207e+0005L,
675     7.267924991381020915185873399453724799625e+0005L,
676     8.462275107688183999611914262050060830880e+0005L,
677     5.514399892230892163373611895645500250514e+0005L,
678     1.898084241009259353540620272932188102299e+0005L,
679     3.102941242117739015721984123081026253068e+0004L,
680     1.958971184431466907681440650181421086143e+0003L,
681     2.878853357310495087181721613889455121867e+0001L,
682 };
683 static GENERIC qone(x)
684 GENERIC x;
685 {
686         GENERIC s,r,t,z;
687         int i;
688         if(x>huge) return 0.375L/x;
689         t = one/x; z = t*t;
690         if(x>sixteen) {
691             r = z*qr0[11]+qr0[10]; s = qs0[10];
692             for(i=9;i>=0;i--) {
693                 r = z*r + qr0[i];
694                 s = z*s + qs0[i];
695             }
696         } else if(x>eight) {
697             r = qr1[11]; s = qs1[11]+z*(qs1[12]+z*qs1[13]);
698             for(i=10;i>=0;i--) {
699                 r = z*r + qr1[i];
700                 s = z*s + qs1[i];
701             }
702         } else if (x>five) {    /* x > 5.0 */
703             r = qr2[11]; s = qs2[11]+z*(qs2[12]+z*qs2[13]);
704             for(i=10;i>=0;i--) {
705                 r = z*r + qr2[i];
706                 s = z*s + qs2[i];
707             }
708         } else if(x>3.5L) {
709             r = qr3[12]; s = qs3[12];
710             for(i=11;i>=0;i--) {
711                 r = z*r + qr3[i];
712                 s = z*s + qs3[i];
713             }
714         } else if(x>2.5L) {
715             r = qr4[12]; s = qs4[12];
716             for(i=11;i>=0;i--) {
717                 r = z*r + qr4[i];
718                 s = z*s + qs4[i];
719             }
720         } else if(x> (1.0L/0.5625L)) {
721             r = qr5[12]; s = qs5[12];
```



```
722             for(i=11;i>=0;i--) {
723                 r = z*r + qr5[i];
724                 s = z*s + qs5[i];
725             }
726         } else {        /* assume x > 1.28 */
727             r = qr6[12]; s = qs6[12];
728             for(i=11;i>=0;i--) {
729                 r = z*r + qr6[i];
730                 s = z*s + qs6[i];
731             }
732         }
733         return t*(r/s);
734 }
```

```
**********************************************************
    6994 Sat May 10 12:09:07 2014
new/usr/src/lib/libm/common/Q/jnl.c
14071:dece9aafe99a - fix build problems on sparc
patch01 - 693 import Sun Devpro Math Library
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#if defined(ELFOBJ)
#pragma weak jnl = __jnl
#pragma weak ynl = __ynl
#endif

/*
 * floating point Bessel's function of the 1st and 2nd kind
 * of order n: jn(n,x),yn(n,x);
 *
 * Special cases:
 *      y0(0)=y1(0)=yn(n,0) = -inf with division by zero signal;
 *      y0(-ve)=y1(-ve)=yn(n,-ve) are NaN with invalid signal.
 * Note 2. About jn(n,x), yn(n,x)
 *      For n=0, j0(x) is called,
 *      for n=1, j1(x) is called,
 *      for n<x, forward recursion us used starting
 *      from values of j0(x) and j1(x).
 *      for n>x, a continued fraction approximation to
 *      j(n,x)/j(n-1,x) is evaluated and then backward
 *      recursion is used starting from a supposed value
 *      for j(n,x). The resulting value of j(0,x) is
 *      compared with the actual value to correct the
 *      supposed value of j(n,x).
 *
 *      yn(n,x) is similar in all respects, except
 *      that forward recursion is used for all
 *      values of n>1.
 *
 */

#include "libm.h"
```



```
#include "longdouble.h"
#include <float.h>      /* LDBL_MAX */

#define GENERIC long double

static const GENERIC
invsqrtpi= 5.641895835477562869480794515607725858441e-0001L,
two  = 2.0L,
zero = 0.0L,
one  = 1.0L;

GENERIC
jnl(n,x) int n; GENERIC x;{
        int i, sgn;
        GENERIC a, b, temp, z, w;

    /*
     * J(-n,x) = (-1)^n * J(n, x), J(n, -x) = (-1)^n * J(n, x)
     * Thus, J(-n,x) = J(n,-x)
     */
        if(n<0){
                n = -n;
                x = -x;
        }
        if(n==0) return(j0l(x));
        if(n==1) return(j1l(x));
        if(x!=x) return x+x;
        if((n&1)==0)
                sgn=0;                  /* even n */
        else
                sgn = signbitl(x);      /* old n  */
        x = fabsl(x);
        if(x == zero||!finitel(x)) b = zero;
        else if((GENERIC)n<=x) {        /* Safe to use
                                           J(n+1,x)=2n/x *J(n,x)-J(n-1,x)
                                         */
            if(x>1.0e91L) {     /* x >> n**2
                                    Jn(x) = cos(x-(2n+1)*pi/4)*sqrt(2/x*pi)
                                    Yn(x) = sin(x-(2n+1)*pi/4)*sqrt(2/x*pi)
                                    Let s=sin(x), c=cos(x),
                                        xn=x-(2n+1)*pi/4, sqt2 = sqrt(2),then

                                           n    sin(xn)*sqt2    cos(xn)*sqt2
                                        ----------------------------------
                                           0     s-c             c+s
                                           1    -s-c            -c+s
                                           2    -s+c            -c-s
                                           3     s+c             c-s
                                */
                switch(n&3) {
                    case 0: temp =  cosl(x)+sinl(x); break;
                    case 1: temp = -cosl(x)+sinl(x); break;
                    case 2: temp = -cosl(x)-sinl(x); break;
                    case 3: temp =  cosl(x)-sinl(x); break;
                }
                b = invsqrtpi*temp/sqrtl(x);
            } else {
                a = j0l(x);
                b = j1l(x);
                for(i=1;i<n;i++){
                    temp = b;
                    b = b*((GENERIC)(i+i)/x) - a; /* avoid underflow */
                    a = temp;
                }
            }
        } else {
```

```
127             if(x<1e-17L) {      /* use J(n,x) = 1/n!*(x/2)^n */
128                 b = powl(0.5L*x,(GENERIC) n);
129                 if (b!=zero) {
130                     for(a=one,i=1;i<=n;i++) a *= (GENERIC)i;
131                     b = b/a;
132                 }
133             } else {
134                 /* use backward recurrence */
135                 /*
136                  *                          x      x^2      x^2
137                  *  J(n,x)/J(n-1,x) =  ----   ------   ------   .....
138                  *                          2n  - 2(n+1) - 2(n+2)
139                  *
140                  *                          1      1        1
141                  *  (for large x)   =  ----  ------   ------   .....
142                  *                          2n   2(n+1)   2(n+2)
143                  *                          -- - ------ - ------ -
144                  *                           x     x         x
145                  *
146                  * Let w = 2n/x and h=2/x, then the above quotient
147                  * is equal to the continued fraction:
148                  *                     1
149                  *      = -----------------------
150                  *                    1
151                  *         w - -----------------
152                  *                       1
153                  *              w+h - ---------
154                  *                    w+2h - ...
155                  *
156                  * To determine how many terms needed, let
157                  * Q(0) = w, Q(1) = w(w+h) - 1,
158                  * Q(k) = (w+k*h)*Q(k-1) - Q(k-2),
159                  * When Q(k) > 1e4      good for single
160                  * When Q(k) > 1e9      good for double
161                  * When Q(k) > 1e17     good for quaduple
162                  */
163             /* determin k */
164                 GENERIC t,v;
165                 double q0,q1,h,tmp; int k,m;
166                 w  = (n+n)/(double)x; h = 2.0/(double)x;
167                 q0 = w;  z = w+h; q1 = w*z - 1.0; k=1;
168                 while(q1<1.0e17) {
169                         k += 1; z += h;
170                         tmp = z*q1 - q0;
171                         q0 = q1;
172                         q1 = tmp;
173                 }
174                 m = n+n;
175                 for(t=zero, i = 2*(n+k); i>=m; i -= 2) t = one/(i/x-t);
176                 a = t;
177                 b = one;
178                 /*
179                  * estimate log((2/x)^n*n!) = n*log(2/x)+n*ln(n)
180                  * hence, if n*(log(2n/x)) > ...
181                  *  single 8.8722839355e+01
182                  *  double 7.09782712893383973096e+02
183                  *  long double 1.13565234062941439494919310779707650060170e+04
184                  *  then recurrent value may overflow and the result is
185                  *  likely underflow to zero
186                  */
187                 tmp = n;
188                 v = two/x;
189                 tmp = tmp*logl(fabsl(v*tmp));
190                 if(tmp<1.13565234062941439494919310779707650e+04L) {
191                     for(i=n-1;i>0;i--){
192                         temp = b;
```



```
193                         b = ((i+i)/x)*b - a;
194                         a = temp;
195                     }
196                 } else {
197                     for(i=n-1;i>0;i--){
198                         temp = b;
199                         b = ((i+i)/x)*b - a;
200                         a = temp;
201                         if(b>1e1000L) {
202                             a /= b;
203                             t /= b;
204                             b  = 1.0;
205                         }
206                     }
207                 }
208                 b = (t*j0l(x)/b);
209             }
210         }
211         if(sgn==1) return -b; else return b;
212 }

214 GENERIC ynl(n,x)
215 int n; GENERIC x;{
216         int i;
217         int sign;
218         GENERIC a, b, temp;

220         if(x!=x) return x+x;
221         if (x <= zero) {
222                 if(x==zero)
223                         return -one/zero;
224                 else
225                         return zero/zero;
226         }
227         sign = 1;
228         if(n<0){
229                 n = -n;
230                 if((n&1) == 1) sign = -1;
231         }
232         if(n==0) return(y0l(x));
233         if(n==1) return(sign*y1l(x));
234         if(!finitel(x)) return zero;

236         if(x>1.0e91L) { /* x >> n**2
237                                     Jn(x) = cos(x-(2n+1)*pi/4)*sqrt(2/x*pi)
238                                     Yn(x) = sin(x-(2n+1)*pi/4)*sqrt(2/x*pi)
239                                     Let s=sin(x), c=cos(x),
240                                         xn=x-(2n+1)*pi/4, sqt2 = sqrt(2),then

242                                            n    sin(xn)*sqt2    cos(xn)*sqt2
243                                         ----------------------------------
244                                            0     s-c              c+s
245                                            1    -s-c             -c+s
246                                            2    -s+c             -c-s
247                                            3     s+c              c-s
248                                 */
249                 switch(n&3) {
250                     case 0: temp =  sinl(x)-cosl(x); break;
251                     case 1: temp = -sinl(x)-cosl(x); break;
252                     case 2: temp = -sinl(x)+cosl(x); break;
253                     case 3: temp =  sinl(x)+cosl(x); break;
254                 }
255                 b = invsqrtpi*temp/sqrtl(x);
256         } else {
257                 a = y0l(x);
258                 b = y1l(x);
```

```
259                 /*
260                  * fix 1262058 and take care of non-default rounding
261                  */
262                 for (i = 1; i < n; i++) {
263                         temp = b;
264                         b *= (GENERIC) (i + i) / x;
265                         if (b <= -LDBL_MAX)
266                                 break;
267                         b -= a;
268                         a = temp;
269                 }
270         }
271         if(sign>0) return b; else return -b;
272 }
```

```
**********************************************************
    1325 Sat May 10 12:09:07 2014
new/usr/src/lib/libm/common/Q/lgammal.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak lgammal = __lgammal

/*
 * long double lgammal(long double x);
 */

#include "libm.h"
#include "longdouble.h"

extern int signgam;
extern int signgaml;

long double
lgammal(long double x) {
        long double y = __k_lgammal(x, &signgaml);

        signgam = signgaml;     /* SUSv3 requires the setting of signgam */
        return (y);
}
```

```
**********************************************************
    1237 Sat May 10 12:09:07 2014
new/usr/src/lib/libm/common/Q/lgammal_r.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * long double lgammal_r(long double x, int *signgamlp);
 */

#pragma weak lgammal_r = __lgammal_r

#include "libm.h"
#include "longdouble.h"

long double
lgammal_r(long double x, int *signgamlp) {
        return (__k_lgammal(x, signgamlp));
}
```

```
**********************************************************
    3071 Sat May 10 12:09:07 2014
new/usr/src/lib/libm/common/Q/log10l.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak log10l = __log10l
#endif

/*
 * log10l(X)
 *
 * Method :
 *      Let log10_2hi = leading 98(SPARC)/49(x86) bits of log10(2) and
 *          log10_2lo = log10(2) - log10_2hi,
 *          ivln10   = 1/log(10) rounded.
 *      Then
 *              n = ilogb(x),
 *              if(n<0)  n = n+1;
 *              x = scalbn(x,-n);
 *              LOG10(x) := n*log10_2hi + (n*log10_2lo + ivln10*log(x))
 *
 * Note1:
 *      For fear of destroying log10(10**n)=n, the rounding mode is
 *      set to Round-to-Nearest.
 *
 * Special cases:
 *      log10(x) is NaN with signal if x < 0;
 *      log10(+INF) is +INF with no signal; log10(0) is -INF with signal;
 *      log10(NaN) is that NaN with no signal;
 *      log10(10**N) = N  for N=0,1,...,22.
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
```



```
 * shown.
 */

#include "libm.h"
#include "longdouble.h"

#if defined(__x86)
#define __swapRD        __swap87RD
#endif
extern enum fp_direction_type __swapRD(enum fp_direction_type);

static const long double
        zero      = 0.0L,
        ivln10    = 4.34294481903251827651128918916605082294e-0001L,
        one       = 1.0L,
#if defined(__x86)
        log10_2hi = 3.01029995663980365350198553642258048057e-01L,
        log10_2lo = 8.29863540341082234978710633729118358541e-16L;
#elif defined(__sparc)
        log10_2hi = 3.01029995663981195213738894724209860346e-01L,
        log10_2lo = 2.83166421308946816789666437195321094566e-31L;
#else
#error Unknown Architecture!
#endif

long double
log10l(long double x) {
        long double y, z;
        enum fp_direction_type rd;
        int n;

        if (!finitel(x))
                return (x + fabsl(x));  /* x is +-INF or NaN */
        else if (x > zero) {
                n = ilogbl(x);
                if (n < 0)
                        n += 1;
                rd = __swapRD(fp_nearest);
                y = n;
                x = scalbnl(x, -n);
                z = y * log10_2lo + ivln10 * logl(x);
                z += y * log10_2hi;
                if (rd != fp_nearest)
                        (void) __swapRD(rd);
                return (z);
        } else if (x == zero)   /* -INF */
                return (-one / zero);
        else                    /* x <0 , return NaN */
                return (zero / zero);
}
```

```
**********************************************************
    6978 Sat May 10 12:09:07 2014
new/usr/src/lib/libm/common/Q/log1pl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#ifdef __LITTLE_ENDIAN
#define H0(x)   *(3 + (int *) &x)
#define H1(x)   *(2 + (int *) &x)
#define H2(x)   *(1 + (int *) &x)
#define H3(x)   *(int *) &x
#else
#define H0(x)   *(int *) &x
#define H1(x)   *(1 + (int *) &x)
#define H2(x)   *(2 + (int *) &x)
#define H3(x)   *(3 + (int *) &x)
#endif

/*
 * log1pl(x)
 * Table look-up algorithm by modifying logl.c
 * By K.C. Ng, July 6, 1995
 *
 * (a). For 1+x in [31/33,33/31], using a special approximation:
 *      s = x/(2.0+x);  ... here |s| <= 0.03125
 *      z = s*s;
 *      return x-s*(x-z*(B1+z*(B2+z*(B3+z*(B4+...+z*B9)...))));
 *      (i.e., x is in [-2/33,2/31])
 *
 * (b). Otherwise, normalize 1+x = 2^n * 1.f.
 *      Here we may need a correction term for 1+x rounded.
 *      Use a 6-bit table look-up: find a 6 bit g that match f to 6.5 bits,
 *      then
 *          log(1+x) = n*ln2 + log(1.g) + log(1.f/1.g).
 *      Here the leading and trailing values of log(1.g) are obtained from
 *      a size-64 table.
 *      For log(1.f/1.g), let s = (1.f-1.g)/(1.f+1.g). Note that
 *              1.f = 2^-n(1+x)
```



```
 *
 *      then
 *          log(1.f/1.g) = log((1+s)/(1-s)) = 2s + 2/3 s^3 + 2/5 s^5 +...
 *      Note that |s|<2**-8=0.00390625. We use an odd s-polynomial
 *      approximation to compute log(1.f/1.g):
 *              s*(A1+s^2*(A2+s^2*(A3+s^2*(A4+s^2*(A5+s^2*(A6+s^2*A7))))))
 *      (Precision is 2**-136.91 bits, absolute error)
 *
 *      CAUTION:
 *      For x>=1, compute 1+x will lost one bit (OK).
 *      For x in [-0.5,-1), 1+x is exact.
 *      For x in (-0.5,-2/33]U[2/31,1), up to 4 last bits of x will be lost
 *      in 1+x.  Therefore, to recover the lost bits, one need to compute
 *      1.f-1.g accurately.
 *
 *      Let hx = HI(x), m = (hx>>16)-0x3fff (=ilogbl(x)), note that
 *              -2/33 = -0.0606...= 2^-5 * 1.939...,
 *               2/31 =  0.09375  = 2^-4 * 1.500...,
 *      so for x in (-0.5,-2/33], -5<=m<=-2,  n= -1, 1+f=2*(1+x)
 *         for x in [2/33,1),     -4<=m<=-1,  n=  0, f=x
 *
 *      In short:
 *      if x>0, let g: hg= ((hx + (0x200<<(-m)))>>(10-m))<<(10-m)
 *      then 1.f-1.g = x-g
 *      if x<0, let g': hg' =((ix-(0x200)<<(-m-1))>>(9-m))<<(9-m)
 *      (ix=hx&0x7fffffff)
 *      then 1.f-1.g = 2*(g'+x),
 *
 * (c). The final result is computed by
 *              (n*ln2_hi+_TBL_logl_hi[j]) +
 *                      ( (n*ln2_lo+_TBL_logl_lo[j]) + s*(A1+...) )
 *
 * Note.
 *      For ln2_hi and _TBL_logl_hi[j], we force their last 32 bit to be zero
 *      so that n*ln2_hi + _TBL_logl_hi[j] is exact. Here
 *      _TBL_logl_hi[j] + _TBL_logl_lo[j] match log(1+j*2**-6) to 194 bits
 *
 *
 * Special cases:
 *      log(x) is NaN with signal if x < 0 (including -INF) ;
 *      log(+INF) is +INF; log(0) is -INF with signal;
 *      log(NaN) is that NaN with no signal.
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */

#pragma weak log1pl = __log1pl

#include "libm.h"

extern const long double _TBL_logl_hi[], _TBL_logl_lo[];

static const long double
zero    =   0.0L,
one     =   1.0L,
two     =   2.0L,
ln2hi   =   6.93147180559945309417231954749584485020 3e-0001L,
ln2lo   =   1.66708592083055220889044933040037975416 9e-0025L,
A1      =   2.00000000000000000000000000000000000024e+0000L,
A2      =   6.66666666666666666666666666666091393804e-0001L,
A3      =   4.00000000000000000000000407167070220671e-0001L,
A4      =   2.85714285714285714273007749061290368116 4e-0001L,
```

```
A5      =   2.22222222222224257770283692081288260509 9e-0001L,
A6      =   1.81818181643549339598591266710588582835 6e-0001L,
A7      =   1.53853783521183975111206751280549693172 5e-0001L,
B1      =   6.66666666666666666666666666666961498329 e-0001L,
B2      =   3.99999999999999999999999900375504235 8e-0001L,
B3      =   2.85714285714285714285727342642834745791 8e-0001L,
B4      =   2.22222222222222221353229049747910109566 e-0001L,
B5      =   1.81818181818182150353255930630907013804 6e-0001L,
B6      =   1.53846153845380921048635608458735678855 6e-0001L,
B7      =   1.33333334446335875612145689264517879548 0e-0001L,
B8      =   1.17646090478389906485464517460336038379 2e-0001L,
B9      =   1.05729386995659899532636860251805699074 6e-0001L;

long double
log1pl(long double x) {
        long double f, s, z, qn, h, t, y, g;
        int i, j, ix, iy, n, hx, m;

        hx = H0(x);
        ix = hx & 0x7fffffff;
        if (ix < 0x3ffaf07c) {  /* |x|<2/33 */
                if (ix <= 0x3f8d0000) { /* x <= 2**-114, return x */
                        if ((int) x == 0)
                                return (x);
                }
                s = x / (two + x);      /* |s|<2**-8 */
                z = s * s;
                return (x - s * (x - z * (B1 + z * (B2 + z * (B3 + z * (B4 +
                    z * (B5 + z * (B6 + z * (B7 + z * (B8 + z * B9)))))))));
        }
        if (ix >= 0x7fff0000) { /* x is +inf or NaN */
                return (x + fabsl(x));
        }
        if (hx < 0 && ix >= 0x3fff0000) {
                if (ix > 0x3fff0000 || (H1(x) | H2(x) | H3(x)) != 0)
                        x = zero;
                return (x / zero);      /* log1p(x) is NaN  if x<-1 */
                /* log1p(-1) is -inf */
        }
        if (ix >= 0x7feeffff)
                y = x;          /* avoid spurious overflow */
        else
                y = one + x;
        iy = H0(y);
        n = ((iy + 0x200) >> 16) - 0x3fff;
        iy = (iy & 0x0000ffff) | 0x3fff0000;    /* scale 1+x to [1,2] */
        H0(y) = iy;
        z = zero;
        m = (ix >> 16) - 0x3fff;
        /* HI(1+x) = (((hx&0xffff)|0x10000)>>(-m))|0x3fff0000 */
        if (n == 0) {           /* x in [2/33,1) */
                g = zero;
                H0(g) = ((hx + (0x200 << (-m))) >> (10 - m)) << (10 - m);
                t = x - g;
                i = (((((hx & 0xffff) | 0x10000) >> (-m)) | 0x3fff0000) +
                        0x200) >> 10;
                H0(z) = i << 10;

        } else if ((1 + n) == 0 && (ix < 0x3ffe0000)) { /* x in (-0.5,-2/33] */
                g = zero;
                H0(g) = ((ix + (0x200 << (-m - 1))) >> (9 - m)) << (9 - m);
                t = g + x;
                t = t + t;
                /*
                 * HI(2*(1+x)) =
                 * ((0x10000-(((hx&0xffff)|0x10000)>>(-m)))<<1)|0x3fff0000
```



```
                 */
                /*
                 * i =
                 * ((((0x10000-(((hx&0xffff)|0x10000)>>(-m)))<<1)|0x3fff0000)+
                 * 0x200)>>10; H0(z)=i<<10;
                 */
                z = two * (one - g);
                i = H0(z) >> 10;
        } else {
                i = (iy + 0x200) >> 10;
                H0(z) = i << 10;
                t = y - z;
        }

        s = t / (y + z);
        j = i & 0x3f;
        z = s * s;
        qn = (long double) n;
        t = qn * ln2lo + _TBL_logl_lo[j];
        h = qn * ln2hi + _TBL_logl_hi[j];
        f = t + s * (A1 + z * (A2 + z * (A3 + z * (A4 + z * (A5 + z * (A6 +
                z * A7))))));
        return (h + f);
}
```

```
**********************************************************
    1605 Sat May 10 12:09:07 2014
new/usr/src/lib/libm/common/Q/log2l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * log2l(x)
 * RETURN THE BASE 2 LOGARITHM OF X
 *
 * Method:
 *      purge off 0,INF, and NaN.
 *      n = ilogb(x)
 *      if(n<0) n+=1
 *      z = scalbn(x,-n)
 *      LOG2(x) = n + (1/ln2)*log(x)
 */

#pragma weak log2l = __log2l

#include "libm.h"
#include "longdouble.h"

static const long double
        zero    = 0.0L,
        half    = 0.5L,
        one     = 1.0L,
        invln2  = 1.44269504088896340735992468100189213742 7e+0000L;

long double
log2l(long double x) {
        int n;

        if (x == zero || !finitel(x))
                return (logl(x));
        n = ilogbl(x);
        if (n < 0)
                n += 1;
```



```
        x = scalbnl(x, -n);
        if (x == half)
                return (n - one);
        return (n + invln2 * logl(x));
}
```

```
**********************************************************
    2481 Sat May 10 12:09:07 2014
new/usr/src/lib/libm/common/Q/logbl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak logbl = __logbl
#endif

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */
#define _C99SUSv3_logb  _C99SUSv3_logb_subnormal_is_like_ilogb

#if defined(__sparc)
#define ISNORMALL(k, x) (k != 0x7fff)                   /* assuming k != 0 */
#define X86PDNRM(k, x)
#define XSCALE_OFFSET   0x406f                          /* 0x3fff + 112 */
static const long double xscale = 5192296858534827628530496329220096.0L;
                                                        /* 2^112 */
#elif defined(__x86)
/*
 * if pseudo-denormal, replace by the equivalent normal
 */
#define X86PDNRM(k, x)  if (k == 0 && (((int *) &x)[1] & 0x80000000) != 0) \
                            ((int *) &x)[2] |= k = 1
#if defined(HANDLE_UNSUPPORTED)                         /* assuming k != 0 */
#define ISNORMALL(k, x) (k != 0x7fff && (((int *) &x)[1] & 0x80000000) != 0)
#else
#define ISNORMALL(k, x) (k != 0x7fff)
#endif
#define XSCALE_OFFSET   0x403e                          /* 0x3fff + 63 */
static const long double xscale = 9223372036854775808.0L;       /* 2^63 */
#endif

static long double
raise_division(long double v) {
```



```
#pragma STDC FENV_ACCESS ON
        static const long double zero = 0.0L;
        return (v / zero);
}

long double
logbl(long double x) {
        int k = XBIASED_EXP(x);

        X86PDNRM(k, x);
        if (k == 0) {
                if (ISZEROL(x))
                        return (raise_division(-1.0L));
                else if ((__xpg6 & _C99SUSv3_logb) != 0) {
                        x *= xscale;            /* scale up by 2^112 or 2^63 */
                        return (long double) (XBIASED_EXP(x) - XSCALE_OFFSET);
                } else
                        return (-16382.L);
        } else if (ISNORMALL(k, x))
                return ((long double) (k - 0x3fff));
        else
                return (x * x);
}
```

```
**********************************************************
    5512 Sat May 10 12:09:07 2014
new/usr/src/lib/libm/common/Q/logl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */
/*
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 */

#pragma weak logl = __logl

/*
 * logl(x)
 * Table look-up algorithm
 * By K.C. Ng, March 6, 1989
 *
 * (a). For x in [31/33,33/31], using a special approximation:
 *      f = x - 1;
 *      s = f/(2.0+f);  ... here |s| <= 0.03125
 *      z = s*s;
 *      return f-s*(f-z*(B1+z*(B2+z*(B3+z*(B4+...+z*B9)...))));
 *
 * (b). Otherwise, normalize x = 2^n * 1.f.
 *      Use a 6-bit table look-up: find a 6 bit g that match f to 6.5 bits,
 *      then
 *          log(x) = n*ln2 + log(1.g) + log(1.f/1.g).
 *      Here the leading and trailing values of log(1.g) are obtained from
 *      a size-64 table.
 *      For log(1.f/1.g), let s = (1.f-1.g)/(1.f+1.g), then
 *          log(1.f/1.g) = log((1+s)/(1-s)) = 2s + 2/3 s^3 + 2/5 s^5 +...
 *      Note that |s|<2**-8=0.00390625. We use an odd s-polynomial
 *      approximation to compute log(1.f/1.g):
 *              s*(A1+s^2*(A2+s^2*(A3+s^2*(A4+s^2*(A5+s^2*(A6+s^2*A7))))))
 *      (Precision is 2**-136.91 bits, absolute error)
 *
 * (c). The final result is computed by
 *              (n*ln2_hi+_TBL_logl_hi[j]) +
 *                      ( (n*ln2_lo+_TBL_logl_lo[j]) + s*(A1+...) )
 *
 * Note.
 *      For ln2_hi and _TBL_logl_hi[j], we force their last 32 bit to be zero
```



```
 *      so that n*ln2_hi + _TBL_logl_hi[j] is exact. Here
 *      _TBL_logl_hi[j] + _TBL_logl_lo[j] match log(1+j*2**-6) to 194 bits
 *
 *
 * Special cases:
 *      log(x) is NaN with signal if x < 0 (including -INF) ;
 *      log(+INF) is +INF; log(0) is -INF with signal;
 *      log(NaN) is that NaN with no signal.
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */

#include "libm.h"

extern const long double _TBL_logl_hi[], _TBL_logl_lo[];

static const long double
        zero    =   0.0L,
        one     =   1.0L,
        two     =   2.0L,
        two113  =   10384593717069655257060992658440192.0L,
        ln2hi   =   6.93147180559945309417231954749584485020 3e-0001L,
        ln2lo   =   1.66708592083055220889044933040037975416 9e-0025L,
        A1      =   2.00000000000000000000000000000000000024e+0000L,
        A2      =   6.66666666666666666666666666666091393804e-0001L,
        A3      =   4.00000000000000000000000407167070220671e-0001L,
        A4      =   2.85714285714285714273007749061290368116 4e-0001L,
        A5      =   2.22222222222224257770283692081288260509 9e-0001L,
        A6      =   1.81818181643549339598591266710588582835 6e-0001L,
        A7      =   1.53853783521183975111206751280549693172 5e-0001L,
        B1      =   6.66666666666666666666666666666961498329e-0001L,
        B2      =   3.99999999999999999999999900376550423 58e-0001L,
        B3      =   2.85714285714285714285727342642834745791 8e-0001L,
        B4      =   2.22222222222222221353229049747910109566e-0001L,
        B5      =   1.81818181818182150353255930630907013804 6e-0001L,
        B6      =   1.53846153845380921048635608458735678855 6e-0001L,
        B7      =   1.33333334446335875612145689264517879548 0e-0001L,
        B8      =   1.17646090478389906485464517460336038379 2e-0001L,
        B9      =   1.05729386995659899532636860251805699074 6e-0001L;

long double
logl(long double x) {
        long double f, s, z, qn, h, t;
        int *px = (int *) &x;
        int *pz = (int *) &z;
        int i, j, ix, i0, i1, n;

        /* get long double precision word ordering */
        if (*(int *) &one == 0) {
                i0 = 3;
                i1 = 0;
        } else {
                i0 = 0;
                i1 = 3;
        }

        n = 0;
        ix = px[i0];
        if (ix > 0x3ffee0f8) {  /* if x >  31/33 */
                if (ix < 0x3fff1084) {  /* if x < 33/31 */
                        f = x - one;
                        z = f * f;
```

```
128                     if (((ix - 0x3fff0000) | px[i1] | px[2] | px[1]) == 0) {
129                             return (zero);  /* log(1)= +0 */
130                     }
131                     s = f / (two + f);      /* |s|<2**-8 */
132                     z = s * s;
133                     return (f - s * (f - z * (B1 + z * (B2 + z * (B3 +
134                             z * (B4 + z * (B5 + z * (B6 + z * (B7 +
135                             z * (B8 + z * B9)))))))));
136             }
137             if (ix >= 0x7fff0000)
138                     return (x + x); /* x is +inf or NaN */
139             goto LARGE_N;
140     }
141     if (ix >= 0x00010000)
142             goto LARGE_N;
143     i = ix & 0x7fffffff;
144     if ((i | px[i1] | px[2] | px[1]) == 0) {
145             px[i0] |= 0x80000000;
146             return (one / x);       /* log(0.0) = -inf */
147     }
148     if (ix < 0) {
149             if ((unsigned) ix >= 0xffff0000)
150                     return (x - x); /* x is -inf or NaN */
151             return (zero / zero);   /* log(x<0) is NaN  */
152     }
153     /* subnormal x */
154     x *= two113;
155     n = -113;
156     ix = px[i0];
157 LARGE_N:
158     n += ((ix + 0x200) >> 16) - 0x3fff;
159     ix = (ix & 0x0000ffff) | 0x3fff0000;    /* scale x to [1,2] */
160     px[i0] = ix;
161     i = ix + 0x200;
162     pz[i0] = i & 0xfffffc00;
163     pz[i1] = pz[1] = pz[2] = 0;
164     s = (x - z) / (x + z);
165     j = (i >> 10) & 0x3f;
166     z = s * s;
167     qn = (long double) n;
168     t = qn * ln2lo + _TBL_logl_lo[j];
169     h = qn * ln2hi + _TBL_logl_hi[j];
170     f = t + s * (A1 + z * (A2 + z * (A3 + z * (A4 + z * (A5 +
171             z * (A6 + z * A7))))));
172     return (h + f);
173 }
```

```
**********************************************************
    6387 Sat May 10 12:09:08 2014
new/usr/src/lib/libm/common/Q/longdouble.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#include <sys/ieeefp.h>

extern long double __k_cosl(long double, long double);
extern long double __k_lgammal(long double, int *);
extern long double __k_sincosl(long double, long double, long double *);
extern long double __k_sinl(long double, long double);
extern long double __k_tanl(long double, long double, int);
extern long double __poly_libmq(long double, int, const long double *);
extern int __rem_pio2l(long double, long double *);

extern long double acosdl(long double);
extern long double acoshl(long double);
extern long double acosl(long double);
extern long double acospil(long double);
extern long double acospl(long double);
extern long double aintl(long double);
extern long double anintl(long double);
extern long double annuityl(long double, long double);
extern long double asindl(long double);
extern long double asinhl(long double);
extern long double asinl(long double);
extern long double asinpil(long double);
extern long double asinpl(long double);
extern long double atan2dl(long double, long double);
extern long double atan2l(long double, long double);
extern long double atan2pil(long double, long double);
extern long double atandl(long double);
extern long double atanhl(long double);
extern long double atanl(long double);
extern long double atanpil(long double);
extern long double atanpl(long double);
extern long double cbrtl(long double);
```



```
extern long double ceill(long double);
extern long double compoundl(long double, long double);
extern long double copysignl(long double, long double);
extern long double cosdl(long double);
extern long double coshl(long double);
extern long double cosl(long double);
extern long double cospil(long double);
extern long double cospl(long double);
extern long double erfcl(long double);
extern long double erfl(long double);
extern long double exp10l(long double);
extern long double exp2l(long double);
extern long double expl(long double);
extern long double expm1l(long double);
extern long double fabsl(long double);
extern int finitel(long double);
extern long double floorl(long double);
extern long double fmodl(long double, long double);
extern enum fp_class_type fp_classl(long double);
extern long double gammal(long double);
extern long double hypotl(long double, long double);
extern int ilogbl(long double);
extern long double infinityl(void);
extern int irintl(long double);
extern int isinfl(long double);
extern int isnanl(long double);
extern int isnormall(long double);
extern int issubnormall(long double);
extern int iszerol(long double);
extern long double j0l(long double);
extern long double j1l(long double);
extern long double jnl(int, long double);
extern long double lgammal(long double);
extern long double log10l(long double);
extern long double log1pl(long double);
extern long double log2l(long double);
extern long double logbl(long double);
extern long double logl(long double);
extern long double max_normall(void);
extern long double max_subnormall(void);
extern long double min_normall(void);
extern long double min_subnormall(void);
extern long double nextafterl(long double, long double);
extern int nintl(long double);
extern long double pow_li(long double *, int *);
extern long double powl(long double, long double);
extern long double quiet_nanl(long);
extern long double remainderl(long double, long double);
extern long double rintl(long double);
extern long double scalbl(long double, long double);
extern long double scalbnl(long double, int);
extern long double signaling_nanl(long);
extern int signbitl(long double);
extern long double significandl(long double);
extern void sincosdl(long double, long double *, long double *);
extern void sincosl(long double, long double *, long double *);
extern void sincospil(long double, long double *, long double *);
extern void sincospl(long double, long double *, long double *);
extern long double sindl(long double);
extern long double sinhl(long double);
extern long double sinl(long double);
extern long double sinpil(long double);
extern long double sinpl(long double);
extern long double sqrtl(long double);
extern long double tandl(long double);
extern long double tanhl(long double);
```

```
128 extern long double tanl(long double);
129 extern long double tanpil(long double);
130 extern long double tanpl(long double);
131 extern long double y0l(long double);
132 extern long double y1l(long double);
133 extern long double ynl(int, long double);

135 extern long double q_copysign_(long double *, long double *);
136 extern long double q_fabs_(long double *);
137 extern int iq_finite_(long double *);
138 extern long double q_fmod_(long double *, long double *);
139 extern enum fp_class_type iq_fp_class_(long double *);
140 extern int iq_ilogb_(long double *);
141 extern long double q_infinity_(void);
142 extern int iq_isinf_(long double *);
143 extern int iq_isnan_(long double *);
144 extern int iq_isnormal_(long double *);
145 extern int iq_issubnormal_(long double *);
146 extern int iq_iszero_(long double *);
147 extern long double q_max_normal_(void);
148 extern long double q_max_subnormal_(void);
149 extern long double q_min_normal_(void);
150 extern long double q_min_subnormal_(void);
151 extern long double q_nextafter_(long double *, long double *);
152 extern long double q_quiet_nan_(long *);
153 extern long double q_remainder_(long double *, long double *);
154 extern long double q_scalbn_(long double *, int *);
155 extern long double q_signaling_nan_(long *);
156 extern int iq_signbit_(long double *);
```

```
**********************************************************
    2759 Sat May 10 12:09:08 2014
new/usr/src/lib/libm/common/Q/nextafterl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak nextafterl = __nextafterl
#endif

#include "libm.h"
#include <float.h>              /* LDBL_MAX, LDBL_MIN */

#if defined(__sparc)
#define n0      0
#define n1      1
#define n2      2
#define n3      3
#define X86PDNRM1(x)
#define INC(px) { \
                        if (++px[n3] == 0) \
                                if (++px[n2] == 0) \
                                        if (++px[n1] == 0) \
                                                ++px[n0]; \
                }
#define DEC(px) { \
                        if (--px[n3] == 0xffffffff) \
                                if (--px[n2] == 0xffffffff) \
                                        if (--px[n1] == 0xffffffff) \
                                                --px[n0]; \
                }
#elif defined(__x86)
#define n0      2
#define n1      1
#define n2      0
#define n3      0
/*
```



```
 * if pseudo-denormal, replace by the equivalent normal
 */
#define X86PDNRM1(x)    if (XBIASED_EXP(x) == 0 && (((int *) &x)[1] & \
                                0x80000000) != 0) \
                                ((int *) &x)[2] |= 1
#define INC(px) { \
                        if (++px[n2] == 0) \
                                if ((++px[n1] & ~0x80000000) == 0) \
                                        px[n1] = 0x80000000, ++px[n0]; \
                }
#define DEC(px) { \
                        if (--px[n2] == 0xffffffff) \
                                if (--px[n1] == 0x7fffffff) \
                                        if ((--px[n0] & 0x7fff) != 0) \
                                                px[n1] |= 0x80000000; \
                }
#endif

long double
nextafterl(long double x, long double y) {
        int *px = (int *) &x;
        int *py = (int *) &y;

        if (x == y)
                return (y);             /* C99 requirement */
        if (x != x || y != y)
                return (x * y);

        if (ISZEROL(x)) {       /* x == 0.0 */
                px[n0] = py[n0] & XSGNMSK;
                px[n1] = px[n2] = 0;
                px[n3] = 1;
        } else {
                X86PDNRM1(x);
                if ((px[n0] & XSGNMSK) == 0) {  /* x > 0.0 */
                        if (x > y)      /* x > y */
                                DEC(px)
                        else
                                INC(px)
                } else {
                        if (x < y)      /* x < y */
                                DEC(px)
                        else
                                INC(px)
                }
        }
#ifndef lint
        {
                volatile long double dummy;
                int k = XBIASED_EXP(x);

                if (k == 0)
                        dummy = LDBL_MIN * copysignl(LDBL_MIN, x);
                else if (k == 0x7fff)
                        dummy = LDBL_MAX * copysignl(LDBL_MAX, x);
        }
#endif
        return (x);
}
```

```
**********************************************************
    9180 Sat May 10 12:09:08 2014
new/usr/src/lib/libm/common/Q/powl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak powl = __powl
#endif

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */
#define _C99SUSv3_pow   _C99SUSv3_pow_treats_Inf_as_an_even_int

#if defined(__sparc)
#define i0      0
#define i1      1
#define i2      2
#define i3      3

static const long double zero = 0.0L, one = 1.0L, two = 2.0L;

extern const long double _TBL_logl_hi[], _TBL_logl_lo[];

static const long double
        two113 = 10384593717069655257060992658440192.0L,
        ln2hi = 6.9314718055994530941723195474958448502 03e-0001L,
        ln2lo = 1.6670859208305522088904493304003797541 69e-0025L,
        A2 = 6.6666666666666666666666666666666091393804e-0001L,
        A3 = 4.0000000000000000000000004071670702206 71e-0001L,
        A4 = 2.8571428571428571427300774906129036811 64e-0001L,
        A5 = 2.2222222222222425777028369208128826050 99e-0001L,
        A6 = 1.8181818164354933959859126671058858283 56e-0001L,
        A7 = 1.5385378352118397511120675128054969317 25e-0001L,
        B1 = 6.6666666666666666666666666666666667787e-0001L,
        B2 = 3.9999999999999999999999999999848524411e-0001L,
        B3 = 2.8571428571428571428571428650845810750 70e-0001L,
        B4 = 2.2222222222222222222220107818006438084 97e-0001L,
```



```
        B5 = 1.8181818181818181850514421713370364036 74e-0001L,
        B6 = 1.5384615384615083635407202862920082076 73e-0001L,
        B7 = 1.3333333335067318420331806383293171084 28e-0001L,
        B8 = 1.1764699845874188906343027882839467616 70e-0001L,
        B9 = 1.0537948915614523317229699015648624971 32e-0001L;

static long double
logl_x(long double x, long double *w) {
        long double f, f1, v, s, z, qn, h, t;
        int *px = (int *) &x;
        int *pz = (int *) &z;
        int i, j, ix, n;

        n = 0;
        ix = px[i0];
        if (ix > 0x3ffef03f && ix < 0x3fff0820) {       /* 65/63 > x > 63/65 */
                f = x - one;
                z = f * f;
                if (((ix - 0x3fff0000) | px[i1] | px[i2] | px[i3]) == 0) {
                        *w = zero;
                        return (zero);  /* log(1)= +0 */
                }
                qn = one / (two + f);
                s = f * qn;     /* |s|<2**-6 */
                v = s * s;
                h = (long double) (2.0 * (double) s);
                f1 = (long double) ((double) f);
                t = ((two * (f - h) - h * f1) - h * (f - f1)) * qn +
                        s * (v * (B1 + v * (B2 + v * (B3 + v * (B4 +
                        v * (B5 + v * (B6 + v * (B7 + v * (B8 + v * B9)))))))));
                s = (long double) ((double) (h + t));
                *w = t - (s - h);
                return (s);
        }
        if (ix < 0x00010000) {  /* subnormal x */
                x *= two113;
                n = -113;
                ix = px[i0];
        }
        /* LARGE_N */
        n += ((ix + 0x200) >> 16) - 0x3fff;
        ix = (ix & 0x0000ffff) | 0x3fff0000;    /* scale x to [1,2] */
        px[i0] = ix;
        i = ix + 0x200;
        pz[i0] = i & 0xfffffc00;
        pz[i1] = pz[i2] = pz[i3] = 0;
        qn = one / (x + z);
        f = x - z;
        s = f * qn;
        f1 = (long double) ((double) f);
        h = (long double) (2.0 * (double) s);
        t = qn * ((two * (f - z * h) - h * f1) - h * (f - f1));
        j = (i >> 10) & 0x3f;
        v = s * s;
        qn = (long double) n;
        t += qn * ln2lo + _TBL_logl_lo[j];
        t += s * (v * (A2 + v * (A3 + v * (A4 + v * (A5 + v * (A6 +
                v * A7))))));
        v = qn * ln2hi + _TBL_logl_hi[j];
        s = h + v;
        t += (h - (s - v));
        z = (long double) ((double) (s + t));
        *w = t - (z - s);
        return (z);
}
```

```
128 extern const long double _TBL_expl_hi[], _TBL_expl_lo[];
129 static const long double
130         invln2_32 = 4.61662413084468290355175897920605483976 5e+1L,
131         ln2_32hi = 2.16608493924982909192884985859245151568 8e-2L,
132         ln2_32lo = 5.20964350259547565278265415750118673177 9e-27L,
133         ln2_64 = 1.08304246962491454596442518977840089856 8e-2L;

135 long double
136 powl(long double x, long double y) {
137         long double z, ax;
138         long double y1, y2, w1, w2;
139         int sbx, sby, j, k, yisint, m;
140         int hx, lx, hy, ly, ahx, ahy;
141         int *pz = (int *) &z;
142         int *px = (int *) &x;
143         int *py = (int *) &y;

145         hx = px[i0];
146         lx = px[i1] | px[i2] | px[i3];
147         hy = py[i0];
148         ly = py[i1] | py[i2] | py[i3];
149         ahx = hx & ~0x80000000;
150         ahy = hy & ~0x80000000;

152         if ((ahy | ly) == 0)
153                 return (one);           /* x**+-0 = 1 */
154         else if (hx == 0x3fff0000 && lx == 0 &&
155                 (__xpg6 & _C99SUSv3_pow) != 0)
156                 return (one);           /* C99: 1**anything = 1 */
157         else if (ahx > 0x7fff0000 || (ahx == 0x7fff0000 && lx != 0) ||
158                 ahy > 0x7fff0000 || (ahy == 0x7fff0000 && ly != 0))
159                 return (x + y);         /* +-NaN return x+y */
160                                         /* includes Sun: 1**NaN = NaN */
161         sbx = (unsigned) hx >> 31;
162         sby = (unsigned) hy >> 31;
163         ax = fabsl(x);
164         /*
165          * determine if y is an odd int when x < 0
166          * yisint = 0 ... y is not an integer
167          * yisint = 1 ... y is an odd int
168          * yisint = 2 ... y is an even int
169          */
170         yisint = 0;
171         if (sbx) {
172                 if (ahy >= 0x40700000)  /* if |y|>=2**113 */
173                         yisint = 2;     /* even integer y */
174                 else if (ahy >= 0x3fff0000) {
175                         k = (ahy >> 16) - 0x3fff;       /* exponent */
176                         if (k > 80) {
177                                 j = ((unsigned) py[i3]) >> (112 - k);
178                                 if ((j << (112 - k)) == py[i3])
179                                         yisint = 2 - (j & 1);
180                         } else if (k > 48) {
181                                 j = ((unsigned) py[i2]) >> (80 - k);
182                                 if ((j << (80 - k)) == py[i2])
183                                         yisint = 2 - (j & 1);
184                         } else if (k > 16) {
185                                 j = ((unsigned) py[i1]) >> (48 - k);
186                                 if ((j << (48 - k)) == py[i1])
187                                         yisint = 2 - (j & 1);
188                         } else if (ly == 0) {
189                                 j = ahy >> (16 - k);
190                                 if ((j << (16 - k)) == ahy)
191                                         yisint = 2 - (j & 1);
192                         }
193                 }
```



```
194         }

196         /* special value of y */
197         if (ly == 0) {
198                 if (ahy == 0x7fff0000) {        /* y is +-inf */
199                         if (((ahx - 0x3fff0000) | lx) == 0) {
200                                 if ((__xpg6 & _C99SUSv3_pow) != 0)
201                                         return (one);
202                                         /* C99: (-1)**+-inf = 1 */
203                                 else
204                                         return (y - y);
205                                         /* Sun: (+-1)**+-inf = NaN */
206                         } else if (ahx >= 0x3fff0000)
207                                         /* (|x|>1)**+,-inf = inf,0 */
208                                 return (sby == 0 ? y : zero);
209                         else            /* (|x|<1)**-,+inf = inf,0 */
210                                 return (sby != 0 ? -y : zero);
211                 } else if (ahy == 0x3fff0000) { /* y is +-1 */
212                         if (sby != 0)
213                                 return (one / x);
214                         else
215                                 return (x);
216                 } else if (hy == 0x40000000)    /* y is 2 */
217                         return (x * x);
218                 else if (hy == 0x3ffe0000) {    /* y is 0.5 */
219                         if (!((ahx | lx) == 0 || ((ahx - 0x7fff0000) | lx) ==
220                                 0))
221                                 return (sqrtl(x));
222                 }
223         }

225         /* special value of x */
226         if (lx == 0) {
227                 if (ahx == 0x7fff0000 || ahx == 0 || ahx == 0x3fff0000) {
228                                                 /* x is +-0,+-inf,+-1 */
229                         z = ax;
230                         if (sby == 1)
231                                 z = one / z;    /* z = 1/|x| if y is negative */
232                         if (sbx == 1) {
233                                 if (ahx == 0x3fff0000 && yisint == 0)
234                                         z = zero / zero;
235                                         /* (-1)**non-int is NaN */
236                                 else if (yisint == 1)
237                                         z = -z; /* (x<0)**odd = -(|x|**odd) */
238                         }
239                         return (z);
240                 }
241         }

243         /* (x<0)**(non-int) is NaN */
244         if (sbx == 1 && yisint == 0)
245                 return (zero / zero);   /* should be volatile */

247         /* Now ax is finite, y is finite */
248         /* first compute log(ax) = w1+w2, with 53 bits w1 */
249         w1 = logl_x(ax, &w2);

251         /* split up y into y1+y2 and compute (y1+y2)*(w1+w2) */
252         if (ly == 0 || ahy >= 0x43fe0000) {
253                 y1 = y * w1;
254                 y2 = y * w2;
255         } else {
256                 y1 = (long double) ((double) y);
257                 y2 = (y - y1) * w1 + y * w2;
258                 y1 *= w1;
259         }
```

```
260         z = y1 + y2;
261         j = pz[i0];
262         if ((unsigned) j >= 0xffff0000) {               /* NaN or -inf */
263                 if (sbx == 1 && yisint == 1)
264                         return (one / z);
265                 else
266                         return (-one / z);
267         } else if ((j & ~0x80000000) < 0x3fc30000) {    /* |x|<2^-60 */
268                 if (sbx == 1 && yisint == 1)
269                         return (-one - z);
270                 else
271                         return (one + z);
272         } else if (j > 0) {
273                 if (j > 0x400d0000) {
274                         if (sbx == 1 && yisint == 1)
275                                 return (scalbnl(-one, 20000));
276                         else
277                                 return (scalbnl(one, 20000));
278                 }
279                 k = (int) (invln2_32 * (z + ln2_64));
280         } else {
281                 if ((unsigned) j > 0xc00d0000) {
282                         if (sbx == 1 && yisint == 1)
283                                 return (scalbnl(-one, -20000));
284                         else
285                                 return (scalbnl(one, -20000));
286                 }
287                 k = (int) (invln2_32 * (z - ln2_64));
288         }
289         j = k & 0x1f;
290         m = k >> 5;
291         {
292                 /* rational approximation coeffs for [-(ln2)/64,(ln2)/64] */
293                 long double
294                         t1 = 1.66666666666666666666666666660876387437e-1L,
295                         t2 = -2.77777777777777777777770781209317347875 6e-3L,
296                         t3 = 6.61375661375661348207428093287422120242 4e-5L,
297                         t4 = -1.65343915339213995416960982274223585112 0e-6L,
298                         t5 = 4.17531485176953975138785211661097379605 3e-8L;
299                 long double t = (long double) k;

301                 w1 = (y2 - (t * ln2_32hi - y1)) - t * ln2_32lo;
302                 t = w1 * w1;
303                 w2 = (w1 - t * (t1 + t * (t2 + t * (t3 + t * (t4 + t * t5))))) -
304                         two;
305                 z = _TBL_expl_hi[j] - ((_TBL_expl_hi[j] * (w1 + w1)) / w2 -
306                         _TBL_expl_lo[j]);
307         }
308         j = m + (pz[i0] >> 16);
309         if (j && (unsigned) j < 0x7fff)
310                 pz[i0] += m << 16;
311         else
312                 z = scalbnl(z, m);

314         if (sbx == 1 && yisint == 1)
315                 z = -z;         /* (-ve)**(odd int) */
316         return (z);
317 }
318 #else
319 #error Unsupported Architecture
320 #endif  /* defined(__sparc) */
```

```
**********************************************************
    2216 Sat May 10 12:09:08 2014
new/usr/src/lib/libm/common/Q/remainderl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 28  */

 30 #pragma weak remainderl = __remainderl

 32 #include "libm.h"
 33 #include "longdouble.h"

 35 /*
 36  * remainderl(x,p)
 37  *      returns  x REM p  =  x - [x/p]*p as if in infinite
 38  *      precise arithmetic, where [x/p] is the (inifinite bit)
 39  *      integer nearest x/p (in half way case choose the even one).
 40  * Method :
 41  *      Based on fmodl() return x-[x/p]chopped*p exactly.
 42  */

 44 #define HFMAX   5.948657476786158825428796633140035080982e+4931L
 45 #define DBMIN   6.724206286224187012525355634643505205196e-4932L

 47 static const long double
 48         zero = 0.0L,
 49         half = 0.5L,
 50         hfmax = HFMAX,  /* half of the maximum number */
 51         dbmin = DBMIN;  /* double of the minimum (normal) number */

 53 long double
 54 remainderl(long double x, long double p) {
 55         long double hp;
 56         int sx;

 58         if (isnanl(p))
 59                 return (x + p);
 60         if (!finitel(x))
 61                 return (x - x);
```



```
 62         p = fabsl(p);
 63         if (p <= hfmax)
 64                 x = fmodl(x, p + p);
 65         sx = signbitl(x);
 66         x = fabsl(x);
 67         if (p < dbmin) {
 68                 if (x + x > p) {
 69                         if (x == p)
 70                                 x = zero;
 71                         else
 72                                 x -= p; /* avoid x-x=-0 in RM mode */
 73                         if (x + x >= p)
 74                                 x -= p;
 75                 }
 76         } else {
 77                 hp = half * p;
 78                 if (x > hp) {
 79                         if (x == p)
 80                                 x = zero;
 81                         else
 82                                 x -= p; /* avoid x-x=-0 in RM mode */
 83                         if (x >= hp)
 84                                 x -= p;
 85                 }
 86         }
 87         return (sx == 0 ? x : -x);
 88 }
```

```
**********************************************************
    2131 Sat May 10 12:09:08 2014
new/usr/src/lib/libm/common/Q/rintl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak rintl = __rintl

/*
 * rintl(long double x) return x rounded to integral according to
 * the prevailing rounding direction
 *
 * NOTE: aintl(x), anintl(x), ceill(x), floorl(x), and rintl(x) return result
 * with the same sign as x's, including 0.0L.
 */

#include "libm.h"
#include "longdouble.h"

extern enum fp_precision_type __swapRP(enum fp_precision_type);

static const double one = 1.0;
static const long double qzero = 0.0L;

long double
rintl(long double x) {
        enum fp_precision_type rp;
        long double t, w, two112;
        int *pt = (int *) &two112;

        if (!finitel(x))
                return (x + x);

        if (*(int *) &one != 0) {       /* set two112 = 2^112 */
                pt[0] = 0x406f0000;
                pt[1] = pt[2] = pt[3] = 0;
        } else {
                pt[3] = 0x406f0000;
```



```
                pt[0] = pt[1] = pt[2] = 0;
        }

        if (fabsl(x) >= two112)
                return (x);     /* already an integer */
        t = copysignl(two112, x);
        rp = __swapRP(fp_extended);     /* make sure precision is long double */
        w = x + t;                      /* x+sign(x)*2^112 rounded to integer */
        (void) __swapRP(rp);            /* restore precision mode */
        if (w == t)
                return (copysignl(qzero, x));   /* x rounded to zero */
        else
                return (w - t);
}
```

```
**********************************************************
    2947 Sat May 10 12:09:08 2014
new/usr/src/lib/libm/common/Q/rndintl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak aintl = __aintl
#pragma weak anintl = __anintl
#pragma weak irintl = __irintl
#pragma weak nintl = __nintl

/*
 * aintl(x)     return x chopped to integral value
 * anintl(x)    return sign(x)*(|x|+0.5) chopped to integral value
 * irintl(x)    return rint(x) in integer format
 * nintl(x)     return anint(x) in integer format
 *
 * NOTE: aintl(x), anintl(x), ceill(x), floorl(x), and rintl(x) return result
 * with the same sign as x's,  including 0.0.
 */

#include "libm.h"
#include "longdouble.h"

extern enum fp_direction_type __swapRD(enum fp_direction_type);

static const long double qone = 1.0L, qhalf = 0.5L, qmhalf = -0.5L;

long double
aintl(long double x) {
        long double t, w;

        if (!finitel(x))
                return (x + x);
        w = fabsl(x);
        t = rintl(w);
        if (t <= w)
                return (copysignl(t, x));       /* NaN or already aint(|x|) */
        else    /* |t|>|x| case */
                return (copysignl(t - qone, x));        /* |t-1|*sign(x) */
}

long double
anintl(long double x) {
        long double t, w, z;

        if (!finitel(x))
                return (x + x);
        w = fabsl(x);
        t = rintl(w);
        if (t == w)
                return (copysignl(t, x));
        z = t - w;
        if (z > qhalf)
                t = t - qone;
        else if (z <= qmhalf)
                t = t + qone;
        return (copysignl(t, x));
}

int
irintl(long double x) {
        enum fp_direction_type rd;

        rd = __swapRD(fp_nearest);
        (void) __swapRD(rd);    /* restore Rounding Direction */
        switch (rd) {
        case fp_nearest:
                if (x < 2147483647.5L && x >= -2147483648.5L)
                        return ((int)rintl(x));
                break;
        case fp_tozero:
                if (x < 2147483648.0L && x > -2147483649.0L)
                        return ((int)rintl(x));
                break;
        case fp_positive:
                if (x <= 2147483647.0L && x > -2147483649.0L)
                        return ((int)rintl(x));
                break;
        case fp_negative:
                if (x < 2147483648.0L && x >= -2147483648.0L)
                        return ((int)rintl(x));
                break;
        }
        return ((int)copysignl(1.0e100L, x));
}

int
nintl(long double x) {
        if ((x < 2147483647.5L) && (x > -2147483648.5L))
                return ((int)anintl(x));
        else
                return ((int)copysignl(1.0e100L, x));
}
```

```
**********************************************************
    1650 Sat May 10 12:09:08 2014
new/usr/src/lib/libm/common/Q/scalbl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak scalbl = __scalbl

/*
 * scalbl(x,n): return x * 2^n by manipulating exponent.
 */

#include "libm.h"

#define n0      0

long double
scalbl(long double x, long double fn) {
        int *py = (int *) &fn, n;
        long double z;

        if (isnanl(x) || isnanl(fn))
                return (x * fn);

        /*
         * fn is inf or NaN
         */
        if ((py[n0] & 0x7fff0000) == 0x7fff0000) {
                if ((py[n0] & 0x80000000) != 0)
                        return (x / (-fn));
                else
                        return (x * fn);
        }
        if (rintl(fn) != fn)
                return ((fn - fn) / (fn - fn));
        if (fn > 65000.0L)
                z = scalbnl(x, 65000);
        else if (-fn > 65000.0L)
```



```
                z = scalbnl(x, -65000);
        else {
                n = (int) fn;
                z = scalbnl(x, n);
        }
        return (z);
}
```

```
**********************************************************
    2517 Sat May 10 12:09:08 2014
new/usr/src/lib/libm/common/Q/scalbnl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak scalbnl = __scalbnl
#endif

#include "libm.h"
#include <float.h>              /* LDBL_MAX, LDBL_MIN */
#include <stdlib.h>             /* abs */

#if defined(__sparc)
#define XSET_EXP(k, x)  ((int *) &x)[0] = (((int *) &x)[0] & ~0x7fff0000) | \
                                (k << 16)
#define ISINFNANL(k, x) (k == 0x7fff)
#define XTWOT_OFFSET    113
static const long double xtwot = 10384593717069655257060992658440192.0L,
                                                                /* 2^113 */
        twomtm1 = 4.81482486096808963263994485646231829 6E-35L;  /* 2^-114 */
#elif defined(__x86)
#define XSET_EXP(k, x)  ((int *) &x)[2] = (((int *) &x)[2] & ~0x7fff) | k
#if defined(HANDLE_UNSUPPORTED)
#define ISINFNANL(k, x) (k == 0x7fff || k != 0 && \
                                (((int *) &x)[1] & 0x80000000) == 0)
#else
#define ISINFNANL(k, x) (k == 0x7fff)
#endif
#define XTWOT_OFFSET    64
static const long double xtwot = 18446744073709551616.0L,       /* 2^64 */
        twomtm1 = 2.7105054312137610850186E-20L;                /* 2^-65 */
#endif

long double
scalbnl(long double x, int n) {
```



```
        int k = XBIASED_EXP(x);

        if (ISINFNANL(k, x))
                return (x + x);
        if (ISZEROL(x) || n == 0)
                return (x);
        if (k == 0) {
                x *= xtwot;
                k = XBIASED_EXP(x) - XTWOT_OFFSET;
        }
        if ((unsigned) abs(n) >= 131072)        /* cast to unsigned for -2^31 */
                n >>= 1;                /* avoid subsequent integer overflow */
        k += n;
        if (k > 0x7ffe)
                return (LDBL_MAX * copysignl(LDBL_MAX, x));
        if (k <= -XTWOT_OFFSET - 1)
                return (LDBL_MIN * copysignl(LDBL_MIN, x));
        if (k > 0) {
                XSET_EXP(k, x);
                return (x);
        }
        k += XTWOT_OFFSET + 1;
        XSET_EXP(k, x);
        return (x * twomtm1);
}
```

```
**********************************************************
    1070 Sat May 10 12:09:09 2014
new/usr/src/lib/libm/common/Q/signgaml.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak signgaml = __signgaml

#include "libm.h"

int signgaml = 0;
```

```
**********************************************************
    1253 Sat May 10 12:09:09 2014
new/usr/src/lib/libm/common/Q/significandl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak significandl = __significandl
#endif

#include "libm.h"

long double
significandl(long double x) {
        if (ISZEROL(x) || XBIASED_EXP(x) == 0x7fff)     /* 0/+-Inf/NaN */
                return (x + x);
        else
                return (scalbnl(x, -ilogbl(x)));
}
```

```
**********************************************************
    2709 Sat May 10 12:09:09 2014
new/usr/src/lib/libm/common/Q/sincosl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * sincosl(x)
 * Table look-up algorithm by K.C. Ng, November, 1989.
 *
 * kernel function:
 *      __k_sincosl     ... sin and cos function on [-pi/4,pi/4]
 *      __rem_pio2l     ... argument reduction routine
 *
 * Method.
 *      Let S and C denote the sin and cos respectively on [-PI/4, +PI/4].
 *      1. Assume the argument x is reduced to y1+y2 = x-k*pi/2 in
 *         [-pi/2 , +pi/2], and let n = k mod 4.
 *      2. Let S=S(y1+y2), C=C(y1+y2). Depending on n, we have
 *
 *          n        sin(x)      cos(x)        tan(x)
 *     ----------------------------------------------------------
 *          0          S           C             S/C
 *          1          C          -S            -C/S
 *          2         -S          -C             S/C
 *          3         -C           S            -C/S
 *     ----------------------------------------------------------
 *
 * Special cases:
 *      Let trig be any of sin, cos, or tan.
 *      trig(+-INF)  is NaN, with signals;
 *      trig(NaN)    is that NaN;
 *
 * Accuracy:
 *      computer TRIG(x) returns trig(x) nearly rounded.
 */

#pragma weak sincosl = __sincosl
```



```
#include "libm.h"
#include "longdouble.h"

void
sincosl(long double x, long double *s, long double *c) {
        long double y[2], z = 0.0L;
        int n, ix;

        ix = *(int *) &x;       /* High word of x */

        /* |x| ~< pi/4 */
        ix &= 0x7fffffff;
        if (ix <= 0x3ffe9220)
                *s = __k_sincosl(x, z, c);
        else if (ix >= 0x7fff0000)
                *s = *c = x - x;        /* trig(Inf or NaN) is NaN */
        else {                          /* argument reduction needed */
                n = __rem_pio2l(x, y);
                switch (n & 3) {
                case 0:
                        *s = __k_sincosl(y[0], y[1], c);
                        break;
                case 1:
                        *c = -__k_sincosl(y[0], y[1], s);
                        break;
                case 2:
                        *s = -__k_sincosl(y[0], y[1], c);
                        *c = -*c;
                        break;
                case 3:
                        *c = __k_sincosl(y[0], y[1], s);
                        *s = -*s;
                        break;
                }
        }
}
```

```
**********************************************************
    5975 Sat May 10 12:09:09 2014
new/usr/src/lib/libm/common/Q/sincospil.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak sincospil = __sincospil

/*
 * void sincospil(long double x, long double *s, long double *c)
 * *s = sinl(pi*x); *c = cosl(pi*x);
 *
 * Algorithm, 10/17/2002, K.C. Ng
 * ------------------------------
 * Let y = |4x|, z = floor(y), and n = (int)(z mod 8.0) (displayed in binary).
 *      1. If y==z, then x is a multiple of pi/4. Return the following values:
 *              ---------------------------------------------------
 *                n  x mod 2    sin(x*pi)    cos(x*pi)   tan(x*pi)
 *              ---------------------------------------------------
 *               000  0.00       +0 ___       +1 ___       +0
 *               001  0.25       +\/0.5       +\/0.5       +1
 *               010  0.50       +1 ___       +0 ___       +inf
 *               011  0.75       +\/0.5       -\/0.5       -1
 *               100  1.00       -0 ___       -1 ___       +0
 *               101  1.25       -\/0.5       -\/0.5       +1
 *               110  1.50       -1 ___       -0 ___       +inf
 *               111  1.75       -\/0.5       +\/0.5       -1
 *              ---------------------------------------------------
 *      2. Otherwise,
 *              ---------------------------------------------------
 *                n     t        sin(x*pi)    cos(x*pi)   tan(x*pi)
 *              ---------------------------------------------------
 *               000  (y-z)/4     sinpi(t)     cospi(t)    tanpi(t)
 *               001  (z+1-y)/4   cospi(t)     sinpi(t)    1/tanpi(t)
 *               010  (y-z)/4     cospi(t)    -sinpi(t)   -1/tanpi(t)
 *               011  (z+1-y)/4   sinpi(t)    -cospi(t)   -tanpi(t)
 *               100  (y-z)/4    -sinpi(t)    -cospi(t)    tanpi(t)
```



```
 *               101  (z+1-y)/4  -cospi(t)    -sinpi(t)    1/tanpi(t)
 *               110  (y-z)/4    -cospi(t)     sinpi(t)   -1/tanpi(t)
 *               111  (z+1-y)/4  -sinpi(t)     cospi(t)   -tanpi(t)
 *              ---------------------------------------------------
 *
 * NOTE. This program compute sinpi/cospi(t<0.25) by __k_sin/cos(pi*t, 0.0).
 * This will return a result with error slightly more than one ulp (but less
 * than 2 ulp). If one wants accurate result,  one may break up pi*t in
 * high (tpi_h) and low (tpi_l) parts and call __k_sin/cos(tip_h, tip_lo)
 * instead.
 */

#include "libm.h"
#include "longdouble.h"

#define I(q, m) ((int *) &(q))[m]
#define U(q, m) ((unsigned *) &(q))[m]
#if defined(__LITTLE_ENDIAN) || defined(__x86)
#define LDBL_MOST_SIGNIF_I(ld)  ((I(ld, 2) << 16) | (0xffff & (I(ld, 1) >> 15)))
#define LDBL_LEAST_SIGNIF_U(ld) U(ld, 0)
#define PREC    64
#define PRECM1  63
#define PRECM2  62
static const long double twoPRECM2 = 9.22337203685477580800000000000000e+18L;
#else
#define LDBL_MOST_SIGNIF_I(ld)  I(ld, 0)
#define LDBL_LEAST_SIGNIF_U(ld) U(ld, sizeof (long double) / sizeof (int) - 1)
#define PREC    113
#define PRECM1  112
#define PRECM2  111
static const long double twoPRECM2 = 5.19229685853482762853049632922009 6e+33L;
#endif

static const long double
zero    = 0.0L,
quater  = 0.25L,
one     = 1.0L,
pi      = 3.14159265358979323846264338327950288419 7e+0000L,
sqrth   = 0.70710678118654752440084436210484903928 4835937688474,
tiny    = 1.0e-100;

void
sincospil(long double x, long double *s, long double *c) {
        long double y, z, t;
        int hx, n, k;
        unsigned lx;

        hx = LDBL_MOST_SIGNIF_I(x);
        lx = LDBL_LEAST_SIGNIF_U(x);
        k = ((hx & 0x7fff0000) >> 16) - 0x3fff;
        if (k >= PRECM2) {              /* |x| >= 2**(Prec-2) */
                if (k >= 16384) {
                        *s = *c = x - x;
                } else {
                        if (k >= PREC) {
                                *s = zero;
                                *c = one;
                        } else if (k == PRECM1) {
                                if ((lx & 1) == 0) {
                                        *s = zero;
                                        *c = one;
                                } else {
                                        *s = -zero;
                                        *c = -one;
                                }
                        } else {        /* k = Prec - 2 */
```

```
127                                 if ((lx & 1) == 0) {
128                                         *s = zero;
129                                         *c = one;
130                                 } else {
131                                         *s = one;
132                                         *c = zero;
133                                 }
134                                 if ((lx & 2) != 0) {
135                                         *s = -*s;
136                                         *c = -*c;
137                                 }
138                         }
139                 }
140         } else if (k < -2)      /* |x| < 0.25 */
141                 *s = __k_sincosl(pi * fabsl(x), zero, c);
142         else {
143                 /* y = |4x|, z = floor(y), and n = (int)(z mod 8.0) */
144                 y = 4.0L * fabsl(x);
145                 if (k < PRECM2) {
146                         z = y + twoPRECM2;
147                         n = LDBL_LEAST_SIGNIF_U(z) & 7; /* 3 LSb of z */
148                         t = z - twoPRECM2;
149                         k = 0;
150                         if (t == y)
151                                 k = 1;
152                         else if (t > y) {
153                                 n -= 1;
154                                 t = quater + (y - t) * quater;
155                         } else
156                                 t = (y - t) * quater;
157                 } else {        /* k = Prec-3 */
158                         n = LDBL_LEAST_SIGNIF_U(y) & 7; /* 3 LSb of z */
159                         k = 1;
160                 }
161                 if (k) {        /* x = N/4 */
162                         if ((n & 1) != 0)
163                                 *s = *c = sqrth + tiny;
164                         else
165                                 if ((n & 2) == 0) {
166                                         *s = zero;
167                                         *c = one;
168                                 } else {
169                                         *s = one;
170                                         *c = zero;
171                                 }
172                         if ((n & 4) != 0)
173                                 *s = -*s;
174                         if (((n + 1) & 4) != 0)
175                                 *c = -*c;
176                 } else {
177                         if ((n & 1) != 0)
178                                 t = quater - t;
179                         if (((n + (n & 1)) & 2) == 0)
180                                 *s = __k_sincosl(pi * t, zero, c);
181                         else
182                                 *c = __k_sincosl(pi * t, zero, s);
183                         if ((n & 4) != 0)
184                                 *s = -*s;
185                         if (((n + 2) & 4) != 0)
186                                 *c = -*c;
187                 }
188         }
189         if (hx < 0)
190                 *s = -*s;
191 }
192 #undef U
```



```
193 #undef LDBL_LEAST_SIGNIF_U
194 #undef I
195 #undef LDBL_MOST_SIGNIF_I
```

```
**********************************************************
    2392 Sat May 10 12:09:09 2014
new/usr/src/lib/libm/common/Q/sinhl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak sinhl = __sinhl

#include "libm.h"
#include "longdouble.h"

/*
 * sinhl(X)
 * RETURN THE HYPERBOLIC SINE OF X
 *
 * Method :
 *      1. reduce x to non-negative by sinhl(-x) = - sinhl(x).
 *      2.
 *                                                 expm1l(x) + expm1l(x)/(expm1l(x)+1)
 *      0 <= x <= lnovft        : sinhl(x) := -------------------------------
 *                                                          2
 *
 *     lnovft <= x <  INF       : sinhl(x) := expl(x-MEP1*ln2)*2**ME
 *
 * here
 *      lnovft:         logrithm of the overflow threshold
 *                      = MEP1*ln2 chopped to machine precision.
 *      ME              maximum exponent
 *      MEP1            maximum exponent plus 1
 *
 * Special cases:
 *      sinhl(x) is x if x is +INF, -INF, or NaN.
 *      only sinhl(0)=0 is exact for finite argument.
 *
 */

#define ME      16383
```



```
#define MEP1    16384
#define LNOVFT  1.13565234062941439494919310779707634284 5e+4L
                /* last 32 bits of LN2HI is zero */
#define LN2HI   6.93147180559945309417231954749584485020 3e-0001L
#define LN2LO   1.66708592083055220889044933040037975416 9e-0025L

static const long double
        half    = 0.5L,
        one     = 1.0L,
        ln2hi   = LN2HI,
        ln2lo   = LN2LO,
        lnovftL = LNOVFT;

long double
sinhl(long double x) {
        long double r, t;

        if (!finitel(x))
                return (x + x); /* sinh of NaN or +-INF is itself */
        r = fabsl(x);
        if (r < lnovftL) {
                t = expm1l(r);
                r = copysignl((t + t / (one + t)) * half, x);
        } else {
                r = copysignl(expl((r - MEP1 * ln2hi) - MEP1 * ln2lo), x);
                r = scalbnl(r, ME);
        }
        return (r);
}
```

```
**********************************************************
    2674 Sat May 10 12:09:09 2014
new/usr/src/lib/libm/common/Q/sinl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
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/*
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 */

/*
 * sinl(x)
 * Table look-up algorithm by K.C. Ng, November, 1989.
 *
 * kernel function:
 *      __k_sinl                ... sin function on [-pi/4,pi/4]
 *      __k_cosl                ... cos function on [-pi/4,pi/4]
 *      __rem_pio2l     ... argument reduction routine
 *
 * Method.
 *      Let S and C denote the sin and cos respectively on [-PI/4, +PI/4].
 *      1. Assume the argument x is reduced to y1+y2 = x-k*pi/2 in
 *         [-pi/2 , +pi/2], and let n = k mod 4.
 *      2. Let S=S(y1+y2), C=C(y1+y2). Depending on n, we have
 *
 *          n        sin(x)      cos(x)        tan(x)
 *     ----------------------------------------------------------
 *          0          S           C             S/C
 *          1          C          -S            -C/S
 *          2         -S          -C             S/C
 *          3         -C           S            -C/S
 *     ----------------------------------------------------------
 *
 * Special cases:
 *      Let trig be any of sin, cos, or tan.
 *      trig(+-INF)  is NaN, with signals;
 *      trig(NaN)    is that NaN;
 *
 * Accuracy:
 *      computer TRIG(x) returns trig(x) nearly rounded.
 */
```



```
#pragma weak sinl = __sinl

#include "libm.h"
#include "longdouble.h"

long double
sinl(long double x) {
        long double y[2], z = 0.0L;
        int n, ix;

        ix = *(int *) &x;               /* High word of x */
        ix &= 0x7fffffff;
        if (ix <= 0x3ffe9220)           /* |x| ~< pi/4 */
                return (__k_sinl(x, z));
        else if (ix >= 0x7fff0000)      /* sin(Inf or NaN) is NaN */
                return (x - x);
        else {                          /* argument reduction needed */
                n = __rem_pio2l(x, y);
                switch (n & 3) {
                        case 0:
                                return (__k_sinl(y[0], y[1]));
                        case 1:
                                return (__k_cosl(y[0], y[1]));
                        case 2:
                                return (-__k_sinl(y[0], y[1]));
                        case 3:
                                return (-__k_cosl(y[0], y[1]));
                }
        }
        /* NOTREACHED */
    return 0.0L;
}
```

```
**********************************************************
    5547 Sat May 10 12:09:09 2014
new/usr/src/lib/libm/common/Q/sinpil.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak sinpil = __sinpil

/*
 * long double sinpil(long double x),
 * return long double precision sinl(pi*x).
 *
 * Algorithm, 10/17/2002, K.C. Ng
 * ------------------------------
 * Let y = |4x|, z = floor(y), and n = (int)(z mod 8.0) (displayed in binary).
 *      1. If y==z, then x is a multiple of pi/4. Return the following values:
 *              ---------------------------------------------------
 *                n  x mod 2    sin(x*pi)    cos(x*pi)   tan(x*pi)
 *              ---------------------------------------------------
 *               000  0.00       +0 ___       +1 ___       +0
 *               001  0.25       +\/0.5       +\/0.5       +1
 *               010  0.50       +1 ___       +0 ___       +inf
 *               011  0.75       +\/0.5       -\/0.5       -1
 *               100  1.00       -0 ___       -1 ___       +0
 *               101  1.25       -\/0.5       -\/0.5       +1
 *               110  1.50       -1 ___       -0 ___       +inf
 *               111  1.75       -\/0.5       +\/0.5       -1
 *              ---------------------------------------------------
 *      2. Otherwise,
 *              ---------------------------------------------------
 *                n     t        sin(x*pi)    cos(x*pi)   tan(x*pi)
 *              ---------------------------------------------------
 *               000  (y-z)/4     sinpi(t)     cospi(t)    tanpi(t)
 *               001  (z+1-y)/4   cospi(t)     sinpi(t)    1/tanpi(t)
 *               010  (y-z)/4     cospi(t)    -sinpi(t)   -1/tanpi(t)
 *               011  (z+1-y)/4   sinpi(t)    -cospi(t)   -tanpi(t)
 *               100  (y-z)/4    -sinpi(t)    -cospi(t)    tanpi(t)
```



```
 *               101  (z+1-y)/4  -cospi(t)    -sinpi(t)    1/tanpi(t)
 *               110  (y-z)/4    -cospi(t)     sinpi(t)   -1/tanpi(t)
 *               111  (z+1-y)/4  -sinpi(t)     cospi(t)   -tanpi(t)
 *              ---------------------------------------------------
 *
 * NOTE. This program compute sinpi/cospi(t<0.25) by __k_sin/cos(pi*t, 0.0).
 * This will return a result with error slightly more than one ulp (but less
 * than 2 ulp). If one wants accurate result,  one may break up pi*t in
 * high (tpi_h) and low (tpi_l) parts and call __k_sin/cos(tip_h, tip_lo)
 * instead.
 */

#include "libm.h"
#include "longdouble.h"

#define I(q, m) ((int *) &(q))[m]
#define U(q, m) ((unsigned *) &(q))[m]
#if defined(__LITTLE_ENDIAN) || defined(__x86)
#define LDBL_MOST_SIGNIF_I(ld)  ((I(ld, 2) << 16) | (0xffff & (I(ld, 1) >> 15)))
#define LDBL_LEAST_SIGNIF_U(ld) U(ld, 0)
#define PREC    64
#define PRECM1  63
#define PRECM2  62
static const long double twoPRECM2 = 9.22337203685477580800000000000000e+18L;
#else
#define LDBL_MOST_SIGNIF_I(ld)  I(ld, 0)
#define LDBL_LEAST_SIGNIF_U(ld) U(ld, sizeof (long double) / sizeof (int) - 1)
#define PREC    113
#define PRECM1  112
#define PRECM2  111
static const long double twoPRECM2 = 5.19229685853482762853049632922009 6e+33L;
#endif

static const long double
zero    = 0.0L,
quater  = 0.25L,
one     = 1.0L,
pi      = 3.14159265358979323846264338327950288419 7e+0000L,
sqrth   = 0.70710678118654752440084436210484903928 4835937688474,
tiny    = 1.0e-100;

long double
sinpil(long double x) {
        long double y, z, t;
        int hx, n, k;
        unsigned lx;

        hx = LDBL_MOST_SIGNIF_I(x);
        lx = LDBL_LEAST_SIGNIF_U(x);
        k = ((hx & 0x7fff0000) >> 16) - 0x3fff;
        if (k >= PRECM2) {              /* |x| >= 2**(Prec-2) */
                if (k >= 16384)
                        y = x - x;
                else {
                        if (k >= PREC)
                                y = zero;
                        else if (k == PRECM1)
                                y = (lx & 1) == 0 ? zero: -zero;
                        else {  /* k = Prec - 2 */
                                y = (lx & 1) == 0 ? zero : one;
                                if ((lx & 2) != 0)
                                        y = -y;
                        }
                }
        } else if (k < -2)      /* |x| < 0.25 */
                y = __k_sinl(pi * fabsl(x), zero);
```

```
127         else {
128                 /* y = |4x|, z = floor(y), and n = (int)(z mod 8.0) */
129                 y = 4.0L * fabsl(x);
130                 if (k < PRECM2) {
131                         z = y + twoPRECM2;
132                         n = LDBL_LEAST_SIGNIF_U(z) & 7; /* 3 LSb of z */
133                         t = z - twoPRECM2;
134                         k = 0;
135                         if (t == y)
136                                 k = 1;
137                         else if (t > y) {
138                                 n -= 1;
139                                 t = quater + (y - t) * quater;
140                         } else
141                                 t = (y - t) * quater;
142                 } else {        /* k = Prec-3 */
143                         n = LDBL_LEAST_SIGNIF_U(y) & 7; /* 3 LSb of z */
144                         k = 1;
145                 }
146                 if (k) {        /* x = N/4 */
147                         if ((n & 1) != 0)
148                                 y = sqrth + tiny;
149                         else
150                                 y = (n & 2) == 0 ? zero : one;
151                         if ((n & 4) != 0)
152                                 y = -y;
153                 } else {
154                         if ((n & 1) != 0)
155                                 t = quater - t;
156                         if (((n + (n & 1)) & 2) == 0)
157                                 y = __k_sinl(pi * t, zero);
158                         else
159                                 y = __k_cosl(pi * t, zero);
160                         if ((n & 4) != 0)
161                                 y = -y;
162                 }
163         }
164         return (hx >= 0 ? y : -y);
165 }
166 #undef U
167 #undef LDBL_LEAST_SIGNIF_U
168 #undef I
169 #undef LDBL_MOST_SIGNIF_I
```

```
**********************************************************
   10172 Sat May 10 12:09:09 2014
new/usr/src/lib/libm/common/Q/sqrtl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak sqrtl = __sqrtl

#include "libm.h"
#include "longdouble.h"

extern int __swapTE(int);
extern int __swapEX(int);
extern enum fp_direction_type __swapRD(enum fp_direction_type);

/*
 * in struct longdouble, msw consists of
 *      unsigned short  sgn:1;
 *      unsigned short  exp:15;
 *      unsigned short  frac1:16;
 */

#ifdef __LITTLE_ENDIAN

/* array indices used to access words within a double */
#define HIWORD  1
#define LOWORD  0

/* structure used to access words within a quad */
union longdouble {
        struct {
                unsigned int    frac4;
                unsigned int    frac3;
                unsigned int    frac2;
                unsigned int    msw;
        } l;
        long double     d;
};
```



```
/* default NaN returned for sqrt(neg) */
static const union longdouble
        qnan = { 0xffffffff, 0xffffffff, 0xffffffff, 0x7fffffff };

/* signalling NaN used to raise invalid */
static const union {
        unsigned u[2];
        double d;
} snan = { 0, 0x7ff00001 };

#else

/* array indices used to access words within a double */
#define HIWORD  0
#define LOWORD  1

/* structure used to access words within a quad */
union longdouble {
        struct {
                unsigned int    msw;
                unsigned int    frac2;
                unsigned int    frac3;
                unsigned int    frac4;
        } l;
        long double     d;
};

/* default NaN returned for sqrt(neg) */
static const union longdouble
        qnan = { 0x7fffffff, 0xffffffff, 0xffffffff, 0xffffffff };

/* signalling NaN used to raise invalid */
static const union {
        unsigned u[2];
        double d;
} snan = { 0x7ff00001, 0 };

#endif /* __LITTLE_ENDIAN */


static const double
        zero = 0.0,
        half = 0.5,
        one = 1.0,
        huge = 1.0e300,
        tiny = 1.0e-300,
        two36 = 6.87194767360000000000e+10,
        two30 = 1.07374182400000000000e+09,
        two6 = 6.40000000000000000000e+01,
        two4 = 1.60000000000000000000e+01,
        twom18 = 3.81469726562500000000e-06,
        twom28 = 3.72529029846191406250e-09,
        twom42 = 2.27373675443232059479e-13,
        twom60 = 8.67361737988403547206e-19,
        twom62 = 2.16840434497100886801e-19,
        twom66 = 1.35525271560688054251e-20,
        twom90 = 8.07793566946316088742e-28,
        twom113 = 9.62964972193617926528e-35,
        twom124 = 4.70197740328915003187e-38;


/*
 *      Extract the exponent and normalized significand (represented as
 *      an array of five doubles) from a finite, nonzero quad.
 */
```

```
128 static int
129 __q_unpack( const union longdouble *x, double *s )
130 {
131         union {
132                 double                  d;
133                 unsigned int    l[2];
134         } u;
135         double                  b;
136         unsigned int    lx, w[3];
137         int                             ex;
138
139         /* get the normalized significand and exponent */
140         ex = (int) ( ( x->l.msw & 0x7fffffff ) >> 16 );
141         lx = x->l.msw & 0xffff;
142         if ( ex )
143         {
144                 lx |= 0x10000;
145                 w[0] = x->l.frac2;
146                 w[1] = x->l.frac3;
147                 w[2] = x->l.frac4;
148         }
149         else
150         {
151                 if ( lx | ( x->l.frac2 & 0xfffe0000 ) )
152                 {
153                         w[0] = x->l.frac2;
154                         w[1] = x->l.frac3;
155                         w[2] = x->l.frac4;
156                         ex = 1;
157                 }
158                 else if ( x->l.frac2 | ( x->l.frac3 & 0xfffe0000 ) )
159                 {
160                         lx = x->l.frac2;
161                         w[0] = x->l.frac3;
162                         w[1] = x->l.frac4;
163                         w[2] = 0;
164                         ex = -31;
165                 }
166                 else if ( x->l.frac3 | ( x->l.frac4 & 0xfffe0000 ) )
167                 {
168                         lx = x->l.frac3;
169                         w[0] = x->l.frac4;
170                         w[1] = w[2] = 0;
171                         ex = -63;
172                 }
173                 else
174                 {
175                         lx = x->l.frac4;
176                         w[0] = w[1] = w[2] = 0;
177                         ex = -95;
178                 }
179                 while ( ( lx & 0x10000 ) == 0 )
180                 {
181                         lx = ( lx << 1 ) | ( w[0] >> 31 );
182                         w[0] = ( w[0] << 1 ) | ( w[1] >> 31 );
183                         w[1] = ( w[1] << 1 ) | ( w[2] >> 31 );
184                         w[2] <<= 1;
185                         ex--;
186                 }
187         }
188
189         /* extract the significand into five doubles */
190         u.l[HIWORD] = 0x42300000;
191         u.l[LOWORD] = 0;
192         b = u.d;
193         u.l[LOWORD] = lx;
```



```
194         s[0] = u.d - b;
195
196         u.l[HIWORD] = 0x40300000;
197         u.l[LOWORD] = 0;
198         b = u.d;
199         u.l[LOWORD] = w[0] & 0xffffff00;
200         s[1] = u.d - b;
201
202         u.l[HIWORD] = 0x3e300000;
203         u.l[LOWORD] = 0;
204         b = u.d;
205         u.l[HIWORD] |= w[0] & 0xff;
206         u.l[LOWORD] = w[1] & 0xffff0000;
207         s[2] = u.d - b;
208
209         u.l[HIWORD] = 0x3c300000;
210         u.l[LOWORD] = 0;
211         b = u.d;
212         u.l[HIWORD] |= w[1] & 0xffff;
213         u.l[LOWORD] = w[2] & 0xff000000;
214         s[3] = u.d - b;
215
216         u.l[HIWORD] = 0x3c300000;
217         u.l[LOWORD] = 0;
218         b = u.d;
219         u.l[LOWORD] = w[2] & 0xffffff;
220         s[4] = u.d - b;
221
222         return ex - 0x3fff;
223 }
224
225
226 /*
227 *       Pack an exponent and array of three doubles representing a finite,
228 *       nonzero number into a quad.  Assume the sign is already there and
229 *       the rounding mode has been fudged accordingly.
230 */
231 static void
232 __q_pack( const double *z, int exp, enum fp_direction_type rm,
233         union longdouble *x, int *inexact )
234 {
235         union {
236                 double                  d;
237                 unsigned int    l[2];
238         } u;
239         double                  s[3], t, t2;
240         unsigned int    msw, frac2, frac3, frac4;
241
242         /* bias exponent and strip off integer bit */
243         exp += 0x3fff;
244         s[0] = z[0] - one;
245         s[1] = z[1];
246         s[2] = z[2];
247
248         /*
249          * chop the significand to obtain the fraction;
250          * use round-to-minus-infinity to ensure chopping
251          */
252         (void) __swapRD( fp_negative );
253
254         /* extract the first eighty bits of fraction */
255         t = s[1] + s[2];
256         u.d = two36 + ( s[0] + t );
257         msw = u.l[LOWORD];
258         s[0] -= ( u.d - two36 );
```

```
260         u.d = two4 + ( s[0] + t );
261         frac2 = u.l[LOWORD];
262         s[0] -= ( u.d - two4 );

264         u.d = twom28 + ( s[0] + t );
265         frac3 = u.l[LOWORD];
266         s[0] -= ( u.d - twom28 );

268         /* condense the remaining fraction; errors here won't matter */
269         t = s[0] + s[1];
270         s[1] = ( ( s[0] - t ) + s[1] ) + s[2];
271         s[0] = t;

273         /* get the last word of fraction */
274         u.d = twom60 + ( s[0] + s[1] );
275         frac4 = u.l[LOWORD];
276         s[0] -= ( u.d - twom60 );

278         /*
279          * keep track of what's left for rounding; note that
280          * t2 will be non-negative due to rounding mode
281          */
282         t = s[0] + s[1];
283         t2 = ( s[0] - t ) + s[1];

285         if ( t != zero )
286         {
287                 *inexact = 1;

289                 /* decide whether to round the fraction up */
290                 if ( rm == fp_positive || ( rm == fp_nearest && ( t > twom113 ||
291                         ( t == twom113 && ( t2 != zero || frac4 & 1 ) ) ) ) )
292                 {
293                         /* round up and renormalize if necessary */
294                         if ( ++frac4 == 0 )
295                                 if ( ++frac3 == 0 )
296                                         if ( ++frac2 == 0 )
297                                                 if ( ++msw == 0x10000 )
298                                                 {
299                                                         msw = 0;
300                                                         exp++;
301                                                 }
302                 }
303         }

305         /* assemble the result */
306         x->l.msw |= msw | ( exp << 16 );
307         x->l.frac2 = frac2;
308         x->l.frac3 = frac3;
309         x->l.frac4 = frac4;
310 }


313 /*
314 *       Compute the square root of x and place the TP result in s.
315 */
316 static void
317 __q_tp_sqrt( const double *x, double *s )
318 {
319         double  c, rr, r[3], tt[3], t[5];

321         /* approximate the divisor for the Newton iteration */
322         c = sqrt( ( x[0] + x[1] ) + x[2] );
323         rr = half / c;

325         /* compute the first five "digits" of the square root */
```



```
326         t[0] = ( c + two30 ) - two30;
327         tt[0] = t[0] + t[0];
328         r[0] = ( ( x[0] - t[0] * t[0] ) + x[1] ) + x[2];

330         t[1] = ( rr * ( r[0] + x[3] ) + two6 ) - two6;
331         tt[1] = t[1] + t[1];
332         r[0] -= tt[0] * t[1];
333         r[1] = x[3] - t[1] * t[1];
334         c = ( r[1] + twom18 ) - twom18;
335         r[0] += c;
336         r[1] = ( r[1] - c ) + x[4];

338         t[2] = ( rr * ( r[0] + r[1] ) + twom18 ) - twom18;
339         tt[2] = t[2] + t[2];
340         r[0] -= tt[0] * t[2];
341         r[1] -= tt[1] * t[2];
342         c = ( r[1] + twom42 ) - twom42;
343         r[0] += c;
344         r[1] = ( r[1] - c ) - t[2] * t[2];

346         t[3] = ( rr * ( r[0] + r[1] ) + twom42 ) - twom42;
347         r[0] = ( ( r[0] - tt[0] * t[3] ) + r[1] ) - tt[1] * t[3];
348         r[1] = -tt[2] * t[3];
349         c = ( r[1] + twom90 ) - twom90;
350         r[0] += c;
351         r[1] = ( r[1] - c ) - t[3] * t[3];

353         t[4] = ( rr * ( r[0] + r[1] ) + twom66 ) - twom66;

355         /* here we just need to get the sign of the remainder */
356         c = ( ( ( ( ( r[0] - tt[0] * t[4] ) - tt[1] * t[4] ) + r[1] )
357                 - tt[2] * t[4] ) - ( t[3] + t[3] ) * t[4] ) - t[4] * t[4];

359         /* reduce to three doubles */
360         t[0] += t[1];
361         t[1] = t[2] + t[3];
362         t[2] = t[4];

364         /* if the third term might lie on a rounding boundary, perturb it */
365         if ( c != zero && t[2] == ( twom62 + t[2] ) - twom62 )
366         {
367                 if ( c < zero )
368                         t[2] -= twom124;
369                 else
370                         t[2] += twom124;
371         }

373         /* condense the square root */
374         c = t[1] + t[2];
375         t[2] += ( t[1] - c );
376         t[1] = c;
377         c = t[0] + t[1];
378         s[1] = t[1] + ( t[0] - c );
379         s[0] = c;
380         if ( s[1] == zero )
381         {
382                 c = s[0] + t[2];
383                 s[1] = t[2] + ( s[0] - c );
384                 s[0] = c;
385                 s[2] = zero;
386         }
387         else
388         {
389                 c = s[1] + t[2];
390                 s[2] = t[2] + ( s[1] - c );
391                 s[1] = c;
```

```
392         }
393 }


396 long double
397 sqrtl( long double ldx )
398 {
399         union   longdouble              x;
400         volatile double                 t;
401         double                                  xx[5], zz[3];
402         enum fp_direction_type  rm;
403         int                             ex, inexact, exc, traps;

405         /* clear cexc */
406         t = zero;
407         t -= zero;

409         /* check for zero operand */
410         x.d = ldx;
411         if ( !( ( x.l.msw & 0x7fffffff ) | x.l.frac2 | x.l.frac3 | x.l.frac4 ) )
412                 return ldx;

414         /* handle nan and inf cases */
415         if ( ( x.l.msw & 0x7fffffff ) >= 0x7fff0000 )
416         {
417                 if ( ( x.l.msw & 0xffff ) | x.l.frac2 | x.l.frac3 | x.l.frac4 )
418                 {
419                         if ( !( x.l.msw & 0x8000 ) )
420                         {
421                                 /* snan, signal invalid */
422                                 t += snan.d;
423                         }
424                         x.l.msw |= 0x8000;
425                         return x.d;
426                 }
427                 if ( x.l.msw & 0x80000000 )
428                 {
429                         /* sqrt(-inf), signal invalid */
430                         t = -one;
431                         t = sqrt( t );
432                         return qnan.d;
433                 }
434                 /* sqrt(inf), return inf */
435                 return x.d;
436         }

438         /* handle negative numbers */
439         if ( x.l.msw & 0x80000000 )
440         {
441                 t = -one;
442                 t = sqrt( t );
443                 return qnan.d;
444         }

446         /* now x is finite, positive */

448         traps = __swapTE( 0 );
449         exc = __swapEX( 0 );
450         rm = __swapRD( fp_nearest );

452         ex = __q_unpack( &x, xx );
453         if ( ex & 1 )
454         {
455                 /* make exponent even */
456                 xx[0] += xx[0];
457                 xx[1] += xx[1];
```



```
458                 xx[2] += xx[2];
459                 xx[3] += xx[3];
460                 xx[4] += xx[4];
461                 ex--;
462         }
463         __q_tp_sqrt( xx, zz );

465         /* put everything together */
466         x.l.msw = 0;
467         inexact = 0;
468         __q_pack( zz, ex >> 1, rm, &x, &inexact );

470         (void) __swapRD( rm );
471         (void) __swapEX( exc );
472         (void) __swapTE( traps );
473         if ( inexact )
474         {
475                 t = huge;
476                 t += tiny;
477         }
478         return x.d;
479 }
```

```
**********************************************************
    2608 Sat May 10 12:09:10 2014
new/usr/src/lib/libm/common/Q/tanhl.c
libm/common/Q/tanhl.c
14071:dece9aafe99a - fix build problems on sparc
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak tanhl = __tanhl
#endif

/*
 * tanhl(x) returns the hyperbolic tangent of x
 *
 * Method :
 *      1. reduce x to non-negative:  tanhl(-x) = - tanhl(x).
 *      2.
 *        0      <  x <=  small    :  tanhl(x) := x
 *                                                -expm1l(-2x)
 *        small  <  x <=  1        :  tanhl(x) := --------------
 *                                                 expm1l(-2x) + 2
 *                                                       2
 *        1      <= x <= threshold :  tanhl(x) := 1 -  ---------------
 *                                                    expm1l(2x) + 2
 *     threshold <  x <= INF       :  tanhl(x) := 1.
 *
 * where
 *      single :        small = 1.e-5           threshold = 11.0
 *      double :        small = 1.e-10          threshold = 22.0
 *      quad   :        small = 1.e-20          threshold = 45.0
 *
 * Note: threshold was chosen so that
 *              fl(1.0+2/(expm1(2*threshold)+2)) == 1.
 *
 * Special cases:
 *      tanhl(NaN) is NaN;
 *      only tanhl(0.0)=0.0 is exact for finite argument.
```



```
 */

#include "libm.h"
#include "longdouble.h"

static const long double small = 1.0e-20L, one = 1.0, two = 2.0,
#ifndef lint
        big = 1.0e+20L,
#endif
        threshold = 45.0L;

long double
tanhl(long double x) {
        long double t, y, z;
        int signx;
        volatile long double dummy;

        if (isnanl(x))
                return (x + x);         /* x is NaN */
        signx = signbitl(x);
        t = fabsl(x);
        z = one;
        if (t <= threshold) {
                if (t > one)
                        z = one - two / (expm1l(t + t) + two);
                else if (t > small) {
                        y = expm1l(-t - t);
                        z = -y / (y + two);
                } else {
#ifndef lint
                        dummy = t + big;
                                                        /* inexact if t != 0 */
#endif
                        return (x);
                }
        } else if (!finitel(t))
                return (copysignl(one, x));
        else
                return (signx ? -z + small * small : z - small * small);
        return (signx ? -z : z);
}
```

```
**********************************************************
    2433 Sat May 10 12:09:10 2014
new/usr/src/lib/libm/common/Q/tanl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
 * tanl(x)
 * Table look-up algorithm by K.C. Ng, November, 1989.
 *
 * kernel function:
 *      __k_tanl        ... tangent function on [-pi/4,pi/4]
 *      __rem_pio2l     ... argument reduction routine
 *
 * Method.
 *      Let S and C denote the sin and cos respectively on [-PI/4, +PI/4].
 *      1. Assume the argument x is reduced to y1+y2 = x-k*pi/2 in
 *         [-pi/2 , +pi/2], and let n = k mod 4.
 *      2. Let S=S(y1+y2), C=C(y1+y2). Depending on n, we have
 *
 *          n        sin(x)      cos(x)        tan(x)
 *     ----------------------------------------------------------
 *          0          S           C             S/C
 *          1          C          -S            -C/S
 *          2         -S          -C             S/C
 *          3         -C           S            -C/S
 *     ----------------------------------------------------------
 *
 * Special cases:
 *      Let trig be any of sin, cos, or tan.
 *      trig(+-INF)  is NaN, with signals;
 *      trig(NaN)    is that NaN;
 *
 * Accuracy:
 *      computer TRIG(x) returns trig(x) nearly rounded.
 */

#pragma weak tanl = __tanl
```



```
#include "libm.h"
#include "longdouble.h"

long double
tanl(long double x) {
        long double y[2], z = 0.0L;
        int n, ix;

        ix = *(int *) &x;               /* High word of x */
        ix &= 0x7fffffff;
        if (ix <= 0x3ffe9220)           /* |x| ~< pi/4 */
                return (__k_tanl(x, z, 0));
        else if (ix >= 0x7fff0000)      /* trig(Inf or NaN) is NaN */
                return (x - x);
        else {                          /* argument reduction needed */
                n = __rem_pio2l(x, y);
                return (__k_tanl(y[0], y[1], (n & 1)));
        }
}
```

```
**********************************************************
    3472 Sat May 10 12:09:10 2014
new/usr/src/lib/libm/common/R/_TBL_r_atan_.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

/*
 * Table of constants for r_atan_().
 * By K.C. Ng, March 9, 1989
 */

#include "libm.h"

const float _TBL_r_atan_hi[] = {
        4.636476040e-01, 4.883339405e-01, 5.123894811e-01, 5.358112454e-01,
        5.585992932e-01, 5.807563663e-01, 6.022873521e-01, 6.231993437e-01,
        6.435011029e-01, 6.632030010e-01, 6.823165417e-01, 7.008544207e-01,
        7.188299894e-01, 7.362574339e-01, 7.531512976e-01, 7.695264816e-01,
        7.853981853e-01, 8.156919479e-01, 8.441540003e-01, 8.709034324e-01,
        8.960554004e-01, 9.197195768e-01, 9.420000315e-01, 9.629943371e-01,
        9.827937484e-01, 1.001483083e+00, 1.019141316e+00, 1.035841227e+00,
        1.051650167e+00, 1.066630363e+00, 1.080839038e+00, 1.094328880e+00,
        1.107148767e+00, 1.130953789e+00, 1.152572036e+00, 1.172273874e+00,
        1.190289974e+00, 1.206817389e+00, 1.222025275e+00, 1.236059427e+00,
        1.249045730e+00, 1.261093378e+00, 1.272297382e+00, 1.282740831e+00,
        1.292496681e+00, 1.301628828e+00, 1.310193896e+00, 1.318242073e+00,
        1.325817704e+00, 1.339705706e+00, 1.352127433e+00, 1.363300085e+00,
        1.373400807e+00, 1.382574797e+00, 1.390942812e+00, 1.398605466e+00,
        1.405647635e+00, 1.412141085e+00, 1.418146968e+00, 1.423717976e+00,
        1.428899288e+00, 1.433730125e+00, 1.438244820e+00, 1.442473054e+00,
        1.446441293e+00,
};

const float _TBL_r_atan_lo[] = {
        +5.012158688e-09, +1.055042365e-08, -2.075691974e-08, -7.480973174e-09,
        +2.211159789e-08, -1.268522887e-08, -5.950149262e-09, -1.374726910e-08,
        +5.868937336e-09, -8.316245470e-09, +1.320299514e-08, -1.277747597e-08,
        +1.018833551e-08, -4.909868068e-09, -1.660708016e-08, -1.222759671e-09,
```



```
        -2.185569414e-08, -2.462078896e-08, -1.416911655e-08, +2.470642002e-08,
        -1.580020736e-08, +2.851478520e-08, +8.908211058e-09, -6.400973085e-09,
        -2.513142405e-08, +5.292293181e-08, +2.785247055e-08, +2.643104224e-08,
        +4.603683834e-08, +1.851388043e-09, -3.735403453e-08, +2.701113111e-08,
        -4.872354964e-08, -4.477816518e-08, -3.857382325e-08, +6.845639611e-09,
        -2.453011483e-08, -1.824929363e-08, +4.798058129e-08, +6.221672777e-08,
        +4.276110843e-08, +4.185424007e-09, +1.285398099e-08, +4.836914869e-08,
        -1.342359379e-08, +5.960489879e-09, +3.875391386e-08, -2.204224536e-08,
        -4.053271141e-08, -4.604370218e-08, -5.190222652e-08, +1.529194549e-08,
        -4.043566193e-08, +2.481348993e-08, +1.503647518e-08, +4.638297924e-08,
        +1.392036975e-08, -2.006252586e-08, +3.051175312e-08, -4.209960824e-09,
        -1.598675681e-08, +2.705746205e-08, -2.514289044e-08, +4.517691110e-08,
        +3.948537852e-08,
};
```

```
**********************************************************
    2789 Sat May 10 12:09:10 2014
new/usr/src/lib/libm/common/R/__cosf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#include "libm.h"

/* INDENT OFF */
/*
 * float __k_cos(double x);
 * kernel (float) cos function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is in double and assumed to be bounded by ~pi/4 in magnitude.
 *
 * Method: Let z = x * x, then
 *      C(x) = (C0 + C1*z + C2*z*z) * (C3 + C4*z + z*z)
 * where
 *      C0 =   1.0934948212718840186827200038953998505887385 3699e-0003
 *      C1 =  -5.0332428598996497939803470005492022686610767 5091e-0004
 *      C2 =   2.4379288026697110775041806155960223983153806 7410e-0005
 *      C3 =   9.1449907260566658222812740524555803552374147 1271e+0002
 *      C4 =  -3.6315127059181543919712250499168384678529320 7730e+0001
 *
 * The remez error is bound by  |cos(x) - C(x)| < 2**(-34.2)
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */
/* INDENT ON */

static const double q[] = {
/* C0 = */   1.0934948212718840186827200038953998505887385 3699e-0003,
/* C1 = */  -5.0332428598996497939803470005492022686610767 5091e-0004,
/* C2 = */   2.4379288026697110775041806155960223983153806 7410e-0005,
/* C3 = */   9.1449907260566658222812740524555803552374147 1271e+0002,
```



```
/* C4 = */  -3.6315127059181543919712250499168384678529320 7730e+0001,
};

#define C0      q[0]
#define C1      q[1]
#define C2      q[2]
#define C3      q[3]
#define C4      q[4]

float
__k_cosf(double x) {
        float ft;
        double z;
        int hx;

        hx = ((int *) &x)[HIWORD];      /* hx = leading x  */
        if ((hx & ~0x80000000) < 0x3f100000) {  /* |x| < 2**-14 */
                ft = (float) 1;
                if (((int) x) == 0)     /* raise inexact if x != 0 */
                        return (ft);
        }
        z = x * x;
        ft = (float) (((C0 + z * C1) + (z * z) * C2) * (C3 + z * (C4 + z)));
        return (ft);
}
```

```
**********************************************************
    3622 Sat May 10 12:09:10 2014
new/usr/src/lib/libm/common/R/__sincosf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include "libm.h"

/* INDENT OFF */
/*
 * void __k_sincosf(double x, float *s, float *c);
 * kernel (float) sincos function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is in double and assumed to be bounded by ~pi/4 in magnitude.
 *
 * Method: Let z = x * x, then
 *      S(x) = x(S0 + S1*z)(S2 + S3*z + z*z)
 *      C(x) = (C0 + C1*z + C2*z*z) * (C3 + C4*z + z*z)
 * where
 *      S0 =   1.85735322054308378716204874632872525989806770558e-0003
 *      S1 =  -1.95035094218403635082921458859320791358115801259e-0004
 *      S2 =   5.38400550766074785970952495168558701485841707252e+0002
 *      S3 =  -3.31975110777873728964197739157371509422022905947e+0001
 *      C0 =   1.09349482127188401868272000389539985058873853699e-0003
 *      C1 =  -5.03324285989964979398034700054920226866107675091e-0004
 *      C2 =   2.43792880266971107750418061559602239831538067410e-0005
 *      C3 =   9.14499072605666582228127405245558035523741471271e+0002
 *      C4 =  -3.63151270591815439197122504991683846785293207730e+0001
 *
 * The remez error in S is bound by  |(sin(x) - S(x))/x| < 2**(-28.2)
 * The remez error in C is bound by  |cos(x) - C(x)| < 2**(-34.2)
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */
/* INDENT ON */
```



```
static const double q[] = {
/* S0 = */  1.85735322054308378716204874632872525989806770558e-0003,
/* S1 = */ -1.95035094218403635082921458859320791358115801259e-0004,
/* S2 = */  5.38400550766074785970952495168558701485841707252e+0002,
/* S3 = */ -3.31975110777873728964197739157371509422022905947e+0001,
/* C0 = */  1.09349482127188401868272000389539985058873853699e-0003,
/* C1 = */ -5.03324285989964979398034700054920226866107675091e-0004,
/* C2 = */  2.43792880266971107750418061559602239831538067410e-0005,
/* C3 = */  9.14499072605666582228127405245558035523741471271e+0002,
/* C4 = */ -3.63151270591815439197122504991683846785293207730e+0001,
};


#define S0      q[0]
#define S1      q[1]
#define S2      q[2]
#define S3      q[3]
#define C0      q[4]
#define C1      q[5]
#define C2      q[6]
#define C3      q[7]
#define C4      q[8]

void
__k_sincosf(double x, float *s, float *c) {
        double z;
        int hx;

        hx = ((int *) &x)[HIWORD];      /* hx = leading x */
        /* small argument */
        if ((hx & ~0x80000000) < 0x3f100000) {  /* if |x| < 2**-14 */
                *s = (float) x; *c = (float) 1;
                if ((int) x == 0)       /* raise inexact if x!=0 */
                        return;
        }
        z = x * x;
        *s = (float) ((x * (S0 + z * S1)) * (S2 + z * (S3 + z)));
        *c = (float) (((C0 + z * C1) + (z * z) * C2) * (C3 + z * (C4 + z)));
}
```

```
**********************************************************
    2626 Sat May 10 12:09:10 2014
new/usr/src/lib/libm/common/R/__sinf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#include "libm.h"

/* INDENT OFF */
/*
 * float __k_sin(double x);
 * kernel (float) sin function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is in double and assumed to be bounded by ~pi/4 in magnitude.
 *
 * Method: Let z = x * x, then
 *      S(x) = x(S0 + S1*z)(S2 + S3*z + z*z)
 * where
 *      S0 =   1.85735322054308378716204874632872525989806770558e-0003,
 *      S1 =  -1.95035094218403635082921458859320791358115801259e-0004,
 *      S2 =   5.38400550766074785970952495168558701485841707252e+0002,
 *      S3 =  -3.31975110777873728964197739157371509422022905947e+0001,
 *
 * The remez error is bound by  |(sin(x) - S(x))/x| < 2**(-28.2)
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */
/* INDENT ON */

static const double q[] = {
/* S0 = */  1.85735322054308378716204874632872525989806770558e-0003,
/* S1 = */ -1.95035094218403635082921458859320791358115801259e-0004,
/* S2 = */  5.38400550766074785970952495168558701485841707252e+0002,
/* S3 = */ -3.31975110777873728964197739157371509422022905947e+0001,
};
```



```
#define S0  q[0]
#define S1  q[1]
#define S2  q[2]
#define S3  q[3]

float
__k_sinf(double x) {
        float ft;
        double z;
        int hx;

        hx = ((int *) &x)[HIWORD];      /* hx = leading x */
        if ((hx & ~0x80000000) < 0x3f100000) {  /* if |x| < 2**-14 */
                ft = (float) x;
                if ((int) x == 0)       /* raise inexact if x!=0 */
                        return (ft);
        }
        z = x * x;
        ft = (float) ((x * (S0 + z * S1)) * (S2 + z * (S3 + z)));
        return (ft);
}
```

```
**********************************************************
    3022 Sat May 10 12:09:10 2014
new/usr/src/lib/libm/common/R/__tanf.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include "libm.h"

/* INDENT OFF */
/*
 * float __k_tan(double x);
 * kernel (float) tan function on [-pi/4, pi/4], pi/4 ~ 0.785398164
 * Input x is in double and assumed to be bounded by ~pi/4 in magnitude.
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following constants.
 * The decimal values may be used, provided that the compiler will convert
 * from decimal to binary accurately enough to produce the hexadecimal values
 * shown.
 */

static const double q[] = {
/* one */ 1.0,
/* P0 */  4.46066928428959230679140546271810308098793029785e-0003,
/* P1 */  4.92165316309189027066395283327437937259674072266e+0000,
/* P2 */ -7.11410648161473480044492134766187518835067749023e-0001,
/* P3 */  4.08549808374053391446523164631798863410949707031e+0000,
/* P4 */  2.50411070398050927821032018982805311679840087891e+0000,
/* P5 */  1.11492064560251158411574579076841473579406738281e+0001,
/* P6 */ -1.50565540968422650891511693771462887525558471680e+0000,
/* P7 */ -1.81484378878349295050043110677506774663925170898e+0000,
/* T0 */  3.33335997532835641297409611782510896641e-0001,
/* T1 */  2.99999759824836376154166828200686722993 9e+00,
};
/* INDENT ON */

#define one q[0]
```



```
#define P0 q[1]
#define P1 q[2]
#define P2 q[3]
#define P3 q[4]
#define P4 q[5]
#define P5 q[6]
#define P6 q[7]
#define P7 q[8]
#define T0 q[9]
#define T1 q[10]

float
__k_tanf(double x, int n) {
        float ft = 0.0;
        double z, w;
        int ix;

        ix = ((int *) &x)[HIWORD] & ~0x80000000;        /* ix = leading |x| */
        /* small argument */
        if (ix < 0x3f800000) {          /* if |x| < 0.0078125 = 2**-7 */
                if (ix < 0x3f100000) {  /* if |x| < 2**-14 */
                        if ((int) x == 0) {     /* raise inexact if x!=0 */
                                ft = n == 0 ? (float) x : (float) (-one / x);
                        }
                        return (ft);
                }
                z = (x * T0) * (T1 + x * x);
                ft = n == 0 ? (float) z : (float) (-one / z);
                return (ft);
        }
        z = x * x;
        w = ((P0 * x) * (P1 + z * (P2 + z)) * (P3 + z * (P4 + z)))
                * (P5 + z * (P6 + z * (P7 + z)));
        ft = n == 0 ? (float) w : (float) (-one / w);
        return (ft);
}
```

```
**********************************************************
    1257 Sat May 10 12:09:10 2014
new/usr/src/lib/libm/common/R/acosf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak acosf = __acosf

#include "libm.h"

static const float zero = 0.0f;

float
acosf(float x) {
        int     ix;

        ix = *(int *)&x & ~0x80000000;
        if (ix > 0x3f800000)    /* |x| > 1 or x is nan */
                return ((x * zero) / zero);
        return ((float)acos((double)x));
}
```

```
**********************************************************
    1264 Sat May 10 12:09:10 2014
new/usr/src/lib/libm/common/R/acoshf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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27  */

29 #pragma weak acoshf = __acoshf

31 #include "libm.h"

33 static const float zero = 0.0f;

35 float
36 acoshf(float x) {
37         int     hx;

39         hx = *(int *)&x;
40         if (hx < 0x3f800000 || hx > 0x7f800000) /* x < 1 or x is nan */
41                 return ((x * zero) / zero);
42         return ((float)acosh((double)x));
43 }
```

```
**********************************************************
    1257 Sat May 10 12:09:11 2014
new/usr/src/lib/libm/common/R/asinf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak asinf = __asinf

#include "libm.h"

static const float zero = 0.0f;

float
asinf(float x) {
        int     ix;

        ix = *(int *)&x & ~0x80000000;
        if (ix > 0x3f800000)    /* |x| > 1 or x is nan */
                return ((x * zero) / zero);
        return ((float)asin((double)x));
}
```

```
**********************************************************
    1187 Sat May 10 12:09:11 2014
new/usr/src/lib/libm/common/R/asinhf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak asinhf = __asinhf

#include "libm.h"

float
asinhf(float x) {
        if (isnanf(x)) {
                return (x * x);         /* + -> * for Cheetah */
        } else {
                return ((float) asinh((double) x));
        }
}
```

```
**********************************************************
    8324 Sat May 10 12:09:11 2014
new/usr/src/lib/libm/common/R/atan2f.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atan2f = __atan2f

#include "libm.h"

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

/*
 * For i = 0, ..., 192, let x[i] be the double precision number whose
 * high order 32 bits are 0x3f900000 + (i << 16) and whose low order
 * 32 bits are zero.  Then TBL[i] := atan(x[i]) to double precision.
 */

static const double TBL[] = {
        1.56237286204768313e-02,
        1.66000375562312640e-02,
        1.75763148444955872e-02,
        1.85525586258889763e-02,
        1.95287670414137082e-02,
        2.05049382324763683e-02,
        2.14810703409090559e-02,
        2.24571615089905717e-02,
        2.34332098794675855e-02,
        2.44092135955758099e-02,
        2.53851708010611396e-02,
        2.63610796402007873e-02,
        2.73369382578244127e-02,
        2.83127447993351995e-02,
        2.92884974107309737e-02,
        3.02641942386252458e-02,
        3.12398334302682774e-02,
        3.31909314971115949e-02,
```



```
        3.51417768027967800e-02,
        3.70923545503918164e-02,
        3.90426499551669928e-02,
        4.09926482452637811e-02,
        4.29423346623621707e-02,
        4.48916944623464972e-02,
        4.68407129159696539e-02,
        4.87893753095156174e-02,
        5.07376669454602178e-02,
        5.26855731431300420e-02,
        5.46330792393594777e-02,
        5.65801705891457105e-02,
        5.85268325663017702e-02,
        6.04730505641073168e-02,
        6.24188099959573500e-02,
        6.43638949198234884e-02,
        7.01969710718705203e-02,
        7.40829225490337306e-02,
        7.79666338315423008e-02,
        8.18479898030765457e-02,
        8.57268757707448092e-02,
        8.96031774848717461e-02,
        9.34767811585894698e-02,
        9.73475734872236709e-02,
        1.01215441667466668e-01,
        1.05080273416329528e-01,
        1.08941956989865793e-01,
        1.12800381201659389e-01,
        1.16655435441069349e-01,
        1.20507009691224562e-01,
        1.24354994546761438e-01,
        1.32039761614638762e-01,
        1.39708874289163648e-01,
        1.47361481088651630e-01,
        1.54996741923940973e-01,
        1.62613828597948568e-01,
        1.70211925285474408e-01,
        1.77790228992676075e-01,
        1.85347949995694761e-01,
        1.92884312257974672e-01,
        2.00398553825878512e-01,
        2.07889927202262986e-01,
        2.15357699697738048e-01,
        2.22801153759394521e-01,
        2.30219587276843718e-01,
        2.37612313865471242e-01,
        2.44978663126864143e-01,
        2.59629629408257512e-01,
        2.74167451119658789e-01,
        2.88587361894077410e-01,
        3.02884868374971417e-01,
        3.17055753209147029e-01,
        3.31096076704132103e-01,
        3.45002177207105132e-01,
        3.58770670270572245e-01,
        3.72398446676754202e-01,
        3.85882669398073752e-01,
        3.99220769575252543e-01,
        4.12410441597387323e-01,
        4.25449637370042266e-01,
        4.38336559857957830e-01,
        4.51069655988523499e-01,
        4.63647609000806094e-01,
        4.88333951056405535e-01,
        5.12389460310737732e-01,
        5.35811237960463704e-01,
```

```
128         5.58599315343562441e-01,
129         5.80756353567670414e-01,
130         6.02287346134964152e-01,
131         6.23199329934065904e-01,
132         6.43501108793284371e-01,
133         6.63202992706093286e-01,
134         6.82316554874748071e-01,
135         7.00854407884450192e-01,
136         7.18829999621624527e-01,
137         7.36257428981428097e-01,
138         7.53151280962194414e-01,
139         7.69526480405658297e-01,
140         7.85398163397448279e-01,
141         8.15691923316223422e-01,
142         8.44153986113171051e-01,
143         8.70903457075652976e-01,
144         8.96055384571343927e-01,
145         9.19719605350416858e-01,
146         9.42000040379463610e-01,
147         9.62994330680936206e-01,
148         9.82793723247329054e-01,
149         1.00148313569423464e+00,
150         1.01914134426634972e+00,
151         1.03584125300880014e+00,
152         1.05165021254837376e+00,
153         1.06663036531574362e+00,
154         1.08083900054116833e+00,
155         1.09432890732118993e+00,
156         1.10714871779409041e+00,
157         1.13095374397916038e+00,
158         1.15257199721566761e+00,
159         1.17227388112847630e+00,
160         1.19028994968253166e+00,
161         1.20681737028525249e+00,
162         1.22202532321098967e+00,
163         1.23605948947808186e+00,
164         1.24904577239825443e+00,
165         1.26109338225244039e+00,
166         1.27229739520871732e+00,
167         1.28274087974427076e+00,
168         1.29249666778978534e+00,
169         1.30162883400919616e+00,
170         1.31019393504755555e+00,
171         1.31824205101683711e+00,
172         1.32581766366803255e+00,
173         1.33970565959899957e+00,
174         1.35212738092095464e+00,
175         1.36330010035969384e+00,
176         1.37340076694501589e+00,
177         1.38257482149012589e+00,
178         1.39094282700241845e+00,
179         1.39860551227195762e+00,
180         1.40564764938026987e+00,
181         1.41214106460849531e+00,
182         1.41814699839963154e+00,
183         1.42371797140649403e+00,
184         1.42889927219073276e+00,
185         1.43373015248470903e+00,
186         1.43824479449822262e+00,
187         1.44247309910910193e+00,
188         1.44644133224813509e+00,
189         1.45368758222803240e+00,
190         1.46013910562100091e+00,
191         1.46591938806466282e+00,
192         1.47112767430373470e+00,
193         1.47584462045214027e+00,
```



```
194         1.48013643959415142e+00,
195         1.48405798811891154e+00,
196         1.48765509490645531e+00,
197         1.49096634108265924e+00,
198         1.49402443552511865e+00,
199         1.49685728913695626e+00,
200         1.49948886200960629e+00,
201         1.50193983749385196e+00,
202         1.50422816301907281e+00,
203         1.50636948736934317e+00,
204         1.50837751679893928e+00,
205         1.51204050407917401e+00,
206         1.51529782154917969e+00,
207         1.51821326518395483e+00,
208         1.52083793107295384e+00,
209         1.52321322351791322e+00,
210         1.52537304737331958e+00,
211         1.52734543140336587e+00,
212         1.52915374769630819e+00,
213         1.53081763967160667e+00,
214         1.53235373677370856e+00,
215         1.53377621092096650e+00,
216         1.53509721411557254e+00,
217         1.53632722579538861e+00,
218         1.53747533091664934e+00,
219         1.53854944435964280e+00,
220         1.53955649336462841e+00,
221         1.54139303859089161e+00,
222         1.54302569020147562e+00,
223         1.54448660954197448e+00,
224         1.54580153317597646e+00,
225         1.54699130060982659e+00,
226         1.54807296595325550e+00,
227         1.54906061995310385e+00,
228         1.54996600675867957e+00,
229         1.55079899282174605e+00,
230         1.55156792769518947e+00,
231         1.55227992472688747e+00,
232         1.55294108165534417e+00,
233         1.55355665560036682e+00,
234         1.55413120308095598e+00,
235         1.55466869295126031e+00,
236         1.55517259817441977e+00,
237 };

239 static const double
240         pio4    =  7.85398163397448279e-01,
241         pio2    =  1.57079632679489655580e+00,
242         negpi   = -3.14159265358979311600e+00,
243         q1      = -3.33333333332964280046e-01,
244         q2      =  1.99999991868537526618e-01,
245         zero    =  0.0;

247 static const float two24 = 16777216.0;

249 float
250 atan2f(float fy, float fx)
251 {
252         double  a, t, s, dbase;
253         float   x, y, base;
254         int     i, k, hx, hy, ix, iy, sign;
255 #if defined(__i386) && !defined(__amd64)
256         int     rp;
257 #endif

259         iy = *(int *)&fy;
```

```
260         ix = *(int *)&fx;
261         hy = iy & ~0x80000000;
262         hx = ix & ~0x80000000;

264         sign = 0;
265         if (hy > hx) {
266                 x = fy;
267                 y = fx;
268                 i = hx;
269                 hx = hy;
270                 hy = i;
271                 if (iy < 0) {
272                         x = -x;
273                         sign = 1;
274                 }
275                 if (ix < 0) {
276                         y = -y;
277                         a = pio2;
278                 } else {
279                         a = -pio2;
280                         sign = 1 - sign;
281                 }
282         } else {
283                 y = fy;
284                 x = fx;
285                 if (iy < 0) {
286                         y = -y;
287                         sign = 1;
288                 }
289                 if (ix < 0) {
290                         x = -x;
291                         a = negpi;
292                         sign = 1 - sign;
293                 } else {
294                         a = zero;
295                 }
296         }

298         if (hx >= 0x7f800000 || hx - hy >= 0x0c800000) {
299                 if (hx >= 0x7f800000) {
300                         if (hx > 0x7f800000) /* nan */
301                                 return (x * y);
302                         else if (hy >= 0x7f800000)
303                                 a += pio4;
304                 } else if ((int)a == 0) {
305                         a = (double)y / x;
306                 }
307                 return ((float)((sign)? -a : a));
308         }

310         if (hy < 0x00800000) {
311                 if (hy == 0)
312                         return ((float)((sign)? -a : a));
313                 /* scale subnormal y */
314                 y *= two24;
315                 x *= two24;
316                 hy = *(int *)&y;
317                 hx = *(int *)&x;
318         }

320 #if defined(__i386) && !defined(__amd64)
321         rp = __swapRP(fp_extended);
322 #endif
323         k = (hy - hx + 0x3f800000) & 0xfff80000;
324         if (k >= 0x3c800000) {  /* |y/x| >= 1/64 */
325                 *(int *)&base = k;
```



```
326                 k = (k - 0x3c800000) >> 19;
327                 a += TBL[k];
328         } else {
329                 /*
330                  * For some reason this is faster on USIII than just
331                  * doing t = y/x in this case.
332                  */
333                 *(int *)&base = 0;
334         }
335         dbase = (double)base;
336         t = (y - x * dbase) / (x + y * dbase);
337         s = t * t;
338         a = (a + t) + t * s * (q1 + s * q2);
339 #if defined(__i386) && !defined(__amd64)
340         if (rp != fp_extended)
341                 (void) __swapRP(rp);
342 #endif
343         return ((float)((sign)? -a : a));
344 }
```

```
**********************************************************
    1509 Sat May 10 12:09:11 2014
new/usr/src/lib/libm/common/R/atan2pif.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atan2pif = __atan2pif

#include "libm.h"

static const double invpi = 0.31830988618379067153776752;

float
atan2pif(float y, float x) {
        int     ix, iy, hx, hy;

        ix = *(int *)&x;
        iy = *(int *)&y;
        hx = ix & ~0x80000000;
        hy = iy & ~0x80000000;
        if (hx > 0x7f800000 || hy > 0x7f800000) /* x or y is nan */
                return (x * y);
        if ((hx | hy) == 0) {
                /* x and y are both zero */
                if (ix == 0)
                        return (y);
                return ((iy == 0)? 1.0f : -1.0f);
        }
        return ((float)(invpi * atan2((double)y, (double)x)));
}
```

```
**********************************************************
    5442 Sat May 10 12:09:11 2014
new/usr/src/lib/libm/common/R/atanf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atanf = __atanf

/* INDENT OFF */
/*
 * float atanf(float x);
 * Table look-up algorithm
 * By K.C. Ng, March 9, 1989
 *
 * Algorithm.
 *
 * The algorithm is based on atan(x)=atan(y)+atan((x-y)/(1+x*y)).
 * We use poly1(x) to approximate atan(x) for x in [0,1/8] with
 * error (relative)
 *      |(atan(x)-poly1(x))/x|<= 2^-115.94      long double
 *      |(atan(x)-poly1(x))/x|<= 2^-58.85       double
 *      |(atan(x)-poly1(x))/x|<= 2^-25.53       float
 * and use poly2(x) to approximate atan(x) for x in [0,1/65] with
 * error (absolute)
 *      |atan(x)-poly2(x)|<= 2^-122.15          long double
 *      |atan(x)-poly2(x)|<= 2^-64.79           double
 *      |atan(x)-poly2(x)|<= 2^-35.36           float
 * and use poly3(x) to approximate atan(x) for x in [1/8,7/16] with
 * error (relative, on for single precision)
 *      |(atan(x)-poly1(x))/x|<= 2^-25.53       float
 *
 * Here poly1-3 are odd polynomial with the following form:
 *              x + x^3*(a1+x^2*(a2+...))
 *
 * (0). Purge off Inf and NaN and 0
 * (1). Reduce x to positive by atan(x) = -atan(-x).
 * (2). For x <= 1/8, use
 *      (2.1) if x < 2^(-prec/2-2), atan(x) =  x  with inexact
```



```
 *      (2.2) Otherwise
 *              atan(x) = poly1(x)
 * (3). For x >= 8 then
 *      (3.1) if x >= 2^(prec+2),   atan(x) = atan(inf) - pio2lo
 *      (3.2) if x >= 2^(prec/3+2), atan(x) = atan(inf) - 1/x
 *      (3.3) if x >  65,           atan(x) = atan(inf) - poly2(1/x)
 *      (3.4) Otherwise,            atan(x) = atan(inf) - poly1(1/x)
 *
 * (4). Now x is in (0.125, 8)
 *      Find y that match x to 4.5 bit after binary (easy).
 *      If iy is the high word of y, then
 *              single : j = (iy - 0x3e000000) >> 19
 *              (single is modified to (iy-0x3f000000)>>19)
 *              double : j = (iy - 0x3fc00000) >> 16
 *              quad   : j = (iy - 0x3ffc0000) >> 12
 *
 *      Let s = (x-y)/(1+x*y). Then
 *      atan(x) = atan(y) + poly1(s)
 *              = _TBL_r_atan_hi[j] + (_TBL_r_atan_lo[j] + poly2(s) )
 *
 *      Note. |s| <= 1.5384615385e-02 = 1/65. Maxium occurs at x = 1.03125
 *
 */

#include "libm.h"

extern const float _TBL_r_atan_hi[], _TBL_r_atan_lo[];
static const float
        big     =   1.0e37F,
        one     =   1.0F,
        p1      =  -3.33318595111168824722536849873354467217 2e-0001F,
        p2      =   1.96935289421345540521134198320318063602 1e-0001F,
        q1      =  -3.33292196409564681956341970411013293745 6e-0001F,
        a1      =  -3.33332346522389361406352335150933893459 2e-0001F,
        a2      =   1.99942562593527780549408227480817406240 3e-0001F,
        a3      =  -1.41754709050973778008576984629030178855 9e-0001F,
        a4      =   1.01625081387199198309727373322743268508 4e-0001F,
        a5      =  -5.13702369368835851575309381179175522180 5e-0002F,
        pio2hi  =   1.570796371e+0000F,
        pio2lo  =  -4.371139000e-0008F;
/* INDENT ON */

float
atanf(float xx) {
        float x, y, z, r, p, s;
        volatile double dummy;
        int ix, iy, sign, j;

        x = xx;
        ix = *(int *) &x;
        sign = ix & 0x80000000;
        ix ^= sign;

        /* for |x| < 1/8 */
        if (ix < 0x3e000000) {
                if (ix < 0x38800000) {  /* if |x| < 2**(-prec/2-2) */
                        dummy = big + x;        /* get inexact flag if x!=0 */
#ifdef lint
                        dummy = dummy;
#endif
                        return (x);
                }
                z = x * x;
                if (ix < 0x3c000000) {  /* if |x| < 2**(-prec/4-1) */
                        x = x + (x * z) * p1;
                        return (x);
```

```
128                 } else {
129                         x = x + (x * z) * (p1 + z * p2);
130                         return (x);
131                 }
132         }

134         /* for |x| >= 8.0 */
135         if (ix >= 0x41000000) {
136                 *(int *) &x = ix;
137                 if (ix < 0x42820000) {  /* x <  65 */
138                         r = one / x;
139                         z = r * r;
140                         y = r * (one + z * (p1 + z * p2));      /* poly1 */
141                         y -= pio2lo;
142                 } else if (ix < 0x44800000) {   /* x <  2**(prec/3+2) */
143                         r = one / x;
144                         z = r * r;
145                         y = r * (one + z * q1); /* poly2 */
146                         y -= pio2lo;
147                 } else if (ix < 0x4c800000) {   /* x <  2**(prec+2) */
148                         y = one / x - pio2lo;
149                 } else if (ix < 0x7f800000) {   /* x <  inf */
150                         y = -pio2lo;
151                 } else {                        /* x is inf or NaN */
152                         if (ix > 0x7f800000) {
153                                 return (x * x); /* - -> * for Cheetah */
154                         }
155                         y = -pio2lo;
156                 }

158                 if (sign == 0)
159                         x = pio2hi - y;
160                 else
161                         x = y - pio2hi;
162                 return (x);
163         }


166         /* now x is between 1/8 and 8 */
167         if (ix < 0x3f000000) {  /* between 1/8 and 1/2 */
168                 z = x * x;
169                 x = x + (x * z) * (a1 + z * (a2 + z * (a3 + z * (a4 +
170                         z * a5))));
171                 return (x);
172         }
173         *(int *) &x = ix;
174         iy = (ix + 0x00040000) & 0x7ff80000;
175         *(int *) &y = iy;
176         j = (iy - 0x3f000000) >> 19;

178         if (ix == iy)
179                 p = x - y;      /* p=0.0 */
180         else {
181                 if (sign == 0)
182                         s = (x - y) / (one + x * y);
183                 else
184                         s = (y - x) / (one + x * y);
185                 z = s * s;
186                 p = s * (one + z * q1);
187         }
188         if (sign == 0) {
189                 r = p + _TBL_r_atan_lo[j];
190                 x = r + _TBL_r_atan_hi[j];
191         } else {
192                 r = p - _TBL_r_atan_lo[j];
193                 x = r - _TBL_r_atan_hi[j];
```



```
194         }
195         return (x);
196 }
```

```
**********************************************************
    1322 Sat May 10 12:09:11 2014
new/usr/src/lib/libm/common/R/atanhf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak atanhf = __atanhf

#include "libm.h"

static const float zero = 0.0f;

float
atanhf(float x) {
        int     ix;

        ix = *((int *)&x) & ~0x80000000;
        if (ix > 0x3f800000)    /* |x| > 1 or x is nan */
                return ((x * zero) / zero);
        if (ix == 0x3f800000)   /* |x| == 1 */
                return (x / zero);
        return ((float)atanh((double)x));
}
```

```
**********************************************************
   20641 Sat May 10 12:09:11 2014
new/usr/src/lib/libm/common/R/besself.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak j0f = __j0f
#pragma weak j1f = __j1f
#pragma weak jnf = __jnf
#pragma weak y0f = __y0f
#pragma weak y1f = __y1f
#pragma weak ynf = __ynf

#include "libm.h"
#include <float.h>

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const float
        zerof   = 0.0f,
        onef    = 1.0f;

static const double C[] = {
        0.0,
        -0.125,
        0.25,
        0.375,
        0.5,
        1.0,
        2.0,
        8.0,
        0.56418958354775628694807945156077258584 41,     /* 1/sqrt(pi) */
        0.63661977236758134307553505349005744 8, /* 2/pi */
        1.0e9,
};

#define zero    C[0]
```



```
#define neighth C[1]
#define quarter C[2]
#define three8  C[3]
#define half    C[4]
#define one     C[5]
#define two     C[6]
#define eight   C[7]
#define isqrtpi C[8]
#define tpi     C[9]
#define big     C[10]

static const double Cj0y0[] = {
        0.48613441833860527213912384 47e5,       /* pr */
        0.13776625494071122781334389 45e6,
        0.12224663640882897318691140 04e6,
        0.41070700843151761355833537 4e5,
        0.50260738018606371258890399 15e4,
        0.17831936591254796545415424 19e3,
        0.88010344055383421691677564 e0,
        0.48613441833860527214140370 58e5,       /* ps */
        0.13781966326303846704775826 99e6,
        0.12239671853410065427489367 87e6,
        0.41201502437953536399958626 17e5,
        0.50682711810535463924901843 53e4,
        0.18298179054727699605356716 64e3,
        1.0,
        -0.17312109957010685391856119 51e3,      /* qr */
        -0.55225591659361669612352406 13e3,
        -0.56049356066373465906145296 13e3,
        -0.22004303002260093794773650 11e3,
        -0.32386935537564884977129674 6e2,
        -0.14294979207907956223499258 e1,
        -0.83469037410238498815891 8e-2,
        0.11079750372486838653267096 45e5,       /* qs */
        0.35445816806270826746514718 73e5,
        0.36191189379183941321790190 59e5,
        0.14398955635653980074714858 22e5,
        0.21902770233443639559302262 34e4,
        0.10669515702040798613750168 2e3,
        1.0,
};

#define pr      Cj0y0
#define ps      (Cj0y0+7)
#define qr      (Cj0y0+14)
#define qs      (Cj0y0+21)

static const double Cj0[] = {
        -2.5000000000000036221318808948304767555 37e-0001,      /* r0 */
        1.0955975473348302632344338559323753533 03e-0002,
        -1.8197347504633209217991872589870980876 97e-0004,
        9.9770019468061316575442125010698939308 46e-0007,
        1.0,                                                    /* s0 */
        1.8676098106629501699667823605881996737 41e-0002,
        1.5903892061815654908784308277069720742 08e-0004,
        6.5208673867425836323755201477144995227 21e-0007,
        9.9999999999999999421564955843970476609 49e-0001,      /* r1 */
        -2.3898877227313191304768398369081437312 81e-0001,
        1.2933594761389390277912703934394936405 70e-0002,
        -2.7709856423431401221688524002285633640 82e-0004,
        2.9052415757720676780867383891696252189 12e-0006,
        -1.6368463562640525979690420092650432512 79e-0008,
        5.0723061607248847750854310590526117378 27e-0011,
        -8.1870607306840668242289147751465361391 12e-0014,
        5.4222193269599498639542978607237234238 42e-0017,
        1.0,                                                    /* s1 */
```

```
128         1.10112277268680770276210474193207622834 9e-0002,
129         6.14016931064164922341142776466914397822 8e-0005,
130         2.29203587751515209797694611929321570525 0e-0007,
131         6.35691042650464433455883203636221958378 9e-0010,
132         1.36662632690021955504509699955394889140 1e-0012,
133         2.28039958686673952289183798556048118008 8e-0015,
134         2.80155982064893966527049252000483661118 7e-0018,
135         2.07310108832034915976441026146635073296 8e-0021,
136 };

138 #define r0      Cj0
139 #define s0      (Cj0+4)
140 #define r1      (Cj0+8)
141 #define s1      (Cj0+17)

143 static const double Cy0[] = {
144         -7.38042951086872252675472302070431764194 1e-0002,       /* u0 */
145         1.77260710268486992430145966304987429481 4e-0001,
146         -1.52437066654271382860407809097079935630 6e-0002,
147         4.65081910069389175714377155762992459191 5e-0004,
148         -7.12576887233952897503631610871823994602 2e-0006,
149         6.41101700165610459832756500477151525714 6e-0008,
150         -3.69427515743303255302124681237925878166 5e-0010,
151         1.43436454420626662425282088964844526384 2e-0012,
152         -3.85206473185993645589503628687413989686 1e-0015,
153         7.18205289972613838173994588191487457969 6e-0018,
154         -9.06055657461967756732374119407979798720 0e-0021,
155         7.12443546740886051526555221713123051145 5e-0024,
156         -2.70972677463639761532881312171543204477 1e-0027,
157         1.0,                                                  /* v0 */
158         4.67867893151254900258770247734921488647 5e-0003,
159         9.48682895552994853482280082949756517898 5e-0006,
160         1.00149592915886164665901084413668245490 6e-0008,
161         4.72533811625602166020444323568535859361 1e-0012,
162 };

164 #define u0      Cy0
165 #define v0      (Cy0+13)

167 static const double Cj1y1[] = {
168         -0.44357578167941278571147207 94e7,       /* pr0 */
169         -0.99422465050776411956583778 99e7,
170         -0.66033732483649391092552454 34e7,
171         -0.15235293511811373832551057 22e7,
172         -0.10982405543459346727374131 39e6,
173         -0.16116166443246101164771289 8e4,
174         -0.44357578167941278568280169 62e7,       /* ps0 */
175         -0.99341243899345856589675563 09e7,
176         -0.65853394797230870728269150 69e7,
177         -0.15118095066341608816445463 58e7,
178         -0.10726385991103820119030638 67e6,
179         -0.14550094401904961824535650 68e4,
180         0.33220913409857223518597044 42e5,        /* qr0 */
181         0.85145160675335701965550011 71e5,
182         0.66178836581270835179399921 66e5,
183         0.18494262873223866796520098 19e5,
184         0.17063754290207680020612835 46e4,
185         0.35265133846636032185921755 80e2,
186         0.70871281941028743573775024 72e6,        /* qs0 */
187         0.18194580422439972989245538 39e7,
188         0.14194606696037208928557552 53e7,
189         0.40029443582266975117086108 13e6,
190         0.37890229745772202641429522 56e5,
191         0.86383677696049909674755171 83e3,
192 };
```



```
194 #define pr0     Cj1y1
195 #define ps0     (Cj1y1+6)
196 #define qr0     (Cj1y1+12)
197 #define qs0     (Cj1y1+18)

199 static const double Cj1[] = {
200         -6.25000000000000220305320098141321894954 8e-0002,       /* a0 */
201         1.60099845564007290132160510198150126376 2e-0003,
202         -1.96388881594831375855251188439016286493 0e-0005,
203         8.26391734109354975978133971341820162099 8e-0008,
204         1.0e0,                                                    /* b0 */
205         1.60506913764300424239535685179787376692 7e-0002,
206         1.14945462325129999642850024950909849938 3e-0004,
207         3.84970167373526097037968180791085232782 5e-0007,
208         4.99999999999999995517408894340485471724 e-0001,
209         -6.00382502812047568483538451994546807542 3e-0002,
210         2.30171989926332182838834446199535541983 2e-0003,
211         -4.20849486923889293485952522165404030406 8e-0005,
212         4.37774513518883778303154002970028244338 8e-0007,
213         -2.85410675567862433514536422673567775417 9e-0009,
214         1.23400286544395202433294390132379841368 9e-0011,
215         -3.64549843703979105895127350883817713431 0e-0014,
216         7.40432059607179745992537710378783741442 2e-0017,
217         -1.00945744827752227526280839851702443908 4e-0019,
218         8.52015835582481979696877141880101993058 5e-0023,
219         -3.45815992608116327448385461460109136142 4e-0026,
220         1.0e0,                                                    /* b1 */
221         4.92349943759048487908113858899898630330 6e-0003,
222         1.05438948921218415649966695350197668845 2e-0005,
223         1.18076837310616652704824036487204381605 0e-0008,
224         5.94266574347609935532324570768064858854 0e-0012,
225 };

227 #define a0      Cj1
228 #define b0      (Cj1+4)
229 #define a1      (Cj1+8)
230 #define b1      (Cj1+20)

232 static const double Cy1[] = {
233         -1.96057090646238946101898325958965596156 0e-0001,       /* c0 */
234         4.93182411835066195345918006000797029113 9e-0002,
235         -1.62697587156539365684593012542468300867 7e-0003,
236         1.35965751792639413269288416808222425836 0e-0005,
237         1.0e0,                                                    /* d0 */
238         2.56580721483839083510822471363090165379 3e-0002,
239         3.37417520897840426865052275252090623150 8e-0004,
240         2.84036857130607071953993693522072884317 7e-0006,
241         1.39638740204899827763890094441575220759 2e-0008,
242         -1.96057090646238947333633961464755535162 6e-0001,       /* c1 */
243         5.33626803033507449423136915993301284473 5e-0002,
244         -2.68413750438274809414918454186633203328 0e-0003,
245         5.73767161897918573698154349858005190306 0e-0005,
246         -6.64269635068633533917117178555766322489 2e-0007,
247         4.69241792256816035401234759196036210166 4e-0009,
248         -2.16172863590778931933523133862141225835 5e-0011,
249         6.72735341973831610719764443184419466870 2e-0014,
250         -1.42750298680386137212523435590679057342 2e-0016,
251         2.02039249872680676946814321961664294037 1e-0019,
252         -1.76137194859510415675304545788827271634 0e-0022,
253         7.35282839194115790517504242024922511581 6e-0026,
254         1.0e0,                                                    /* d1 */
255         5.02918743672794776491624707610228339944 2e-0003,
256         1.10269309580824277507485654892780175062 7e-0005,
257         1.26803577454317483782953460383022721629 1e-0008,
258         6.57941627176661082519254229582130873020 6e-0012,
259 };
```

```
#define c0      Cy1
#define d0      (Cy1+4)
#define c1      (Cy1+9)
#define d1      (Cy1+21)


/* core of j0f computation; assumes fx is finite */
static double
__k_j0f(float fx)
{
        double  x, z, s, c, ss, cc, r, t, p0, q0;
        int     ix, i;

        ix = *(int *)&fx & ~0x80000000;
        x = fabs((double)fx);
        if (ix > 0x41000000) {
                /* x > 8; see comments in j0.c */
                s = sin(x);
                c = cos(x);
                if (signbit(s) != signbit(c)) {
                        ss = s - c;
                        cc = -cos(x + x) / ss;
                } else {
                        cc = s + c;
                        ss = -cos(x + x) / cc;
                }
                if (ix > 0x501502f9) {
                        /* x > 1.0e10 */
                        p0 = one;
                        q0 = neighth / x;
                } else {
                        t = eight / x;
                        z = t * t;
                        p0 = (pr[0] + z * (pr[1] + z * (pr[2] + z * (pr[3] +
                            z * (pr[4] + z * (pr[5] + z * pr[6]))))) /
                            (ps[0] + z * (ps[1] + z * (ps[2] + z * (ps[3] +
                            z * (ps[4] + z * (ps[5] + z))))));
                        q0 = ((qr[0] + z * (qr[1] + z * (qr[2] + z * (qr[3] +
                            z * (qr[4] + z * (qr[5] + z * qr[6]))))) /
                            (qs[0] + z * (qs[1] + z * (qs[2] + z * (qs[3] +
                            z * (qs[4] + z * (qs[5] + z)))))) * t;
                }
                return (isqrtpi * (p0 * cc - q0 * ss) / sqrt(x));
        }
        if (ix <= 0x3727c5ac) {
                /* x <= 1.0e-5 */
                if (ix <= 0x219392ef) /* x <= 1.0e-18 */
                        return (one - x);
                return (one - x * x * quarter);
        }
        z = x * x;
        if (ix <= 0x3fa3d70a) {
                /* x <= 1.28 */
                r = r0[0] + z * (r0[1] + z * (r0[2] + z * r0[3]));
                s = s0[0] + z * (s0[1] + z * (s0[2] + z * s0[3]));
                return (one + z * (r / s));
        }
        r = r1[8];
        s = s1[8];
        for (i = 7; i >= 0; i--) {
                r = r * z + r1[i];
                s = s * z + s1[i];
        }
        return (r / s);
}
```



```
float
j0f(float fx)
{
        float   f;
        int     ix;
#if defined(__i386) && !defined(__amd64)
        int     rp;
#endif

        ix = *(int *)&fx & ~0x80000000;
        if (ix >= 0x7f800000) {                 /* nan or inf */
                if (ix > 0x7f800000)
                        return (fx * fx);
                return (zerof);
        }

#if defined(__i386) && !defined(__amd64)
        rp = __swapRP(fp_extended);
#endif
        f = (float)__k_j0f(fx);
#if defined(__i386) && !defined(__amd64)
        if (rp != fp_extended)
                (void) __swapRP(rp);
#endif
        return (f);
}

/* core of y0f computation; assumes fx is finite and positive */
static double
__k_y0f(float fx)
{
        double  x, z, s, c, ss, cc, t, p0, q0, u, v;
        int     ix, i;

        ix = *(int *)&fx;
        x = (double)fx;
        if (ix > 0x41000000) {
                /* x > 8; see comments in j0.c */
                s = sin(x);
                c = cos(x);
                if (signbit(s) != signbit(c)) {
                        ss = s - c;
                        cc = -cos(x + x) / ss;
                } else {
                        cc = s + c;
                        ss = -cos(x + x) / cc;
                }
                if (ix > 0x501502f9) {
                        /* x > 1.0e10 */
                        p0 = one;
                        q0 = neighth / x;
                } else {
                        t = eight / x;
                        z = t * t;
                        p0 = (pr[0] + z * (pr[1] + z * (pr[2] + z * (pr[3] +
                            z * (pr[4] + z * (pr[5] + z * pr[6]))))) /
                            (ps[0] + z * (ps[1] + z * (ps[2] + z * (ps[3] +
                            z * (ps[4] + z * (ps[5] + z)))))));
                        q0 = ((qr[0] + z * (qr[1] + z * (qr[2] + z * (qr[3] +
                            z * (qr[4] + z * (qr[5] + z * qr[6]))))) /
                            (qs[0] + z * (qs[1] + z * (qs[2] + z * (qs[3] +
                            z * (qs[4] + z * (qs[5] + z)))))) * t;
                }
                return (isqrtpi * (p0 * ss + q0 * cc) / sqrt(x));
        }
```

```
392         if (ix <= 0x219392ef) /* x <= 1.0e-18 */
393                 return (u0[0] + tpi * log(x));
394         z = x * x;
395         u = u0[12];
396         for (i = 11; i >= 0; i--)
397                 u = u * z + u0[i];
398         v = v0[0] + z * (v0[1] + z * (v0[2] + z * (v0[3] + z * v0[4])));
399         return (u / v + tpi * (__k_j0f(fx) * log(x)));
400 }

402 float
403 y0f(float fx)
404 {
405         float   f;
406         int     ix;
407 #if defined(__i386) && !defined(__amd64)
408         int     rp;
409 #endif

411         ix = *(int *)&fx;
412         if ((ix & ~0x80000000) > 0x7f800000)    /* nan */
413                 return (fx * fx);
414         if (ix <= 0) {                          /* zero or negative */
415                 if ((ix << 1) == 0)
416                         return (-onef / zerof);
417                 return (zerof / zerof);
418         }
419         if (ix == 0x7f800000)                   /* +inf */
420                 return (zerof);

422 #if defined(__i386) && !defined(__amd64)
423         rp = __swapRP(fp_extended);
424 #endif
425         f = (float)__k_y0f(fx);
426 #if defined(__i386) && !defined(__amd64)
427         if (rp != fp_extended)
428                 (void) __swapRP(rp);
429 #endif
430         return (f);
431 }

433 /* core of j1f computation; assumes fx is finite */
434 static double
435 __k_j1f(float fx)
436 {
437         double  x, z, s, c, ss, cc, r, t, p1, q1;
438         int     i, ix, sgn;

440         ix = *(int *)&fx;
441         sgn = (unsigned)ix >> 31;
442         ix &= ~0x80000000;
443         x = fabs((double)fx);
444         if (ix > 0x41000000) {
445                 /* x > 8; see comments in j1.c */
446                 s = sin(x);
447                 c = cos(x);
448                 if (signbit(s) != signbit(c)) {
449                         cc = s - c;
450                         ss = cos(x + x) / cc;
451                 } else {
452                         ss = -s - c;
453                         cc = cos(x + x) / ss;
454                 }
455                 if (ix > 0x501502f9) {
456                         /* x > 1.0e10 */
457                         p1 = one;
```



```
458                         q1 = three8 / x;
459                 } else {
460                         t = eight / x;
461                         z = t * t;
462                         p1 = (pr0[0] + z * (pr0[1] + z * (pr0[2] + z *
463                             (pr0[3] + z * (pr0[4] + z * pr0[5])))) /
464                             (ps0[0] + z * (ps0[1] + z * (ps0[2] + z *
465                             (ps0[3] + z * (ps0[4] + z * (ps0[5] + z))))));
466                         q1 = ((qr0[0] + z * (qr0[1] + z * (qr0[2] + z *
467                             (qr0[3] + z * (qr0[4] + z * qr0[5])))) /
468                             (qs0[0] + z * (qs0[1] + z * (qs0[2] + z *
469                             (qs0[3] + z * (qs0[4] + z * (qs0[5] + z)))))) * t;
470                 }
471                 t = isqrtpi * (p1 * cc - q1 * ss) / sqrt(x);
472                 return ((sgn)? -t : t);
473         }
474         if (ix <= 0x3727c5ac) {
475                 /* x <= 1.0e-5 */
476                 if (ix <= 0x219392ef) /* x <= 1.0e-18 */
477                         t = half * x;
478                 else
479                         t = x * (half + neighth * x * x);
480                 return ((sgn)? -t : t);
481         }
482         z = x * x;
483         if (ix < 0x3fa3d70a) {
484                 /* x < 1.28 */
485                 r = a0[0] + z * (a0[1] + z * (a0[2] + z * a0[3]));
486                 s = b0[0] + z * (b0[1] + z * (b0[2] + z * b0[3]));
487                 t = x * half + x * (z * (r / s));
488         } else {
489                 r = a1[11];
490                 for (i = 10; i >= 0; i--)
491                         r = r * z + a1[i];
492                 s = b1[0] + z * (b1[1] + z * (b1[2] + z * (b1[3] + z * b1[4])));
493                 t = x * (r / s);
494         }
495         return ((sgn)? -t : t);
496 }

498 float
499 j1f(float fx)
500 {
501         float   f;
502         int     ix;
503 #if defined(__i386) && !defined(__amd64)
504         int     rp;
505 #endif

507         ix = *(int *)&fx & ~0x80000000;
508         if (ix >= 0x7f800000)                   /* nan or inf */
509                 return (onef / fx);

511 #if defined(__i386) && !defined(__amd64)
512         rp = __swapRP(fp_extended);
513 #endif
514         f = (float)__k_j1f(fx);
515 #if defined(__i386) && !defined(__amd64)
516         if (rp != fp_extended)
517                 (void) __swapRP(rp);
518 #endif
519         return (f);
520 }

522 /* core of y1f computation; assumes fx is finite and positive */
523 static double
```

```
__k_y1f(float fx)
{
        double  x, z, s, c, ss, cc, u, v, p1, q1, t;
        int     i, ix;

        ix = *(int *)&fx;
        x = (double)fx;
        if (ix > 0x41000000) {
                /* x > 8; see comments in j1.c */
                s = sin(x);
                c = cos(x);
                if (signbit(s) != signbit(c)) {
                        cc = s - c;
                        ss = cos(x + x) / cc;
                } else {
                        ss = -s - c;
                        cc = cos(x + x) / ss;
                }
                if (ix > 0x501502f9) {
                        /* x > 1.0e10 */
                        p1 = one;
                        q1 = three8 / x;
                } else {
                        t = eight / x;
                        z = t * t;
                        p1 = (pr0[0] + z * (pr0[1] + z * (pr0[2] + z *
                            (pr0[3] + z * (pr0[4] + z * pr0[5])))) /
                            (ps0[0] + z * (ps0[1] + z * (ps0[2] + z *
                            (ps0[3] + z * (ps0[4] + z * (ps0[5] + z))))));
                        q1 = ((qr0[0] + z * (qr0[1] + z * (qr0[2] + z *
                            (qr0[3] + z * (qr0[4] + z * qr0[5])))) /
                            (qs0[0] + z * (qs0[1] + z * (qs0[2] + z *
                            (qs0[3] + z * (qs0[4] + z * (qs0[5] + z)))))) * t;
                }
                return (isqrtpi * (p1 * ss + q1 * cc) / sqrt(x));
        }
        if (ix <= 0x219392ef) /* x <= 1.0e-18 */
                return (-tpi / x);
        z = x * x;
        if (ix < 0x3fa3d70a) {
                /* x < 1.28 */
                u = c0[0] + z * (c0[1] + z * (c0[2] + z * c0[3]));
                v = d0[0] + z * (d0[1] + z * (d0[2] + z * (d0[3] + z * d0[4])));
        } else {
                u = c1[11];
                for (i = 10; i >= 0; i--)
                        u = u * z + c1[i];
                v = d1[0] + z * (d1[1] + z * (d1[2] + z * (d1[3] + z * d1[4])));
        }
        return (x * (u / v) + tpi * (__k_j1f(fx) * log(x) - one / x));
}

float
y1f(float fx)
{
        float   f;
        int     ix;
#if defined(__i386) && !defined(__amd64)
        int     rp;
#endif

        ix = *(int *)&fx;
        if ((ix & ~0x80000000) > 0x7f800000)    /* nan */
                return (fx * fx);
        if (ix <= 0) {                          /* zero or negative */
                if ((ix << 1) == 0)
```



```
                        return (-onef / zerof);
                return (zerof / zerof);
        }
        if (ix == 0x7f800000)                   /* +inf */
                return (zerof);

#if defined(__i386) && !defined(__amd64)
        rp = __swapRP(fp_extended);
#endif
        f = (float)__k_y1f(fx);
#if defined(__i386) && !defined(__amd64)
        if (rp != fp_extended)
                (void) __swapRP(rp);
#endif
        return (f);
}

float
jnf(int n, float fx)
{
        double  a, b, temp, x, z, w, t, q0, q1, h;
        float   f;
        int     i, ix, sgn, m, k;
#if defined(__i386) && !defined(__amd64)
        int     rp;
#endif

        if (n < 0) {
                n = -n;
                fx = -fx;
        }
        if (n == 0)
                return (j0f(fx));
        if (n == 1)
                return (j1f(fx));

        ix = *(int *)&fx;
        sgn = (n & 1)? ((unsigned)ix >> 31) : 0;
        ix &= ~0x80000000;
        if (ix >= 0x7f800000) {         /* nan or inf */
                if (ix > 0x7f800000)
                        return (fx * fx);
                return ((sgn)? -zerof : zerof);
        }
        if ((ix << 1) == 0)
                return ((sgn)? -zerof : zerof);

#if defined(__i386) && !defined(__amd64)
        rp = __swapRP(fp_extended);
#endif
        fx = fabsf(fx);
        x = (double)fx;
        if ((double)n <= x) {
                /* safe to use J(n+1,x) = 2n/x * J(n,x) - J(n-1,x) */
                a = __k_j0f(fx);
                b = __k_j1f(fx);
                for (i = 1; i < n; i++) {
                        temp = b;
                        b = b * ((double)(i + i) / x) - a;
                        a = temp;
                }
                f = (float)b;
#if defined(__i386) && !defined(__amd64)
                if (rp != fp_extended)
                        (void) __swapRP(rp);
#endif
```

```
656                 return ((sgn)? -f : f);
657         }
658         if (ix < 0x3089705f) {
659                 /* x < 1.0e-9; use J(n,x) = 1/n! * (x / 2)^n */
660                 if (n > 6)
661                         n = 6;  /* result underflows to zero for n >= 6 */
662                 b = t = half * x;
663                 a = one;
664                 for (i = 2; i <= n; i++) {
665                         b *= t;
666                         a *= (double)i;
667                 }
668                 b /= a;
669         } else {
670                 /*
671                  * Use the backward recurrence:
672                  *
673                  *                          x      x^2      x^2
674                  *  J(n,x)/J(n-1,x) =  ---- - ------ - ------   .....
675                  *                          2n    2(n+1)   2(n+2)
676                  *
677                  * Let w = 2n/x and h = 2/x.  Then the above quotient
678                  * is equal to the continued fraction:
679                  *                      1
680                  *      = -----------------------
681                  *                         1
682                  *         w - -----------------
683                  *                        1
684                  *              w+h - ---------
685                  *                     w+2h - ...
686                  *
687                  * To determine how many terms are needed, run the
688                  * recurrence
689                  *
690                  *      Q(0) = w,
691                  *      Q(1) = w(w+h) - 1,
692                  *      Q(k) = (w+k*h)*Q(k-1) - Q(k-2).
693                  *
694                  * Then when Q(k) > 1e4, k is large enough for single
695                  * precision.
696                  */
697 /* XXX NOT DONE - rework this */
698                 w = (n + n) / x;
699                 h = two / x;
700                 q0 = w;
701                 z = w + h;
702                 q1 = w * z - one;
703                 k = 1;
704                 while (q1 < big) {
705                         k++;
706                         z += h;
707                         temp = z * q1 - q0;
708                         q0 = q1;
709                         q1 = temp;
710                 }
711                 m = n + n;
712                 t = zero;
713                 for (i = (n + k) << 1; i >= m; i -= 2)
714                         t = one / ((double)i / x - t);
715                 a = t;
716                 b = one;
717                 /*
718                  * estimate log((2/x)^n*n!) = n*log(2/x)+n*ln(n)
719                  * hence, if n*(log(2n/x)) > ...
720                  *      single 8.8722839355e+01
721                  *      double 7.09782712893383973096e+02
```



```
722                  *      then recurrent value may overflow and the result is
723                  *      likely underflow to zero
724                  */
725                 temp = (double)n;
726                 temp *= log((two / x) * temp);
727                 if (temp < 7.09782712893383973096e+02) {
728                         for (i = n - 1; i > 0; i--) {
729                                 temp = b;
730                                 b = b * ((double)(i + i) / x) - a;
731                                 a = temp;
732                         }
733                 } else {
734                         for (i = n - 1; i > 0; i--) {
735                                 temp = b;
736                                 b = b * ((double)(i + i) / x) - a;
737                                 a = temp;
738                                 if (b > 1.0e100) {
739                                         a /= b;
740                                         t /= b;
741                                         b = one;
742                                 }
743                         }
744                 }
745                 b = (t * __k_j0f(fx) / b);
746         }
747         f = (float)b;
748 #if defined(__i386) && !defined(__amd64)
749         if (rp != fp_extended)
750                 (void) __swapRP(rp);
751 #endif
752         return ((sgn)? -f : f);
753 }

755 float
756 ynf(int n, float fx)
757 {
758         double  a, b, temp, x;
759         float   f;
760         int     i, sign, ix;
761 #if defined(__i386) && !defined(__amd64)
762         int     rp;
763 #endif

765         sign = 0;
766         if (n < 0) {
767                 n = -n;
768                 if (n & 1)
769                         sign = 1;
770         }
771         if (n == 0)
772                 return (y0f(fx));
773         if (n == 1)
774                 return ((sign)? -y1f(fx) : y1f(fx));

776         ix = *(int *)&fx;
777         if ((ix & ~0x80000000) > 0x7f800000)    /* nan */
778                 return (fx * fx);
779         if (ix <= 0) {                          /* zero or negative */
780                 if ((ix << 1) == 0)
781                         return (-onef / zerof);
782                 return (zerof / zerof);
783         }
784         if (ix == 0x7f800000)                   /* +inf */
785                 return (zerof);

787 #if defined(__i386) && !defined(__amd64)
```

```
788         rp = __swapRP(fp_extended);
789 #endif
790         a = __k_y0f(fx);
791         b = __k_y1f(fx);
792         x = (double)fx;
793         for (i = 1; i < n; i++) {
794                 temp = b;
795                 b *= (double)(i + i) / x;
796                 if (b <= -DBL_MAX)
797                         break;
798                 b -= a;
799                 a = temp;
800         }
801         f = (float)b;
802 #if defined(__i386) && !defined(__amd64)
803         if (rp != fp_extended)
804                 (void) __swapRP(rp);
805 #endif
806         return ((sign)? -f : f);
807 }
```

****
1197 Sat May 10 12:09:11 2014
new/usr/src/lib/libm/common/R/cbrtf.c
patch01 - 693 import Sun Devpro Math Library
****

```
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#pragma weak cbrtf = __cbrtf

#include "libm.h"

float
cbrtf(float x) {
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
        if (isnanf(x))
                return (x * x);
        else
#endif
        return ((float) cbrt((double) x));
}
```

****
1216 Sat May 10 12:09:12 2014
new/usr/src/lib/libm/common/R/copysignf.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#if defined(ELFOBJ)
#pragma weak copysignf = __copysignf
#endif

#include "libm.h"

float
copysignf(float x, float y) {
        float w;

        *(int *) &w = (*(int *) &x & ~0x80000000) | (*(int *) &y & 0x80000000);
        return (w);
}
```

```
**********************************************************
    3872 Sat May 10 12:09:12 2014
new/usr/src/lib/libm/common/R/cosf.c
libm/common/R/cosf.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak cosf = __cosf

/*
 * See sincosf.c
 */

#include "libm.h"

extern const int _TBL_ipio2_inf[];
extern int __rem_pio2m(double *, double *, int, int, int, const int *);
#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const double C[] = {
        1.85735322054308378716204874632872525989806770558e-0003,
        -1.95035094218403635082921458859320791358115801259e-0004,
        5.38400550766074785970952495168558701485841707252e+0002,
        -3.31975110777873728964197739157371509422022905947e+0001,
        1.09349482127188401868272000389539985058873853699e-0003,
        -5.03324285989964979398034700054920226866107675091e-0004,
        2.43792880266971107750418061559602239831538067410e-0005,
        9.14499072605666582228127405245558035523741471271e+0002,
        -3.63151270591815439197122504991683846785293207730e+0001,
        0.63661977236758134307553 5,     /* 2^ -1  * 1.45F306DC9C883 */
        0.5,
        1.57079632673412561 4166,        /* 2^  0  * 1.921FB54400000 */
        6.07710050650619260 1475e-11,    /* 2^-34  * 1.0B4611A626331 */
};

#define S0      C[0]
```



```
#define S1      C[1]
#define S2      C[2]
#define S3      C[3]
#define C0      C[4]
#define C1      C[5]
#define C2      C[6]
#define C3      C[7]
#define C4      C[8]
#define invpio2 C[9]
#define half    C[10]
#define pio2_1  C[11]
#define pio2_t  C[12]

float
cosf(float x)
{
        double  y, z, w;
        float   f;
        int     n, ix, hx, hy;
        volatile int i;

        hx = *((int *)&x);
        ix = hx & 0x7fffffff;

        y = (double)x;

        if (ix <= 0x4016cbe4) {         /* |x| < 3*pi/4 */
                if (ix <= 0x3f490fdb) {         /* |x| < pi/4 */
                        if (ix <= 0x39800000) { /* |x| <= 2**-12 */
                                i = (int)y;
#ifdef lint
                                i = i;
#endif
                                return (1.0f);
                        }
                        z = y * y;
                        return (((float)(((C0 + z * C1) + (z * z) * C2) *
                            (C3 + z * (C4 + z))));
                } else if (hx > 0) {
                        y = (y - pio2_1) - pio2_t;
                        z = y * y;
                        return ((float)-((y * (S0 + z * S1)) *
                            (S2 + z * (S3 + z))));
                } else {
                        y = (y + pio2_1) + pio2_t;
                        z = y * y;
                        return ((float)((y * (S0 + z * S1)) *
                            (S2 + z * (S3 + z))));
                }
        } else if (ix <= 0x49c90fdb) {  /* |x| < 2^19*pi */
#if defined(__i386) && !defined(__amd64)
                int     rp;

                rp = __swapRP(fp_extended);
#endif
                w = y * invpio2;
                if (hx < 0)
                        n = (int)(w - half);
                else
                        n = (int)(w + half);
                y = (y - n * pio2_1) - n * pio2_t;
                n++;
#if defined(__i386) && !defined(__amd64)
                if (rp != fp_extended)
                        (void) __swapRP(rp);
#endif
```

```
126         } else {
127                 if (ix >= 0x7f800000)
128                         return (x / x); /* cos(Inf or NaN) is NaN */
129                 hy = ((int *)&y)[HIWORD];
130                 n = ((hy >> 20) & 0x7ff) - 1046;
131                 ((int *)&w)[HIWORD] = (hy & 0xfffff) | 0x41600000;
132                 ((int *)&w)[LOWORD] = ((int *)&y)[LOWORD];
133                 n = __rem_pio2m(&w, &y, n, 1, 0, _TBL_ipio2_inf) + 1;
134         }

136         if (n & 1) {
137                 /* compute cos y */
138                 z = y * y;
139                 f = (float)(((C0 + z * C1) + (z * z) * C2) *
140                     (C3 + z * (C4 + z)));
141         } else {
142                 /* compute sin y */
143                 z = y * y;
144                 f = (float)((y * (S0 + z * S1)) * (S2 + z * (S3 + z)));
145         }

147         return ((n & 2)? -f : f);
148 }
```

```
**********************************************************
    1354 Sat May 10 12:09:12 2014
new/usr/src/lib/libm/common/R/coshf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak coshf = __coshf

#include "libm.h"

float
coshf(float x) {
        double  c;
        float   w;
        int     ix;

        ix = *(int *)&x & ~0x80000000;
        if (ix >= 0x7f800000) {
                /* coshf(x) is |x| if x is +-Inf or NaN */
                return (x * x);
        }
        if (ix >= 0x43000000)   /* coshf(x) trivially overflows */
                c = 1.0e100;
        else
                c = cosh((double)x);
        w = (float)c;
        return (w);
}
```

```
**********************************************************
    1706 Sat May 10 12:09:12 2014
new/usr/src/lib/libm/common/R/erff.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak erff = __erff
#pragma weak erfcf = __erfcf

#include "libm.h"

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

float
erff(float x) {
        int     ix;

        ix = *(int *)&x & ~0x80000000;
        if (ix > 0x7f800000)    /* x is NaN */
                return (x * x);
        return ((float)erf((double)x));
}

float
erfcf(float x) {
        float   f;
        int     ix;
#if defined(__i386) && !defined(__amd64)
        int     rp;
#endif

        ix = *(int *)&x & ~0x80000000;
        if (ix > 0x7f800000)    /* x is NaN */
                return (x * x);

#if defined(__i386) && !defined(__amd64)
        rp = __swapRP(fp_extended);
```



```
#endif
        f = (float)erfc((double)x);
#if defined(__i386) && !defined(__amd64)
        if (rp != fp_extended)
                (void) __swapRP(rp);
#endif
        return (f);
}
```

```
**********************************************************
    1231 Sat May 10 12:09:12 2014
new/usr/src/lib/libm/common/R/exp10f.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak exp10f = __exp10f

#include "libm.h"

extern double exp10(double);

float
exp10f(float x) {
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
        if (isnanf(x))
                return (x * x);
        else
#endif
        return ((float) exp10((double) x));
}
```

****
1197 Sat May 10 12:09:12 2014
new/usr/src/lib/libm/common/R/exp2f.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#pragma weak exp2f = __exp2f

#include "libm.h"

float
exp2f(float x) {
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
        if (isnanf(x))
                return (x * x);
        else
#endif
        return ((float) exp2((double) x));
}
```

```
**********************************************************
   16892 Sat May 10 12:09:12 2014
new/usr/src/lib/libm/common/R/expf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak expf = __expf

/* INDENT OFF */
/*
 * float expf(float x);
 * Code by K.C. Ng for SUN 5.0 libmopt
 * 11/5/99
 * Method :
 *      1. For |x| >= 2^7, either underflow/overflow.
 *         More precisely:
 *              x > 88.722839355...(0x42B17218) => overflow;
 *              x < -103.97207642..(0xc2CFF1B4) => underflow.
 *      2. For |x| <  2^-6, use polynomail
 *              exp(x) = 1 + x + p1*x^2 + p2*x^3
 *      3. Otherwise, write |x|=(1+r)*2^n, where 0<=r<1.
 *         Let t = 2^n * (1+r) .... x > 0;
 *             t = 2^n * (1-r) .... x < 0. (x= -2**(n+1)+t)
 *         Since -6 <= n <= 6, we may break t into
 *         six 6-bits chunks:
 *                    -5     -11     -17     -23     -29
 *         t=j *2+j *2  +j *2   +j *2   +j *2   +j *2
 *            1    2      3       4       5       6
 *
 *         where 0 <= j  < 64 for i = 1,...,6.
 *                      i
 *         Note that since t has only 24 significant bits,
 *         either j  or j  must be 0.
 *                1     6
 *                                            7-6i
 *         One may define j  by   (int) ( t * 2     ) mod 64
 *                        i
 *         mathematically. In actual implementation, they can
 *         be obtained by manipulating the exponent and
```



```
 *         mantissa bits as follow:
 *              Let ix = (HEX(x)&0x007fffff)|0x00800000.
 *              If n>=0, let ix=ix<<n, then j =0 and
 *                                           6
 *                  j  = ix>>(30-6i)) mod 64  ...i=1,...,5
 *                   i
 *              Otherwise, let ix=ix<<(j+6), then j = 0 and
 *                                                 1
 *                  j  = ix>>(36-6i)) mod 64  ...i=2,...,6
 *                   i
 *
 *      4. Compute exp(t) by table look-up method.
 *         Precompute ET[k] = exp(j*2^(7-6i)), k=j+64*(6-i).
 *         Then
 *         exp(t) = ET[j +320]*ET[j +256]*ET[j +192]*
 *                      1          2          3
 *
 *                  ET[j +128]*ET[j +64]*ET[j ]
 *                      4          5         6
 *
 *                                  n+1
 *      5. If x < 0, return exp(-2   )* exp(t). Note that
 *         -6 <= n <= 6. Let k = n - 6, then we can
 *         precompute
 *                         k-5          n+1
 *         EN[k] = exp(-2   ) = exp(-2   ) for k=0,1,...,12.
 *
 *
 * Special cases:
 *      exp(INF) is INF, exp(NaN) is NaN;
 *      exp(-INF) = 0;
 *      for finite argument, only exp(0) = 1 is exact.
 *
 * Accuracy:
 *      All calculations are done in double precision except for
 *      the case |x| < 2^-6.  When |x| < 2^-6, the error is less
 *      than 0.55 ulp.  When |x| >= 2^-6 and the result is normal,
 *      the error is less than 0.51 ulp.  When FDTOS_TRAPS_... is
 *      defined and the result is subnormal, the error can be as
 *      large as 0.75 ulp.
 */
/* INDENT ON */

#include "libm.h"

/*
 * ET[k] = exp(j*2^(7-6i)) , where j = k mod 64, i = k/64
 */
static const double ET[] = {
        1.0000000000000000000e+00, 1.0000000186264514923e+00,
        1.0000000372529029846e+00, 1.0000000558793544769e+00,
        1.0000000745058059692e+00, 1.0000000931322574615e+00,
        1.0000000117587089539e+00, 1.0000001303851604462e+00,
        1.0000001490116119385e+00, 1.0000001676380656512e+00,
        1.0000001862645171435e+00, 1.0000002048909686359e+00,
        1.0000002235174201282e+00, 1.0000002421438716205e+00,
        1.0000002607703253332e+00, 1.0000002793967768255e+00,
        1.0000002980232283178e+00, 1.0000003166496798102e+00,
        1.0000003352761335229e+00, 1.0000003539025850152e+00,
        1.0000003725290365075e+00, 1.0000003911554879998e+00,
        1.0000004097819417126e+00, 1.0000004284083932049e+00,
        1.0000004470348446972e+00, 1.0000004656612984100e+00,
        1.0000004842877499023e+00, 1.0000005029142036150e+00,
        1.0000005215406551073e+00, 1.0000005401671088201e+00,
        1.0000005587935603124e+00, 1.0000005774200140252e+00,
        1.0000005960464655175e+00, 1.0000006146729192302e+00,
```

```
128         1.0000000632993707225e+00, 1.0000000651925824435 3e+00,
129         1.0000000670552275 9276e+00, 1.0000000689178729 6404e+00,
130         1.0000000707805181 1327e+00, 1.0000000726431634 8454e+00,
131         1.0000000745058086 3377e+00, 1.0000000763684540 0505e+00,
132         1.0000000782310993 7632e+00, 1.0000000800937445 2556e+00,
133         1.0000000819563898 683e+00, 1.0000000838190352 6811e+00,
134         1.0000000856816806 3938e+00, 1.0000000875443257 8861e+00,
135         1.0000000894069711 5989e+00, 1.0000000912696165 3116e+00,
136         1.0000000931322619 0244e+00, 1.0000000949949070 5167e+00,
137         1.0000000968575524 2295e+00, 1.0000000987201977 9422e+00,
138         1.0000001005828431 6550e+00, 1.0000001024454885 3677e+00,
139         1.0000001043081336 8600e+00, 1.0000001061707790 5728e+00,
140         1.0000001080334244 2856e+00, 1.0000001098960697 9983e+00,
141         1.0000001117587151 7111e+00, 1.0000001136213605 4238e+00,
142         1.0000001154840059 1366e+00, 1.0000001173466512 8493e+00,
143         1.0000000000000000 0000e+00, 1.0000001192092966 5621e+00,
144         1.0000002384186075 2327e+00, 1.0000003576279326 0119e+00,
145         1.0000004768372718 8996e+00, 1.0000005960466253 8959e+00,
146         1.0000007152559310 007e+00, 1.0000008344653750 2141e+00,
147         1.0000009536747711 5360e+00, 1.0000010728841814 9665e+00,
148         1.0000011920936060 5055e+00, 1.0000013113030448 1530e+00,
149         1.0000014305124977 9091e+00, 1.0000015497219649 7738e+00,
150         1.0000016689314463 7470e+00, 1.0000017881409419 8287e+00,
151         1.0000019073504518 0190e+00, 1.0000020265599758 3179e+00,
152         1.0000021457695140 7253e+00, 1.0000022649790665 2412e+00,
153         1.0000023841886331 8657e+00, 1.0000025033982140 5987e+00,
154         1.0000026226078091 4403e+00, 1.0000027418174184 3904e+00,
155         1.0000028610270419 4491e+00, 1.0000029802366796 6163e+00,
156         1.0000030994463315 8921e+00, 1.0000032186559977 2764e+00,
157         1.0000033378656780 7692e+00, 1.0000034570753726 3706e+00,
158         1.0000035762850814 0806e+00, 1.0000036954948043 8991e+00,
159         1.0000038147045415 8261e+00, 1.0000039339142929 8617e+00,
160         1.0000040531240586 0059e+00, 1.0000041723338384 2586e+00,
161         1.0000042915436246 198e+00, 1.0000044107534407 0896e+00,
162         1.0000045299632631 6679e+00, 1.0000046491730998 3548e+00,
163         1.0000047683829507 1502e+00, 1.0000048875928158 0542e+00,
164         1.0000050068026951 0667e+00, 1.0000051260125885 1878e+00,
165         1.0000052452224963 4174e+00, 1.0000053644324182 7556e+00,
166         1.0000054836423544 2023e+00, 1.0000056028523047 7575e+00,
167         1.0000057220622693 4213e+00, 1.0000058412722481 1937e+00,
168         1.0000059604822411 0746e+00, 1.0000060796922483 0640e+00,
169         1.0000061989022697 1620e+00, 1.0000063181123053 3685e+00,
170         1.0000064372235516 836e+00, 1.0000065565324192 1073e+00,
171         1.0000066757424974 6394e+00, 1.0000067949525899 2802e+00,
172         1.0000069141626966 0294e+00, 1.0000070333728174 8873e+00,
173         1.0000071525829525 8536e+00, 1.0000072717931018 9285e+00,
174         1.0000073910032654 1120e+00, 1.0000075102134431 4040e+00,
175         1.0000000000000000 0000e+00, 1.0000076294236350 8046e+00,
176         1.0000152589054784 8796e+00, 1.0000228884553022 251e+00,
177         1.0000305180437909 5024e+00, 1.0000381477002613 3729e+00,
178         1.0000457774149413 8365e+00, 1.0000534071878317 5546e+00,
179         1.0000610370189331 1886e+00, 1.0000686669082454 7383e+00,
180         1.0000762968557694 8653e+00, 1.0000839268615058 2307e+00,
181         1.0000915569254544 8346e+00, 1.0000991870476161 3384e+00,
182         1.0001068172279914 4033e+00, 1.0001144474665804 0295e+00,
183         1.0001220776338368 781e+00, 1.0001297081184019 6106e+00,
184         1.0001373385316352 2269e+00, 1.0001449690030841 3885e+00,
185         1.0001525995327493 7565e+00, 1.0001602301206309 3311e+00,
186         1.0001678607667294 7736e+00, 1.0001754914710456 7453e+00,
187         1.0001831222335795 2462e+00, 1.0001907530543319 1581e+00,
188         1.0001983839333028 4809e+00, 1.0002060148704929 8761e+00,
189         1.0002136458659030 0050e+00, 1.0002212769195328 8675e+00,
190         1.0002289080313835 3455e+00, 1.0002365392014549 4389e+00,
191         1.0002441704297477 8091e+00, 1.0002518017162671 175e+00,
192         1.0002594330609997 3640e+00, 1.0002670644639597 4304e+00,
193         1.0002746959251427 3167e+00, 1.0002823274445495 9047e+00,
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194         1.0002899590221803 1944e+00, 1.0002975906580355 8471e+00,
195         1.0003052223521160 5242e+00, 1.0003128541044217 2257e+00,
196         1.0003204859149534 8333e+00, 1.0003281177837115 5675e+00,
197         1.0003357497106961 6488e+00, 1.0003433816959081 9589e+00,
198         1.0003510137393476 4979e+00, 1.0003586458410154 1475e+00,
199         1.0003662780009114 9076e+00, 1.0003739102190367 6602e+00,
200         1.0003815424953914 6257e+00, 1.0003891748299758 0244e+00,
201         1.0003968072227906 7382e+00, 1.0004044396738362 9875e+00,
202         1.0004120721831128 9928e+00, 1.0004197047506213 6359e+00,
203         1.0004273373763619 1371e+00, 1.0004349700603499 375e+00,
204         1.0004426028025410 4778e+00, 1.0004502356029802 9786e+00,
205         1.0004578684616536 3215e+00, 1.0004655013785612 7272e+00,
206         1.0004731343537036 6363e+00, 1.0004807673870812 4900e+00,
207         1.0000000000000000 0000e+00, 1.0004884004786944 7289e+00,
208         1.0009770394924164 5383e+00, 1.0014659171576667 5179e+00,
209         1.0019550335910027 9717e+00, 1.0024443889090390 8579e+00,
210         1.0029339832284467 3487e+00, 1.0034238166659545 9322e+00,
211         1.0039138893383474 6489e+00, 1.0044042013624685 5165e+00,
212         1.0048947528552165 6645e+00, 1.0053854393354861 993e+00,
213         1.0058765747144782 2211e+00, 1.0063678453150763 9251e+00,
214         1.0068593558524709 9411e+00, 1.0073511064438473 9942e+00,
215         1.0078430972064480 4642e+00, 1.0083353282575243 856e+00,
216         1.0088277997145780 3292e+00, 1.0093205116948789 0796e+00,
217         1.0098134643159468 7374e+00, 1.0103066576953110 2782e+00,
218         1.0108000919505575 3324e+00, 1.0112937671993305 0666e+00,
219         1.0117876835593315 7430e+00, 1.0122818411483189 8377e+00,
220         1.0127762400841096 0244e+00, 1.0132708804845771 4109e+00,
221         1.0137657624676528 2008e+00, 1.0142608861513265 748e+00,
222         1.0147562516536434 7069e+00, 1.0152518590927093 1894e+00,
223         1.0157477085866857 2693e+00, 1.0162438002537923 5093e+00,
224         1.0167401342123065 7883e+00, 1.0172367105805637 5216e+00,
225         1.0177335294769569 4404e+00, 1.0182305910199367 3714e+00,
226         1.0187278953280123 3392e+00, 1.0192254425197500 0229e+00,
227         1.0197232327137741 8585e+00, 1.0202212660287675 0390e+00,
228         1.0207195425834700 8526e+00, 1.0212180624966806 7856e+00,
229         1.0217168258872555 4197e+00, 1.0222158328741091 0934e+00,
230         1.0227150835762137 6817e+00, 1.0232145781126005 2573e+00,
231         1.0237143166023578 9884e+00, 1.0242142991646328 0207e+00,
232         1.0247145259186305 4771e+00, 1.0252149969836144 0167e+00,
233         1.0257157124789060 2763e+00, 1.0262166725238856 2492e+00,
234         1.0267178772379901 2859e+00, 1.0272193267407172 5344e+00,
235         1.0277210211516216 7202e+00, 1.0282229605903165 9254e+00,
236         1.0287251451764733 9893e+00, 1.0292275750298227 6101e+00,
237         1.0297302502701528 5815e+00, 1.0302331710173109 3359e+00,
238         1.0307363373912026 2831e+00, 1.0312397495117924 2510e+00,
239         1.0000000000000000 0000e+00, 1.0317434074991076 0038e+00,
240         1.0644944589178595 4288e+00, 1.0982851403078257 5794e+00,
241         1.1331484530668263 2220e+00, 1.1691184461695043 3284e+00,
242         1.2062302494209806 7136e+00, 1.2445201077660952 2935e+00,
243         1.2840254166877413 9438e+00, 1.3247847587288656 9675e+00,
244         1.3668379411737963 1139e+00, 1.4102260349257107 4746e+00,
245         1.4549914146182012 5087e+00, 1.5011778000012279 529e+00,
246         1.5488302986341331 2910e+00, 1.5979954499506332 5104e+00,
247         1.6487212707001281 9416e+00, 1.7010573018484007 6014e+00,
248         1.7550546569602984 9809e+00, 1.8107660721193872 2664e+00,
249         1.8682459574322232 613e+00, 1.9275504501675446 7113e+00,
250         1.9887374695822919 1684e+00, 2.0518667734879767 4725e+00,
251         2.1170001661267478 426e+00, 2.1842008108156178 9915e+00,
252         2.2535347872132085 4561e+00, 2.3250696602771210 3084e+00,
253         2.3988752939670980 8793e+00, 2.4750237699630250 8871e+00,
254         2.5535894580629268 0913e+00, 2.6346490888156308 6851e+00,
255         2.7182818284590455 3488e+00, 2.8045693562372266 9604e+00,
256         2.8935959441717611 3623e+00, 2.9854485393653558 1340e+00,
257         3.0802168489180310 4733e+00, 3.1779934275388340 018e+00,
258         3.2788737679386734 6692e+00, 3.3829563940924689 5468e+00,
259         3.4903429574618414 2217e+00, 3.6011383362721756 1073e+00,
```

```
260         3.71545073794110392029e+00, 3.83339180475841034834e+00,
261         3.95507672292057721464e+00, 4.08062433502646015882e+00,
262         4.21015725614395996956e+00, 4.34380199356104235164e+00,
263         4.48168907033806451778e+00, 4.62395315278208052234e+00,
264         4.77073318196760265408e+00, 4.92217250943229078786e+00,
265         5.07841903718008147450e+00, 5.23962536212848917216e+00,
266         5.40594892514116676097e+00, 5.57755216479125959239e+00,
267         5.75460267600573072144e+00, 5.93727337374560715233e+00,
268         6.12574266188198635064e+00, 6.32019460743274397174e+00,
269         6.52081912033011246166e+00, 6.72781213889469142941e+00,
270         6.94137582119703555605e+00, 7.16171874249371143151e+00,
271         1.00000000000000000000e+00, 7.38905609893065040694e+00,
272         5.45981500331442362040e+01, 4.03428793492735110249e+02,
273         2.98095798704172830185e+03, 2.20264657948067178950e+04,
274         1.62754791419003915507e+05, 1.20260428416477679275e+06,
275         8.88611052050787210464e+06, 6.56599691373305097222e+07,
276         4.85165195409790277481e+08, 3.58491284613159179688e+09,
277         2.64891221298434715271e+10, 1.95729609428838775635e+11,
278         1.44625706429147509766e+12, 1.06864745815244628906e+13,
279         7.89629601826806875000e+13, 5.83461742527454875000e+14,
280         4.31123154711519500000e+15, 3.18559317571137560000e+16,
281         2.35385266837020000000e+17, 1.73927494152050099200e+18,
282         1.28516001143593082880e+19, 9.49611942060244828160e+19,
283         7.01673591209763143680e+20, 5.18470552858707204506e+21,
284         3.83100800071657691546e+22, 2.83075330327469394756e+23,
285         2.09165949601299610311e+24, 1.54553893559010391826e+25,
286         1.14200738981568423454e+26, 8.43835666874145383188e+26,
287         6.23514908081161674391e+27, 4.60718663433129178064e+28,
288         3.40427604993174075827e+29, 2.51543867091916687979e+30,
289         1.85867174528412788702e+31, 1.37338297954017610775e+32,
290         1.01480038811388874615e+33, 7.49841699699012090701e+33,
291         5.54062238439350983445e+34, 4.09399696212745451138e+35,
292         3.02507732220114256223e+36, 2.23524660373471497416e+37,
293         1.65163625499400180987e+38, 1.22040329431784083418e+39,
294         9.01762840503429851945e+39, 6.66317621641089618500e+40,
295         4.92345828601205826106e+41, 3.63797094760880474988e+42,
296         2.68811741816613560943e+43, 1.98626483613765434356e+44,
297         1.46766223015544238535e+45, 1.08446385529002313207e+46,
298         8.01316426400059069850e+46, 5.92097202766466993617e+47,
299         4.37503944726134096988e+48, 3.23274119108485947460e+49,
300         2.38869060142499127023e+50, 1.76501688569176554670e+51,
301         1.30418087839363225614e+52, 9.63666567360320166416e+52,
302         7.12058632688933793173e+53, 5.26144118266638596909e+54,
303 };

304 /*
305  * EN[k] = exp(-2^(k-5))
306  */
307 static const double EN[] = {
308         9.69233234476344129860e-01, 9.39413062813475807644e-01,
309         8.82496902584595455110e-01, 7.78800783071404878477e-01,
310         6.06530659712633424263e-01, 3.67879441171442334024e-01,
311         1.35335283236612702318e-01, 1.83156388887341786686e-02,
312         3.35462627902511853224e-04, 1.12535174719259116458e-07,
313         1.26641655490941755372e-14, 1.60381089054863792659e-28,
314 #if defined(FDTOS_TRAPS_INCOMPLETE_IN_FNS_MODE)
315         2.96555550007072683578e-38,     /* exp(-128) scaled up by 2^60 */
316 #else
317         2.57220937264241481170e-56,
318 #endif
319 };

320 static const float F[] = {
321         0.0f,
322         1.0f,
323         5.0000000951292138e-01F,
```



```
324         1.6666518897347284e-01F,
325         3.40282346638528859811704E+38F,
326         1.17549435082228750796888E-38F,
327 #if defined(FDTOS_TRAPS_INCOMPLETE_IN_FNS_MODE)
328         8.67361737988403547205962240695953369140625e-19F
329 #endif
330 };

331 #define zero    F[0]
332 #define one     F[1]
333 #define p1      F[2]
334 #define p2      F[3]
335 #define big     F[4]
336 #define tiny    F[5]
337 #if defined(FDTOS_TRAPS_INCOMPLETE_IN_FNS_MODE)
338 #define twom60  F[6]
339 #endif

340 float
341 expf(float xf) {
342         double  w, p, q;
343         int     hx, ix, n;

344         hx = *(int *)&xf;
345         ix = hx & ~0x80000000;

346         if (ix < 0x3c800000) {  /* |x| < 2**-6 */
347                 if (ix < 0x38800000)    /* |x| < 2**-14 */
348                         return (one + xf);
349                 return (one + (xf + (xf * xf) * (p1 + xf * p2)));
350         }

351         n = ix >> 23;           /* biased exponent */

352         if (n >= 0x86) {        /* |x| >= 2^7 */
353                 if (n >= 0xff) {        /* x is nan of +-inf */
354                         if (hx == 0xff800000)
355                                 return (zero);  /* exp(-inf)=0 */
356                         return (xf * xf);       /* exp(nan/inf) is nan or inf */
357                 }
358                 if (hx > 0)
359                         return (big * big);     /* overflow */
360                 else
361                         return (tiny * tiny);   /* underflow */
362         }

363         ix -= n << 23;
364         if (hx > 0)
365                 ix += 0x800000;
366         else
367                 ix = 0x800000 - ix;
368         if (n >= 0x7f) {        /* n >= 0 */
369                 ix <<= n - 0x7f;
370                 w = ET[(ix & 0x3f) + 64] * ET[((ix >> 6) & 0x3f) + 128];
371                 p = ET[((ix >> 12) & 0x3f) + 192] *
372                     ET[((ix >> 18) & 0x3f) + 256];
373                 q = ET[((ix >> 24) & 0x3f) + 320];
374         } else {
375                 ix <<= n - 0x79;
376                 w = ET[ix & 0x3f] * ET[((ix >> 6) & 0x3f) + 64];
377                 p = ET[((ix >> 12) & 0x3f) + 128] *
378                     ET[((ix >> 18) & 0x3f) + 192];
379                 q = ET[((ix >> 24) & 0x3f) + 256];
380         }
381         xf = (float)((w * p) * (hx < 0 ? q * EN[n - 0x79] : q));
382 #if defined(FDTOS_TRAPS_INCOMPLETE_IN_FNS_MODE)
```

```
392         if ((unsigned)hx >= 0xc2800000u) {
393                 if ((unsigned)hx >= 0xc2aeac50) { /* force underflow */
394                         volatile float  t = tiny;
395                         t *= t;
396                 }
397                 return (xf * twom60);
398         }
399 #endif
400         return (xf);
401 }
```

```
**********************************************************
    1201 Sat May 10 12:09:12 2014
new/usr/src/lib/libm/common/R/expm1f.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak expm1f = __expm1f

#include "libm.h"

float
expm1f(float x) {
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
        if (isnanf(x))
                return (x * x);
        else
#endif
        return ((float) expm1((double) x));
}
```

****
1113 Sat May 10 12:09:12 2014
new/usr/src/lib/libm/common/R/fabsf.c
patch01 - 693 import Sun Devpro Math Library
****

```
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#pragma weak fabsf = __fabsf

#include "libm.h"

float
fabsf(float x) {
        *(int *) &x &= ~0x80000000;
        return (x);
}
```

```
**********************************************************
    2643 Sat May 10 12:09:13 2014
new/usr/src/lib/libm/common/R/floorf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak ceilf = __ceilf
#pragma weak floorf = __floorf

/* INDENT OFF */
/*
 * ceilf(x)     return the biggest integral value (in float) below x
 * floorf(x)    return the least integral value (in float) above x
 *
 * NOTE: ceilf(x) and floorf(x) return result
 * with the same sign as x's,  including 0.0F.
 */

#include "libm.h"

static const float xf[] = {
/* ZEROF */     0.0f,
/* ONEF */      1.0f,
/* MONEF */     -1.0f,
/* HUGEF */     1.0e30f,
};

#define ZEROF   xf[0]
#define ONEF    xf[1]
#define MONEF   xf[2]
#define HUGEF   xf[3]
/* INDENT ON */

float
ceilf(float x) {
        volatile float dummy;
        int hx, k, j, ix;
```



```
        hx = *(int *) &x;
        ix = hx & ~0x80000000;
        k = ix >> 23;
        if (((k - 127) ^ (k - 150)) < 0) {
                k = (1 << (150 - k)) - 1;
                if ((k & hx) != 0)
                        dummy = HUGEF + x;      /* raise inexact */
                j = k & (~(hx >> 31));
                *(int *) &x = (hx + j) & ~k;
                return (x);
        } else if (k <= 126) {
                dummy = HUGEF + x;
                if (hx > 0)
                        return (ONEF);
                else if (ix == 0)
                        return (x);
                else
                        return (-ZEROF);
        } else
                /* signal invalid if x is a SNaN */
                return (x * ONEF);              /* +0 -> *1 for Cheetah */
}

float
floorf(float x) {
        volatile float dummy;
        int hx, k, j, ix;

        hx = *(int *) &x;
        ix = hx & ~0x80000000;
        k = ix >> 23;
        if (((k - 127) ^ (k - 150)) < 0) {
                k = (1 << (150 - k)) - 1;
                if ((k & hx) != 0)
                        dummy = HUGEF + x;      /* raise inexact */
                j = k & (hx >> 31);
                *(int *) &x = (hx + j) & ~k;
                return (x);
        } else if (k <= 126) {
                dummy = HUGEF + x;
                if (hx > 0)
                        return (ZEROF);
                else if (ix == 0)
                        return (x);
                else
                        return (MONEF);
        } else
                /* signal invalid if x is a SNaN */
                return (x * ONEF);              /* +0 -> *1 for Cheetah */
}
```

```
**********************************************************
    3443 Sat May 10 12:09:13 2014
new/usr/src/lib/libm/common/R/fmodf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak fmodf = __fmodf

#include "libm.h"

/* INDENT OFF */
static const int
        is = (int)0x80000000,
        im = 0x007fffff,
        ii = 0x7f800000,
        iu = 0x00800000;
/* INDENT ON */

static const float zero = 0.0;

float
fmodf(float x, float y) {
        float   w;
        int     hx, ix, iy, iz, k, ny, nd;

        hx = *(int *)&x;
        ix = hx & 0x7fffffff;
        iy = *(int *)&y & 0x7fffffff;

        /* purge off exception values */
        if (ix >= ii || iy > ii || iy == 0) {
                w = x * y;
                w = w / w;
        } else if (ix <= iy) {
                if (ix < iy)
                        w = x;  /* return x if |x|<|y| */
                else
                        w = zero * x;   /* return sign(x)*0.0 */
        } else {
```



```
                /* INDENT OFF */
                /*
                 * scale x,y to "normal" with
                 *      ny = exponent of y
                 *      nd = exponent of x minus exponent of y
                 */
                /* INDENT ON */
                ny = iy >> 23;
                k = ix >> 23;

                /* special case for subnormal y or x */
                if (ny == 0) {
                        ny = 1;
                        while (iy < iu) {
                                ny -= 1;
                                iy += iy;
                        }
                        nd = k - ny;
                        if (k == 0) {
                                nd += 1;
                                while (ix < iu) {
                                        nd -= 1;
                                        ix += ix;
                                }
                        } else {
                                ix = iu | (ix & im);
                        }
                } else {
                        nd = k - ny;
                        ix = iu | (ix & im);
                        iy = iu | (iy & im);
                }

                /* fix point fmod for normalized ix and iy */
                /* INDENT OFF */
                /*
                 * while (nd--) {
                 *      iz = ix - iy;
                 * if (iz < 0)
                 *      ix = ix + ix;
                 * else if (iz == 0) {
                 *      *(int *) &w = is & hx;
                 *      return w;
                 * }
                 * else
                 *      ix = iz + iz;
                 * }
                 */
                /* INDENT ON */
                /* unroll the above loop 4 times to gain performance */
                k = nd >> 2;
                nd -= k << 2;
                while (k--) {
                        iz = ix - iy;
                        if (iz >= 0)
                                ix = iz + iz;
                        else
                                ix += ix;
                        iz = ix - iy;
                        if (iz >= 0)
                                ix = iz + iz;
                        else
                                ix += ix;
                        iz = ix - iy;
                        if (iz >= 0)
                                ix = iz + iz;
```

```
128                         else
129                                 ix += ix;
130                         iz = ix - iy;
131                         if (iz >= 0)
132                                 ix = iz + iz;
133                         else
134                                 ix += ix;
135                         if (iz == 0) {
136                                 *(int *)&w = is & hx;
137                                 return (w);
138                         }
139                 }
140                 while (nd--) {
141                         iz = ix - iy;
142                         if (iz >= 0)
143                                 ix = iz + iz;
144                         else
145                                 ix += ix;
146                 }
147                 /* end of unrolling */

149                 iz = ix - iy;
150                 if (iz >= 0)
151                         ix = iz;

153                 /* convert back to floating value and restore the sign */
154                 if (ix == 0) {
155                         *(int *)&w = is & hx;
156                         return (w);
157                 }
158                 while (ix < iu) {
159                         ix += ix;
160                         ny -= 1;
161                 }
162                 while (ix > (iu + iu)) {
163                         ny += 1;
164                         ix >>= 1;
165                 }
166                 if (ny > 0) {
167                         *(int *)&w = (is & hx) | (ix & im) | (ny << 23);
168                 } else {
169                         /* subnormal output */
170                         k = -ny + 1;
171                         ix >>= k;
172                         *(int *)&w = (is & hx) | ix;
173                 }
174         }
175         return (w);
176 }
```

```
**********************************************************
    1095 Sat May 10 12:09:13 2014
new/usr/src/lib/libm/common/R/gammaf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak gammaf = __gammaf

#include "libm.h"

float
gammaf(float x) {
        return (lgammaf(x));
}
```

```
**********************************************************
    1130 Sat May 10 12:09:13 2014
new/usr/src/lib/libm/common/R/gammaf_r.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak gammaf_r = __gammaf_r

#include "libm.h"

float
gammaf_r(float x, int *signgamfp) {
        return (lgammaf_r(x, signgamfp));
}
```

```
**********************************************************
    1821 Sat May 10 12:09:13 2014
new/usr/src/lib/libm/common/R/hypotf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak hypotf = __hypotf

#include "libm.h"

float
hypotf(float x, float y) {
        double dx, dy;
        float w;
        int ix, iy;

        ix = (*(int *) &x) & 0x7fffffff;
        iy = (*(int *) &y) & 0x7fffffff;
        if (ix >= 0x7f800000) {
                if (ix == 0x7f800000)
                        *(int *) &w = x == y ? iy : ix; /* w = |x| = inf */
                else if (iy == 0x7f800000)
                        *(int *) &w = x == y ? ix : iy; /* w = |y| = inf */
                else
                        w = fabsf(x) * fabsf(y);        /* + -> * for Cheetah */
        } else if (iy >= 0x7f800000) {
                if (iy == 0x7f800000)
                        *(int *) &w = x == y ? ix : iy; /* w = |y| = inf */
                else
                        w = fabsf(x) * fabsf(y);        /* + -> * for Cheetah */
        } else if (ix == 0)
                *(int *) &w = iy;       /* w = |y|  */
        else if (iy == 0)
                *(int *) &w = ix;       /* w = |x|  */
        else {
                dx = (double) x;
                dy = (double) y;
                w = (float) sqrt(dx * dx + dy * dy);
```



```
        }
        return (w);
}
```

```
**********************************************************
    2183 Sat May 10 12:09:13 2014
new/usr/src/lib/libm/common/R/ilogbf.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak ilogbf = __ilogbf
#endif

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */

#if defined(USE_FPSCALE) || defined(__x86)
static const float two25 = 33554432.0F;
#else
/*
 * v: a non-zero subnormal |x|
 */
static int
ilogbf_subnormal(unsigned v) {
        int r = -126 - 23;

        if (v & 0xffff0000)
                r += 16, v >>= 16;
        if (v & 0xff00)
                r += 8, v >>= 8;
        if (v & 0xf0)
                r += 4, v >>= 4;
        v <<= 1;
        return (r + ((0xffffaa50 >> v) & 0x3));
}
#endif  /* defined(USE_FPSCALE) */

static int
raise_invalid(int v) {  /* SUSv3 requires ilogbf(0,+/-Inf,NaN) raise invalid */
#ifndef lint
```



```
        if ((__xpg6 & _C99SUSv3_ilogb_0InfNaN_raises_invalid) != 0) {
                static const double zero = 0.0;
                volatile double dummy;

                dummy = zero / zero;
        }
#endif
        return (v);
}

int
ilogbf(float x) {
        int k = *((int *) &x) & ~0x80000000;

        if (k < 0x00800000) {
                if (k == 0)
                        return (raise_invalid(0x80000001));
                else {
#if defined(USE_FPSCALE) || defined(__x86)
                        x *= two25;
                        return (((*((int *) &x) & 0x7f800000) >> 23) - 152);
#else
                        return (ilogbf_subnormal(k));
#endif
                }
        } else if (k < 0x7f800000)
                return ((k >> 23) - 127);
        else
                return (raise_invalid(0x7fffffff));
}
```

****
1183 Sat May 10 12:09:13 2014
new/usr/src/lib/libm/common/R/isnanf.c
patch01 - 693 import Sun Devpro Math Library
****

```
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#if defined(ELFOBJ)
#pragma weak isnanf = __isnanf
#pragma weak _isnanf = __isnanf
#endif

#include "libm.h"

int
isnanf(float x) {
        return ((*(int *) &x & ~0x80000000) > 0x7f800000);
}
```

```
**********************************************************
    1268 Sat May 10 12:09:13 2014
new/usr/src/lib/libm/common/R/lgammaf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak lgammaf = __lgammaf

#include "libm.h"

extern int signgamf;

float
lgammaf(float x) {
        float    y;

        if (isnanf(x))
                return (x * x);
        y = (float)__k_lgamma((double)x, &signgamf);
        signgam = signgamf;     /* SUSv3 requires the setting of signgam */
        return (y);
}
```

```
**********************************************************
    1183 Sat May 10 12:09:14 2014
new/usr/src/lib/libm/common/R/lgammaf_r.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

#pragma weak lgammaf_r = __lgammaf_r

#include "libm.h"

float
lgammaf_r(float x, int *signgamfp) {
        if (isnanf(x))
                return (x * x);
        return ((float)__k_lgamma((double)x, signgamfp));
}
```

```
**********************************************************
    1409 Sat May 10 12:09:14 2014
new/usr/src/lib/libm/common/R/log10f.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak log10f = __log10f

#include "libm.h"

static const float zero = 0.0f, mone = -1.0f;

float
log10f(float x) {
        int     hx, ix;
        float   w;

        hx = *(int *)&x;
        ix = hx & ~0x80000000;
        if (ix > 0x7f800000)
                return (x * x);
        if (ix == 0x7f800000)
                return (x + x * x);
        if (ix == 0) {
                w = mone;
                return (w / zero);
        }
        if (hx < 0) {
                w = zero;
                return (w / zero);
        }
        return ((float)log10((double)x));
}
```

```
**********************************************************
    1416 Sat May 10 12:09:14 2014
new/usr/src/lib/libm/common/R/log1pf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#pragma weak log1pf = __log1pf

#include "libm.h"

static const float zero = 0.0f;

float
log1pf(float x) {
        int     ix;

        ix = *(int *)&x;
        if (ix >= 0x7f800000) {
                /* x is +inf or nan */
                return (x * x);
        }
        if (ix < 0) {
                ix &= ~0x80000000;
                if (ix == 0x3f800000) /* x is -1 */
                        return (x / zero);
                if (ix > 0x3f800000) /* x is < -1 or nan */
                        return ((x * zero) / zero);
        }
        return ((float)log1p((double)x));
}
```

****
1197 Sat May 10 12:09:14 2014
new/usr/src/lib/libm/common/R/log2f.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#pragma weak log2f = __log2f

#include "libm.h"

float
log2f(float x) {
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
        if (isnanf(x))
                return (x * x);
        else
#endif
        return ((float) log2((double) x));
}
```

```
**********************************************************
    2161 Sat May 10 12:09:14 2014
new/usr/src/lib/libm/common/R/logbf.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak logbf = __logbf
#endif

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */
#define _C99SUSv3_logb  _C99SUSv3_logb_subnormal_is_like_ilogb

#if defined(USE_FPSCALE) || defined(__x86)
static const float two25 = 33554432.0F;
#else
/*
 * v: a non-zero subnormal |x|
 */
static int
ilogbf_subnormal(unsigned v) {
        int r = -126 - 23;

        if (v & 0xffff0000)
                r += 16, v >>= 16;
        if (v & 0xff00)
                r += 8, v >>= 8;
        if (v & 0xf0)
                r += 4, v >>= 4;
        v <<= 1;
        return (r + ((0xffffaa50 >> v) & 0x3));
}
#endif  /* defined(USE_FPSCALE) */

static float
raise_division(float t) {
```



```
#pragma STDC FENV_ACCESS ON
        static const float zero = 0.0F;
        return (t / zero);
}

float
logbf(float x) {
        int k = *((int *) &x) & ~0x80000000;

        if (k < 0x00800000) {
                if (k == 0)
                        return (raise_division(-1.0F));
                else if ((__xpg6 & _C99SUSv3_logb) != 0) {
#if defined(USE_FPSCALE) || defined(__x86)
                        x *= two25;
                        return ((float) (((*((int *) &x) & 0x7f800000) >> 23) -
                                152));
#else
                        return ((float) ilogbf_subnormal(k));
#endif
                } else
                        return (-126.F);
        } else if (k < 0x7f800000)
                return ((float) ((k >> 23) - 127));
        else
                return (x * x);
}
```

```
**********************************************************
    4679 Sat May 10 12:09:14 2014
new/usr/src/lib/libm/common/R/logf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak logf = __logf

/*
 * Algorithm:
 *
 * Let y = x rounded to six significant bits.  Then for any choice
 * of e and z such that y = 2^e z, we have
 *
 * log(x) = e log(2) + log(z) + log(1+(x-y)/y)
 *
 * Note that (x-y)/y = (x'-y')/y' for any scaled x' = sx, y' = sy;
 * in particular, we can take s to be the power of two that makes
 * ulp(x') = 1.
 *
 * From a table, obtain l = log(z) and r = 1/y'.  For |s| <= 2^-6,
 * approximate log(1+s) by a polynomial p(s) where p(s) := s+s*s*
 * (K1+s*(K2+s*K3)).  Then we compute the expression above as
 * e*ln2 + l + p(r*(x'-y')) all evaluated in double precision.
 *
 * When x is subnormal, we first scale it to the normal range,
 * adjusting e accordingly.
 *
 * Accuracy:
 *
 * The largest error is less than 0.6 ulps.
 */

#include "libm.h"

/*
 * For i = 0, ..., 12,
 *   TBL[2i] = log(1 + i/32) and TBL[2i+1] = 2^-23 / (1 + i/32)
 *
```



```
 * For i = 13, ..., 32,
 *   TBL[2i] = log(1/2 + i/64) and TBL[2i+1] = 2^-23 / (1 + i/32)
 */
static const double TBL[] = {
        0.00000000000000000e+00, 1.19202895507812500e-07,
        3.07716586675368733e-02, 1.15596886837121215 3e-07,
        6.06246218643483994e-02, 1.12196978400735292 6e-07,
        8.96121568968713805e-02, 1.08991350446428568 0e-07,
        1.17783035656383455 7e-01, 1.05963812934027771 9e-07,
        1.45182009844497889 0e-01, 1.03099926097972978 7e-07,
        1.71850256926659228 4e-01, 1.00386770148026310 2e-07,
        1.97825743329919867 5e-01, 9.78127504006410222 5e-08,
        2.23143551314209764 9e-01, 9.53674316406250052 9e-08,
        2.47836163904581269 2e-01, 9.30413967225609788 4e-08,
        2.71933715483641758 0e-01, 9.08261253720238044 8e-08,
        2.95464212893835898 0e-01, 8.87138898925581272 e-08,
        3.18453731118534588 7e-01, 8.66976651278409115 0e-08,
        -3.52220593589352093 4e-01, 8.47710503472222254 6e-08,
        -3.30241686870576867 1e-01, 8.29282014266304324 8e-08,
        -3.08735481649613285 9e-01, 8.11637716090425512 2e-08,
        -2.87682072451780901 4e-01, 7.94728597005208289 2e-08,
        -2.67062785249045253 6e-01, 7.78509646045918305 2e-08,
        -2.46860077931525784 3e-01, 7.62939453125000015 9e-08,
        -2.27057450635346075 3e-01, 7.47979856004901950 4e-08,
        -2.07639364778244489 6e-01, 7.33595628004807733 0e-08,
        -1.88591169807550029 8e-01, 7.19754201061320727 2e-08,
        -1.69899036795397473 4e-01, 7.06425419560185146 0e-08,
        -1.51549898127200932 7e-01, 6.93581321022727239 0e-08,
        -1.33531392624522626 8e-01, 6.81195940290178533 6e-08,
        -1.15831815525121700 8e-01, 6.69245134320175401 4e-08,
        -9.84400728132525243 4e-02, 6.57706425107758611 6e-08,
        -8.13456394539524008 1e-02, 6.46558585805084723 e-08,
        -6.45385211375711781 4e-02, 6.35782877604166657 8e-08,
        -4.80092191863606063 1e-02, 6.25360207479508229 3e-08,
        -3.17486983145802981 2e-02, 6.15273752520161273 2e-08,
        -1.57483569681391676 1e-02, 6.05507502480158696 5e-08,
        0.00000000000000000e+00, 5.96046447753906250 0e-08,
};

static const double C[] = {
        6.93147180559945286 2e-01,
        -2.49887584306188944 706e-01,
        3.33688099812545549 46e-01,
        -5.00000084024749765 65e-01
};

#define ln2     C[0]
#define K3      C[1]
#define K2      C[2]
#define K1      C[3]

float
logf(float x)
{
        double  v, t;
        float   f;
        int     hx, ix, i, exp, iy;

        hx = *(int *)&x;
        ix = hx & ~0x80000000;

        if (ix >= 0x7f800000)   /* nan or inf */
                return ((hx < 0)? x * 0.0f : x * x);

        exp = 0;
        if (hx < 0x00800000) { /* negative, zero, or subnormal */
```

```
128                 if (hx <= 0) {
129                         f = 0.0f;
130                         return ((ix == 0)? -1.0f / f : f / f);
131                 }

133                 /* subnormal; scale by 2^149 */
134                 f = (float)ix;
135                 ix = *(int *)&f;
136                 exp = -149;
137         }

139         exp += (ix - 0x3f320000) >> 23;
140         ix &= 0x007fffff;
141         iy = (ix + 0x20000) & 0xfffc0000;
142         i = iy >> 17;
143         t = ln2 * (double)exp + TBL[i];
144         v = (double)(ix - iy) * TBL[i + 1];
145         v += (v * v) * (K1 + v * (K2 + v * K3));
146         f = (float)(t + v);
147         return (f);
148 }
```

```
**********************************************************
    1964 Sat May 10 12:09:14 2014
new/usr/src/lib/libm/common/R/nextafterf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#if defined(ELFOBJ)
#pragma weak nextafterf = __nextafterf
#endif

#include "libm.h"

float
nextafterf(float x, float y) {
        float w;
        int *pw = (int *) &w;
        int *px = (int *) &x;
        int *py = (int *) &y;
        int ix, iy, iz;

        ix = px[0];
        iy = py[0];
        if ((ix & ~0x80000000) > 0x7f800000)
                return (x * y);         /* + -> * for Cheetah */
        if ((iy & ~0x80000000) > 0x7f800000)
                return (y * x);         /* + -> * for Cheetah */
        if (ix == iy || (ix | iy) == 0x80000000)
                return (y);             /* C99 requirement */
        if ((ix & ~0x80000000) == 0)
                iz = 1 | (iy & 0x80000000);
        else if (ix > 0) {
                if (ix > iy)
                        iz = ix - 1;
                else
                        iz = ix + 1;
        } else {
                if (iy < 0 && ix < iy)
                        iz = ix + 1;
```



```
                else
                        iz = ix - 1;
        }
        pw[0] = iz;
        ix = iz & 0x7f800000;
        if (ix == 0x7f800000) {
                /* raise overflow */
                volatile float t;

                *(int *) &t = 0x7f7fffff;
                t *= t;
        } else if (ix == 0) {
                /* raise underflow */
                volatile float t;

                *(int *) &t = 0x00800000;
                t *= t;
        }
        return (w);
}
```

```
**********************************************************
    8104 Sat May 10 12:09:14 2014
new/usr/src/lib/libm/common/R/powf.c
patch01 - 693 import Sun Devpro Math Library
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 */

#pragma weak powf = __powf

#include "libm.h"
#include "xpg6.h"       /* __xpg6 */
#define _C99SUSv3_pow   _C99SUSv3_pow_treats_Inf_as_an_even_int

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

/* INDENT OFF */
static const double
        ln2 = 6.93147180559945286227e-01,       /* 0x3fe62e42, 0xfefa39ef */
        invln2 = 1.44269504088896338700e+00,    /* 0x3ff71547, 0x652b82fe */
        dtwo = 2.0,
        done = 1.0,
        dhalf = 0.5,
        d32 = 32.0,
        d1_32 = 0.03125,
        A0 = 1.99999999981372330364751114699596643925 0e+0000,
        A1 = 6.66691081793585853377013865713966560861 0e-0001,
        t0 = 2.00000000004777489262405315073203746943e+0000,
        t1 = 1.66666340834992637987311193299425072630 7e-0001;

static const double S[] = {
        1.00000000000000000000e+00,     /* 3FF0000000000000 */
        1.02189714865411662714e+00,     /* 3FF059B0D3158574 */
        1.04427378242741375480e+00,     /* 3FF0B5586CF9890F */
        1.06714040067682369717e+00,     /* 3FF11301D0125B51 */
        1.09050773266525768967e+00,     /* 3FF172B83C7D517B */
        1.11438674259589243221e+00,     /* 3FF1D4873168B9AA */
        1.13878863475669156458e+00,     /* 3FF2387A6E756238 */
        1.16372485877757747552e+00,     /* 3FF29E9DF51FDEE1 */
```



```
        1.18920711500272102690e+00,     /* 3FF306FE0A31B715 */
        1.21524735998046895524e+00,     /* 3FF371A7373AA9CB */
        1.24185781207348400201e+00,     /* 3FF3DEA64C123422 */
        1.26905095719173321989e+00,     /* 3FF44E086061892D */
        1.29683955465100964055e+00,     /* 3FF4BFDAD5362A27 */
        1.32523664315974132322e+00,     /* 3FF5342B569D4F82 */
        1.35425554693689265129e+00,     /* 3FF5AB07DD485429 */
        1.38390988196383202258e+00,     /* 3FF6247EB03A5585 */
        1.41421356237309514547e+00,     /* 3FF6A09E667F3BCD */
        1.44518080697704665027e+00,     /* 3FF71F75E8EC5F74 */
        1.47682614593949934623e+00,     /* 3FF7A11473EB0187 */
        1.50916442759342284141e+00,     /* 3FF82589994CCE13 */
        1.54221082540794074411e+00,     /* 3FF8ACE5422AA0DB */
        1.57598084510788649659e+00,     /* 3FF93737B0CDC5E5 */
        1.61049033194925428347e+00,     /* 3FF9C49182A3F090 */
        1.64575547815396494578e+00,     /* 3FFA5503B23E255D */
        1.68179283050742900407e+00,     /* 3FFAE89F995AD3AD */
        1.71861929812247793414e+00,     /* 3FFB7F76F2FB5E47 */
        1.75625216037329945351e+00,     /* 3FFC199BDD85529C */
        1.79470907500310716820e+00,     /* 3FFCB720DCEF9069 */
        1.83400808640934243066e+00,     /* 3FFD5818DCFBA487 */
        1.87416763411029996256e+00,     /* 3FFDFC97337B9B5F */
        1.91520656139714740007e+00,     /* 3FFEA4AFA2A490DA */
        1.95714412417540017941e+00,     /* 3FFF50765B6E4540 */
};

static const double TBL[] = {
        0.00000000000000000e+00,
        3.07716586667536873e-02,
        6.06246218164348399e-02,
        8.96121586896871380e-02,
        1.17783035656383456e-01,
        1.45182009844497889e-01,
        1.71850256926659228e-01,
        1.97825743329919868e-01,
        2.23143551314209765e-01,
        2.47836163904581269e-01,
        2.71933715483641758e-01,
        2.95464212893835898e-01,
        3.18453731118534589e-01,
        3.40926586970593193e-01,
        3.62905493689368475e-01,
        3.84411698910332056e-01,
        4.05465108108164385e-01,
        4.26084395310900088e-01,
        4.46287102628419530e-01,
        4.66089729924599239e-01,
        4.85507815781700824e-01,
        5.04556010752395312e-01,
        5.23248143764547868e-01,
        5.41597282432744409e-01,
        5.59615787935422659e-01,
        5.77315365034823613e-01,
        5.94707107746692776e-01,
        6.11801541105992941e-01,
        6.28608659422374094e-01,
        6.45137961373584701e-01,
        6.61398482245365016e-01,
        6.77398823591806143e-01,
};

static const float zero = 0.0F, one = 1.0F, huge = 1.0e25f, tiny = 1.0e-25f;
/* INDENT ON */

float
powf(float x, float y) {
```

```
128         float   fx = x, fy = y;
129         float   fz;
130         int     ix, iy, jx, jy, k, iw, yisint;
131
132         ix = *(int *)&x;
133         iy = *(int *)&y;
134         jx = ix & ~0x80000000;
135         jy = iy & ~0x80000000;
136
137         if (jy == 0)
138                 return (one);   /* x**+-0 = 1 */
139         else if (ix == 0x3f800000 && (__xpg6 & _C99SUSv3_pow) != 0)
140                 return (one);   /* C99: 1**anything = 1 */
141         else if (((0x7f800000 - jx) | (0x7f800000 - jy)) < 0)
142                 return (fx * fy);       /* at least one of x or y is NaN */
143                                         /* includes Sun: 1**NaN = NaN */
144         /* INDENT OFF */
145         /*
146          * determine if y is an odd int
147          * yisint = 0 ... y is not an integer
148          * yisint = 1 ... y is an odd int
149          * yisint = 2 ... y is an even int
150          */
151         /* INDENT ON */
152         yisint = 0;
153         if (ix < 0) {
154                 if (jy >= 0x4b800000) {
155                         yisint = 2;     /* |y|>=2**24: y must be even */
156                 } else if (jy >= 0x3f800000) {
157                         k = (jy >> 23) - 0x7f;  /* exponent */
158                         iw = jy >> (23 - k);
159                         if ((iw << (23 - k)) == jy)
160                                 yisint = 2 - (iw & 1);
161                 }
162         }
163
164         /* special value of y */
165         if ((jy & ~0x7f800000) == 0) {
166                 if (jy == 0x7f800000) {         /* y is +-inf */
167                         if (jx == 0x3f800000) {
168                                 if ((__xpg6 & _C99SUSv3_pow) != 0)
169                                         fz = one;
170                                                 /* C99: (-1)**+-inf is 1 */
171                                 else
172                                         fz = fy - fy;
173                                                 /* Sun: (+-1)**+-inf = NaN */
174                         } else if (jx > 0x3f800000) {
175                                                 /* (|x|>1)**+,-inf = inf,0 */
176                                 if (iy > 0)
177                                         fz = fy;
178                                 else
179                                         fz = zero;
180                         } else {                /* (|x|<1)**-,+inf = inf,0 */
181                                 if (iy < 0)
182                                         fz = -fy;
183                                 else
184                                         fz = zero;
185                         }
186                         return (fz);
187                 } else if (jy == 0x3f800000) {  /* y is +-1 */
188                         if (iy < 0)
189                                 fx = one / fx;  /* y is -1 */
190                         return (fx);
191                 } else if (iy == 0x40000000) {  /* y is 2 */
192                         return (fx * fx);
193                 } else if (iy == 0x3f000000) {  /* y is 0.5 */
```



```
194                         if (jx != 0 && jx != 0x7f800000)
195                                 return (sqrtf(x));
196                 }
197         }
198
199         /* special value of x */
200         if ((jx & ~0x7f800000) == 0) {
201                 if (jx == 0x7f800000 || jx == 0 || jx == 0x3f800000) {
202                         /* x is +-0,+-inf,-1; set fz = |x|**y */
203                         *(int *)&fz = jx;
204                         if (iy < 0)
205                                 fz = one / fz;
206                         if (ix < 0) {
207                                 if (jx == 0x3f800000 && yisint == 0) {
208                                         /* (-1)**non-int is NaN */
209                                         fz = zero;
210                                         fz /= fz;
211                                 } else if (yisint == 1) {
212                                         /* (x<0)**odd = -(|x|**odd) */
213                                         fz = -fz;
214                                 }
215                         }
216                         return (fz);
217                 }
218         }
219
220         /* (x<0)**(non-int) is NaN */
221         if (ix < 0 && yisint == 0) {
222                 fz = zero;
223                 return (fz / fz);
224         }
225
226         /*
227          * compute exp(y*log(|x|))
228          * fx = *(float *) &jx;
229          * fz = (float) exp(((double) fy) * log((double) fx));
230          */
231         {
232                 double  dx, dy, dz, ds;
233                 int     *px = (int *)&dx, *pz = (int *)&dz, i, n, m;
234 #if defined(__i386) && !defined(__amd64)
235                 int     rp = __swapRP(fp_extended);
236 #endif
237
238                 fx = *(float *)&jx;
239                 dx = (double)fx;
240
241                 /* compute log(x)/ln2 */
242                 i = px[HIWORD] + 0x4000;
243                 n = (i >> 20) - 0x3ff;
244                 pz[HIWORD] = i & 0xffff8000;
245                 pz[LOWORD] = 0;
246                 ds = (dx - dz) / (dx + dz);
247                 i = (i >> 15) & 0x1f;
248                 dz = ds * ds;
249                 dy = invln2 * (TBL[i] + ds * (A0 + dz * A1));
250                 if (n == 0)
251                         dz = (double)fy * dy;
252                 else
253                         dz = (double)fy * (dy + (double)n);
254
255                 /* compute exp2(dz=y*ln(x)) */
256                 i = pz[HIWORD];
257                 if ((i & ~0x80000000) >= 0x40640000) {  /* |z| >= 160.0 */
258                         fz = (i > 0)? huge : tiny;
259                         if (ix < 0 && yisint == 1)
```

```
260                                 fz *= -fz;      /* (-ve)**(odd int) */
261                         else
262                                 fz *= fz;
263 #if defined(__i386) && !defined(__amd64)
264                         if (rp != fp_extended)
265                                 (void) __swapRP(rp);
266 #endif
267                         return (fz);
268                 }

270                 n = (int)(d32 * dz + (i > 0 ? dhalf : -dhalf));
271                 i = n & 0x1f;
272                 m = n >> 5;
273                 dy = ln2 * (dz - d1_32 * (double)n);
274                 dx = S[i] * (done - (dtwo * dy) / (dy * (done - dy * t1) - t0));
275                 if (m != 0)
276                         px[HIWORD] += m << 20;
277                 fz = (float)dx;
278 #if defined(__i386) && !defined(__amd64)
279                 if (rp != fp_extended)
280                         (void) __swapRP(rp);
281 #endif
282         }

284         /* end of computing exp(y*log(x)) */
285         if (ix < 0 && yisint == 1)
286                 fz = -fz;       /* (-ve)**(odd int) */
287         return (fz);
288 }
```

```
**********************************************************
    1408 Sat May 10 12:09:14 2014
new/usr/src/lib/libm/common/R/remainderf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak remainderf = __remainderf
#endif

#include "libm.h"

float
remainderf(float x, float y) {
        if (isnanf(x) || isnanf(y))
                return (x * y);
        if (y == 0.0f || (*(int *) &x & ~0x80000000) == 0x7f800000) {
                /* y is 0 or x is infinite; raise invalid and return NaN */
                y = 0.0f;
                *(int *) &x = 0x7f800000;
                return (x * y);
        }
        return ((float) remainder((double) x, (double) y));
}
```

```
**********************************************************
    3807 Sat May 10 12:09:15 2014
new/usr/src/lib/libm/common/R/rintf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak aintf = __aintf
#pragma weak anintf = __anintf
#pragma weak irintf = __irintf
#pragma weak nintf = __nintf
#pragma weak rintf = __rintf
#endif

/* INDENT OFF */
/*
 * aintf(x)     return x chopped to integral value
 * anintf(x)    return sign(x)*(|x|+0.5) chopped to integral value
 * irintf(x)    return rint(x) in integer format
 * nintf(x)     return anint(x) in integer format
 * rintf(x)     return x rounded to integral according to the rounding direction
 *
 * NOTE: rintf(x), aintf(x) and anintf(x) return results with the same sign as
 * x's,  including 0.0.
 */

#include "libm.h"

static const float xf[] = {
/* ZEROF */     0.0f,
/* TWO_23F */   8.3886080000e6f,
/* MTWO_23F */  -8.3886080000e6f,
/* ONEF */      1.0f,
/* MONEF */     -1.0f,
/* HALFF */     0.5f,
/* MHALFF */    -0.5f,
/* HUGEF */     1.0e30f,
};
```



```
#define ZEROF           xf[0]
#define TWO_23F         xf[1]
#define MTWO_23F        xf[2]
#define ONEF            xf[3]
#define MONEF           xf[4]
#define HALFF           xf[5]
#define MHALFF          xf[6]
#define HUGEF           xf[7]
/* INDENT ON */

float
aintf(float x) {
        int hx, k;
        float y;

        hx = *(int *) &x;
        k = (hx & ~0x80000000) >> 23;
        if (k < 150) {
                y = (float) ((int) x);
                /*
                 * make sure y has the same sign of x when |x|<0.5
                 * (i.e., y=0.0)
                 */
                return (((k - 127) & hx) < 0 ? -y : y);
        } else
                /* signal invalid if x is a SNaN */
                return (x * ONEF);              /* +0 -> *1 for Cheetah */
}

float
anintf(float x) {
        volatile float dummy;
        int hx, k, j, ix;

        hx = *(int *) &x;
        ix = hx & ~0x80000000;
        k = ix >> 23;
        if (((k - 127) ^ (k - 150)) < 0) {
                j = 1 << (149 - k);
                k = j + j - 1;
                if ((k & hx) != 0)
                        dummy = HUGEF + x;      /* raise inexact */
                *(int *) &x = (hx + j) & ~k;
                return (x);
        } else if (k <= 126) {
                dummy = HUGEF + x;
                *(int *) &x = (0x3f800000 & ((125 - k) >> 31)) |
                        (0x80000000 & hx);
                return (x);
        } else
                /* signal invalid if x is a SNaN */
                return (x * ONEF);              /* +0 -> *1 for Cheetah */
}

int
irintf(float x) {
        float v;
        int hx, k;

        hx = *(int *) &x;
        k = (hx & ~0x80000000) >> 23;
        v = xf[((k - 150) >> 31) & (1 - (hx >> 31))];
        return ((int) ((float) (x + v) - v));
}
```

```
128 int
129 nintf(float x) {
130         int hx, ix, k, j, m;
131         volatile float dummy;
132
133         hx = *(int *) &x;
134         k = (hx & ~0x80000000) >> 23;
135         if (((k - 126) ^ (k - 150)) < 0) {
136                 ix = (hx & 0x00ffffff) | 0x800000;
137                 m = 149 - k;
138                 j = 1 << m;
139                 if ((ix & (j + j - 1)) != 0)
140                         dummy = HUGEF + x;
141                 hx = hx >> 31;
142                 return ((((ix + j) >> (m + 1)) ^ hx) - hx);
143         } else
144                 return ((int) x);
145 }
146
147 float
148 rintf(float x) {
149         float w, v;
150         int hx, k;
151
152         hx = *(int *) &x;
153         k = (hx & ~0x80000000) >> 23;
154 #if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
155         if (k >= 150)
156                 return (x * ONEF);
157         v = xf[1 - (hx >> 31)];
158 #else
159         v = xf[((k - 150) >> 31) & (1 - (hx >> 31))];
160 #endif
161         w = (float) (x + v);
162         if (k < 127 && w == v)
163                 return (ZEROF * x);
164         else
165                 return (w - v);
166 }
```

```
**********************************************************
    1725 Sat May 10 12:09:15 2014
new/usr/src/lib/libm/common/R/scalbf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak scalbf = __scalbf

#include "libm.h"

float
scalbf(float x, float y) {
        int     ix, iy, hx, hy, n;

        ix = *(int *)&x;
        iy = *(int *)&y;
        hx = ix & ~0x80000000;
        hy = iy & ~0x80000000;

        if (hx > 0x7f800000 || hy >= 0x7f800000) {
                /* x is nan or y is inf or nan */
                return ((iy < 0)? x / -y : x * y);
        }

        /* see if y is an integer without raising inexact */
        if (hy >= 0x4b000000) {
                /* |y| >= 2^23, so it must be an integer */
                n = (iy < 0)? -65000 : 65000;
        } else if (hy < 0x3f800000) {
                /* |y| < 1, so it must be zero or non-integer */
                return ((hy == 0)? x : (x - x) / (x - x));
        } else {
                if (hy & ((1 << (0x96 - (hy >> 23))) - 1))
                        return ((y - y) / (y - y));
                n = (int)y;
        }
        return (scalbnf(x, n));
}
```

```
**********************************************************
    2469 Sat May 10 12:09:15 2014
new/usr/src/lib/libm/common/R/scalbnf.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#if defined(ELFOBJ)
#pragma weak scalbnf = __scalbnf
#endif

#include "libm.h"
#include <float.h>              /* FLT_MAX, FLT_MIN */
#include <stdlib.h>             /* abs */

static const float twom25f = 2.98023223876953125e-8F;
#if defined(USE_FPSCALE) || defined(__x86)
static const float two23f = 8388608.0F;
#else
/*
 * v: a non-zero subnormal |x|; returns [-22, 0]
 */
static int
ilogbf_biased(unsigned v) {
        int r = -22;

        if (v & 0xffff0000)
                r += 16, v >>= 16;
        if (v & 0xff00)
                r += 8, v >>= 8;
        if (v & 0xf0)
                r += 4, v >>= 4;
        v <<= 1;
        return (r + ((0xffffaa50 >> v) & 0x3));
}
#endif  /* defined(USE_FPSCALE) */

float
```



```
scalbnf(float x, int n) {
        int *px = (int *) &x, ix, k;

        ix = *px & ~0x80000000;
        k = ix >> 23;
        if (k == 0xff)
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return (ix > 0x7f800000 ? x * x : x);
#else
                return (x + x);
#endif
        if (ix == 0 || n == 0)
                return (x);
        if (k == 0) {
#if defined(USE_FPSCALE) || defined(__x86)
                x *= two23f;
                k = ((*px & ~0x80000000) >> 23) - 23;
#else
                k = ilogbf_biased(ix);
                *px = (*px & 0x80000000) | (ix << (-k + 1));
#endif
        }
        if ((unsigned) abs(n) >= 131072)        /* cast to unsigned for -2^31 */
                n >>= 1;                /* avoid subsequent integer overflow */
        k += n;
        if (k > 0xfe)
                return (FLT_MAX * copysignf(FLT_MAX, x));
        if (k <= -25)
                return (FLT_MIN * copysignf(FLT_MIN, x));
        if (k > 0) {
                *px = (*px & ~0x7f800000) | (k << 23);
                return (x);
        }
        k += 25;
        *px = (*px & ~0x7f800000) | (k << 23);
        return (x * twom25f);
}
```

```
**********************************************************
    1070 Sat May 10 12:09:15 2014
new/usr/src/lib/libm/common/R/signgamf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak signgamf = __signgamf

#include "libm.h"

int signgamf = 0;
```

```
**********************************************************
    1364 Sat May 10 12:09:15 2014
new/usr/src/lib/libm/common/R/significandf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak significandf = __significandf
#endif

#include "libm.h"

float
significandf(float x) {
        int ix = *(int *) &x & ~0x80000000;

        if (ix == 0 || ix >= 0x7f800000)        /* 0/+-Inf/NaN */
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return (ix > 0x7f800000 ? x * x : x);
#else
                return (x + x);
#endif
        else
                return (scalbnf(x, -ilogbf(x)));
}
```

```
**********************************************************
    5085 Sat May 10 12:09:15 2014
new/usr/src/lib/libm/common/R/sincosf.c
libm/common/R/sincosf.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak sincosf = __sincosf

/* INDENT OFF */
/*
 * For |x| < pi/4, let z = x * x, and approximate sin(x) by
 *
 *      S(x) = x(S0 + S1*z)(S2 + S3*z + z*z)
 * where
 *      S0 =   1.85735322054308378716204874632872525989806770558e-0003,
 *      S1 =  -1.95035094218403635082921458859320791358115801259e-0004,
 *      S2 =   5.38400550766074785970952495168558701485841707252e+0002,
 *      S3 =  -3.31975110777873728964197739157371509422022905947e+0001,
 *
 * with error bounded by |(sin(x) - S(x))/x| < 2**(-28.2), and
 * cos(x) by
 *
 *      C(x) = (C0 + C1*z + C2*z*z) * (C3 + C4*z + z*z)
 * where
 *      C0 =   1.09349482127188401868272000389539985058873853699e-0003
 *      C1 =  -5.03324285989964979398034700054920226866107675091e-0004
 *      C2 =   2.43792880266971107750418061559602239831538067410e-0005
 *      C3 =   9.14499072605666582228127405245558035523741471271e+0002
 *      C4 =  -3.63151270591815439197122504991683846785293207730e+0001
 *
 * with error bounded by |cos(x) - C(x)| < 2**(-34.2).
 */
/* INDENT ON */

#include "libm.h"

extern const int _TBL_ipio2_inf[];
```



```
extern int __rem_pio2m(double *, double *, int, int, int, const int *);
#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const double C[] = {
        1.85735322054308378716204874632872525989806770558e-0003,
        -1.95035094218403635082921458859320791358115801259e-0004,
        5.38400550766074785970952495168558701485841707252e+0002,
        -3.31975110777873728964197739157371509422022905947e+0001,
        1.09349482127188401868272000389539985058873853699e-0003,
        -5.03324285989964979398034700054920226866107675091e-0004,
        2.43792880266971107750418061559602239831538067410e-0005,
        9.14499072605666582228127405245558035523741471271e+0002,
        -3.63151270591815439197122504991683846785293207730e+0001,
        0.63661977236758134307553505,     /* 2^ -1  * 1.45F306DC9C883 */
        0.5,
        1.57079632673412561416 6,         /* 2^  0  * 1.921FB54400000 */
        6.07710050650619260147 5e-11,     /* 2^-34  * 1.0B4611A626331 */
};

#define S0      C[0]
#define S1      C[1]
#define S2      C[2]
#define S3      C[3]
#define C0      C[4]
#define C1      C[5]
#define C2      C[6]
#define C3      C[7]
#define C4      C[8]
#define invpio2 C[9]
#define half    C[10]
#define pio2_1  C[11]
#define pio2_t  C[12]

void
sincosf(float x, float *s, float *c)
{
        double  y, z, w;
        float   f, g;
        int     n, ix, hx, hy;
        volatile int i;

        hx = *((int *)&x);
        ix = hx & 0x7fffffff;

        y = (double)x;

        if (ix <= 0x4016cbe4) {         /* |x| < 3*pi/4 */
                if (ix <= 0x3f490fdb) {         /* |x| < pi/4 */
                        if (ix <= 0x39800000) { /* |x| <= 2**-12 */
                                i = (int)y;
#ifdef lint
                                i = i;
#endif
                                *s = x;
                                *c = 1.0f;
                                return;
                        }
                        z = y * y;
                        *s = (float)((y * (S0 + z * S1)) *
                            (S2 + z * (S3 + z)));
                        *c = (float)(((C0 + z * C1) + (z * z) * C2) *
                            (C3 + z * (C4 + z)));
                } else if (hx > 0) {
                        y = (y - pio2_1) - pio2_t;
```

```
126                         z = y * y;
127                         *s = (float)(((C0 + z * C1) + (z * z) * C2) *
128                             (C3 + z * (C4 + z)));
129                         *c = (float)-((y * (S0 + z * S1)) *
130                             (S2 + z * (S3 + z)));
131                 } else {
132                         y = (y + pio2_1) + pio2_t;
133                         z = y * y;
134                         *s = (float)-(((C0 + z * C1) + (z * z) * C2) *
135                             (C3 + z * (C4 + z)));
136                         *c = (float)((y * (S0 + z * S1)) *
137                             (S2 + z * (S3 + z)));
138                 }
139                 return;
140         } else if (ix <= 0x49c90fdb) {  /* |x| < 2^19*pi */
141 #if defined(__i386) && !defined(__amd64)
142                 int     rp;

144                 rp = __swapRP(fp_extended);
145 #endif
146                 w = y * invpio2;
147                 if (hx < 0)
148                         n = (int)(w - half);
149                 else
150                         n = (int)(w + half);
151                 y = (y - n * pio2_1) - n * pio2_t;
152 #if defined(__i386) && !defined(__amd64)
153                 if (rp != fp_extended)
154                         (void) __swapRP(rp);
155 #endif
156         } else {
157                 if (ix >= 0x7f800000) {
158                         *s = *c = x / x;
159                         return;
160                 }
161                 hy = ((int *)&y)[HIWORD];
162                 n = ((hy >> 20) & 0x7ff) - 1046;
163                 ((int *)&w)[HIWORD] = (hy & 0xfffff) | 0x41600000;
164                 ((int *)&w)[LOWORD] = ((int *)&y)[LOWORD];
165                 n = __rem_pio2m(&w, &y, n, 1, 0, _TBL_ipio2_inf);
166                 if (hy < 0) {
167                         y = -y;
168                         n = -n;
169                 }
170         }

172         z = y * y;
173         f = (float)((y * (S0 + z * S1)) * (S2 + z * (S3 + z)));
174         g = (float)(((C0 + z * C1) + (z * z) * C2) *
175             (C3 + z * (C4 + z)));
176         if (n & 2) {
177                 f = -f;
178                 g = -g;
179         }
180         if (n & 1) {
181                 *s = g;
182                 *c = -f;
183         } else {
184                 *s = f;
185                 *c = g;
186         }
187 }
```

```
**********************************************************
    1385 Sat May 10 12:09:15 2014
new/usr/src/lib/libm/common/R/sincospif.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak sincospif = __sincospif

#include "libm.h"

extern void sincospi(double, double *, double *);

void
sincospif(float x, float *s, float *c) {
        double ds, dc;

#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
        if (isnanf(x))
                *s = *c = x * x;
        else {
#endif
        sincospi((double) x, &ds, &dc);
        *s = (float) ds;
        *c = (float) dc;
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
        }
#endif
}
```

```
**********************************************************
    3911 Sat May 10 12:09:15 2014
new/usr/src/lib/libm/common/R/sinf.c
libm/common/R/sinf.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#pragma weak sinf = __sinf

/*
 * See sincosf.c
 */

#include "libm.h"

extern const int _TBL_ipio2_inf[];
extern int __rem_pio2m(double *, double *, int, int, int, const int *);
#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const double C[] = {
        1.85735322054308378716204874632872525989806770558e-0003,
        -1.95035094218403635082921458859320791358115801259e-0004,
        5.38400550766074785970952495168558701485841707252e+0002,
        -3.31975110777873728964197739157371509422022905947e+0001,
        1.09349482127188401868272000389539985058873853699e-0003,
        -5.03324285989964979398034700054920226866107675091e-0004,
        2.43792880266971107750418061559602239831538067410e-0005,
        9.14499072605666582228127405245558035523741471271e+0002,
        -3.63151270591815439197122504991683846785293207730e+0001,
        0.63661977236758134307553 5,     /* 2^ -1  * 1.45F306DC9C883 */
        0.5,
        1.57079632673412561 4166,        /* 2^  0  * 1.921FB54400000 */
        6.07710050650619260 1475e-11,    /* 2^-34  * 1.0B4611A626331 */
};

#define S0      C[0]
```



```
#define S1      C[1]
#define S2      C[2]
#define S3      C[3]
#define C0      C[4]
#define C1      C[5]
#define C2      C[6]
#define C3      C[7]
#define C4      C[8]
#define invpio2 C[9]
#define half    C[10]
#define pio2_1  C[11]
#define pio2_t  C[12]

float
sinf(float x)
{
        double  y, z, w;
        float   f;
        int     n, ix, hx, hy;
        volatile int i;

        hx = *((int *)&x);
        ix = hx & 0x7fffffff;

        y = (double)x;

        if (ix <= 0x4016cbe4) {         /* |x| < 3*pi/4 */
                if (ix <= 0x3f490fdb) {         /* |x| < pi/4 */
                        if (ix <= 0x39800000) { /* |x| <= 2**-12 */
                                i = (int)y;
#ifdef lint
                                i = i;
#endif
                                return (x);
                        }
                        z = y * y;
                        return ((float)((y * (S0 + z * S1)) *
                            (S2 + z * (S3 + z))));
                } else if (hx > 0) {
                        y = (y - pio2_1) - pio2_t;
                        z = y * y;
                        return ((float)(((C0 + z * C1) + (z * z) * C2) *
                            (C3 + z * (C4 + z))));
                } else {
                        y = (y + pio2_1) + pio2_t;
                        z = y * y;
                        return ((float)-(((C0 + z * C1) + (z * z) * C2) *
                            (C3 + z * (C4 + z))));
                }
        } else if (ix <= 0x49c90fdb) {  /* |x| < 2^19*pi */
#if defined(__i386) && !defined(__amd64)
                int     rp;

                rp = __swapRP(fp_extended);
#endif
                w = y * invpio2;
                if (hx < 0)
                        n = (int)(w - half);
                else
                        n = (int)(w + half);
                y = (y - n * pio2_1) - n * pio2_t;
#if defined(__i386) && !defined(__amd64)
                if (rp != fp_extended)
                        (void) __swapRP(rp);
#endif
        } else {
```

```
126                 if (ix >= 0x7f800000)
127                         return (x / x); /* sin(Inf or NaN) is NaN */
128                 hy = ((int *)&y)[HIWORD];
129                 n = ((hy >> 20) & 0x7ff) - 1046;
130                 ((int *)&w)[HIWORD] = (hy & 0xfffff) | 0x41600000;
131                 ((int *)&w)[LOWORD] = ((int *)&y)[LOWORD];
132                 n = __rem_pio2m(&w, &y, n, 1, 0, _TBL_ipio2_inf);
133                 if (hy < 0) {
134                         y = -y;
135                         n = -n;
136                 }
137         }

139         if (n & 1) {
140                 /* compute cos y */
141                 z = y * y;
142                 f = (float)(((C0 + z * C1) + (z * z) * C2) *
143                     (C3 + z * (C4 + z)));
144         } else {
145                 /* compute sin y */
146                 z = y * y;
147                 f = (float)((y * (S0 + z * S1)) * (S2 + z * (S3 + z)));
148         }

150         return ((n & 2)? -f : f);
151 }
```

```
**********************************************************
    1390 Sat May 10 12:09:16 2014
new/usr/src/lib/libm/common/R/sinhf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
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 */

#pragma weak sinhf = __sinhf

#include "libm.h"

float
sinhf(float x) {
        double  s;
        float   w;
        int     hx, ix;

        hx = *(int *)&x;
        ix = hx & ~0x80000000;
        if (ix >= 0x7f800000) {
                /* sinhf(x) is x if x is +-Inf or NaN */
                return (x * 1.0f);
        }
        if (ix >= 0x43000000)   /* sinhf(x) trivially overflows */
                s = (hx < 0)? -1.0e100 : 1.0e100;
        else
                s = sinh((double)x);
        w = (float)s;
        return (w);
}
```

```
**********************************************************
    2261 Sat May 10 12:09:16 2014
new/usr/src/lib/libm/common/R/sqrtf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak sqrtf = __sqrtf

#include "libm.h"

#ifdef __INLINE

extern float __inline_sqrtf(float);

float
sqrtf(float x) {
        return (__inline_sqrtf(x));
}

#else   /* defined(__INLINE) */

static const float huge = 1.0e35F, tiny = 1.0e-35F, zero = 0.0f;

float
sqrtf(float x) {
        float   dz, w;
        int     *pw = (int *)&w;
        int     ix, j, r, q, m, n, s, t;

        w = x;
        ix = pw[0];
        if (ix <= 0) {
                /* x is <= 0 or nan */
                j = ix & 0x7fffffff;
                if (j == 0)
                        return (w);
                return ((w * zero) / zero);
        }
```



```
        if ((ix & 0x7f800000) == 0x7f800000) {
                /* x is +inf or nan */
                return (w * w);
        }

        m = ir_ilogb_(&w);
        n = -m;
        w = r_scalbn_(&w, (int *)&n);
        ix = (pw[0] & 0x007fffff) | 0x00800000;
        n = m / 2;
        if ((n + n) != m) {
                ix = ix + ix;
                m -= 1;
                n = m / 2;
        }

        /* generate sqrt(x) bit by bit */
        ix <<= 1;
        q = s = 0;
        r = 0x01000000;
        for (j = 1; j <= 25; j++) {
                t = s + r;
                if (t <= ix) {
                        s = t + r;
                        ix -= t;
                        q += r;
                }
                ix <<= 1;
                r >>= 1;
        }
        if (ix == 0)
                goto done;

        /* raise inexact and determine the ambient rounding mode */
        dz = huge - tiny;
        if (dz < huge)
                goto done;
        dz = huge + tiny;
        if (dz > huge)
                q += 1;
        q += (q & 1);

done:
        pw[0] = (q >> 1) + 0x3f000000;
        return (r_scalbn_(&w, (int *)&n));
}

#endif  /* defined(__INLINE) */
```

```
**********************************************************
    4309 Sat May 10 12:09:16 2014
new/usr/src/lib/libm/common/R/tanf.c
libm/common/R/tanf.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#pragma weak tanf = __tanf

#include "libm.h"

extern const int _TBL_ipio2_inf[];
extern int __rem_pio2m(double *, double *, int, int, int, const int *);
#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const double C[] = {
        1.0,
        4.4606692842895923067914054627181030809879302978 5e-0003,
        4.9216531630918902706639528332743793725967407226 6e+0000,
        -7.1141064816147348004449213476618751883506774902 3e-0001,
        4.0854980837405339144652316463179886341094970703 1e+0000,
        2.5041107039805092782103201898280531167984008789 1e+0000,
        1.1149206456025115841157457907684147357940673828 1e+0001,
        -1.5056554096842265089151169377146288752555847168 0e+0000,
        -1.8148437887834929505004311067750677466392517089 8e+0000,
        3.3333599753283564129740961178251089664 1e-0001,
        2.9999759824836376154166828200686722993 9e+00,
        0.6366197723675813430755 35,     /* 2^ -1  * 1.45F306DC9C883 */
        0.5,
        1.570796326734125614166,         /* 2^  0  * 1.921FB54400000 */
        6.0771005065061926014 75e-11,    /* 2^-34  * 1.0B4611A626331 */
};

#define one     C[0]
#define P0      C[1]
#define P1      C[2]
#define P2      C[3]
#define P3      C[4]
#define P4      C[5]
#define P5      C[6]
#define P6      C[7]
#define P7      C[8]
#define T0      C[9]
#define T1      C[10]
#define invpio2 C[11]
#define half    C[12]
#define pio2_1  C[13]
#define pio2_t  C[14]

float
tanf(float x)
{
        double  y, z, w;
        float   f;
        int     n, ix, hx, hy;
        volatile int i;

        hx = *((int *)&x);
        ix = hx & 0x7fffffff;

        y = (double)x;

        if (ix <= 0x4016cbe4) {         /* |x| < 3*pi/4 */
                if (ix <= 0x3f490fdb) {         /* |x| < pi/4 */
                        if (ix < 0x3c000000) {          /* |x| < 2**-7 */
                                if (ix <= 0x39800000) { /* |x| < 2**-12 */
                                        i = (int)y;
#ifdef lint
                                        i = i;
#endif
                                        return (x);
                                }
                                return ((float)((y * T0) * (T1 + y * y)));
                        }
                        z = y * y;
                        return ((float)(((P0 * y) * (P1 + z * (P2 + z)) *
                            (P3 + z * (P4 + z))) *
                            (P5 + z * (P6 + z * (P7 + z)))));
                }
                if (hx > 0)
                        y = (y - pio2_1) - pio2_t;
                else
                        y = (y + pio2_1) + pio2_t;
                hy = ((int *)&y)[HIWORD] & ~0x80000000;
                if (hy < 0x3f800000) {          /* |y| < 2**-7 */
                        z = (y * T0) * (T1 + y * y);
                        return ((float)(-one / z));
                }
                z = y * y;
                w = ((P0 * y) * (P1 + z * (P2 + z)) * (P3 + z * (P4 + z))) *
                    (P5 + z * (P6 + z * (P7 + z)));
                return ((float)(-one / w));
        }

        if (ix <= 0x49c90fdb) { /* |x| < 2^19*pi */
#if defined(__i386) && !defined(__amd64)
                int     rp;

                rp = __swapRP(fp_extended);
#endif
                w = y * invpio2;
                if (hx < 0)
```

```
126                         n = (int)(w - half);
127                 else
128                         n = (int)(w + half);
129                 y = (y - n * pio2_1) - n * pio2_t;
130 #if defined(__i386) && !defined(__amd64)
131                 if (rp != fp_extended)
132                         (void) __swapRP(rp);
133 #endif
134         } else {
135                 if (ix >= 0x7f800000)
136                         return (x / x); /* sin(Inf or NaN) is NaN */
137                 hy = ((int *)&y)[HIWORD];
138                 n = ((hy >> 20) & 0x7ff) - 1046;
139                 ((int *)&w)[HIWORD] = (hy & 0xfffff) | 0x41600000;
140                 ((int *)&w)[LOWORD] = ((int *)&y)[LOWORD];
141                 n = __rem_pio2m(&w, &y, n, 1, 0, _TBL_ipio2_inf);
142                 if (hy < 0) {
143                         y = -y;
144                         n = -n;
145                 }
146         }

148         hy = ((int *)&y)[HIWORD] & ~0x80000000;
149         if (hy < 0x3f800000) {          /* |y| < 2**-7 */
150                 z = (y * T0) * (T1 + y * y);
151                 f = ((n & 1) == 0)? (float)z : (float)(-one / z);
152                 return (f);
153         }
154         z = y * y;
155         w = ((P0 * y) * (P1 + z * (P2 + z)) * (P3 + z * (P4 + z))) *
156             (P5 + z * (P6 + z * (P7 + z)));
157         f = ((n & 1) == 0)? (float)w : (float)(-one / w);
158         return (f);
159 }
```

```
**********************************************************
    1197 Sat May 10 12:09:16 2014
new/usr/src/lib/libm/common/R/tanhf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak tanhf = __tanhf

#include "libm.h"

float
tanhf(float x) {
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
        if (isnanf(x))
                return (x * x);
        else
#endif
        return ((float) tanh((double) x));
}
```

```
**********************************************************
    4671 Sat May 10 12:09:16 2014
new/usr/src/lib/libm/common/complex/cabs.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak cabs = __cabs

#include "libm_synonyms.h"
#include <math.h>
#include "complex_wrapper.h"

/*
 * If C were the only standard we cared about, cabs could just call
 * hypot.  Unfortunately, various other standards say that hypot must
 * call matherr and/or set errno to ERANGE when the result overflows.
 * Since cabs should do neither of these things, we have to either
 * make hypot a wrapper on another internal function or duplicate
 * the hypot implementation here.  I've chosen to do the latter.
 */

static const double
        zero = 0.0,
        onep1u = 1.0000000000000022204e+00,     /* 0x3ff00000 1 = 1+2**-52 */
        twom53 = 1.1102230246251654042e-16,     /* 0x3ca00000 0 = 2**-53 */
        twom768 = 6.4411487695971333308e-232,   /* 2^-768 */
        two768  = 1.5525180923007089350e+231;   /* 2^768 */

double
cabs(dcomplex z)
{
        double          x, y, xh, yh, w, ax, ay;
        int             i, j, nx, ny, ix, iy, iscale = 0;
        unsigned        lx, ly;

        x = D_RE(z);
        y = D_IM(z);

        ix = ((int *)&x)[HIWORD] & ~0x80000000;
```



```
        lx = ((int *)&x)[LOWORD];
        iy = ((int *)&y)[HIWORD] & ~0x80000000;
        ly = ((int *)&y)[LOWORD];

        /* force ax = |x| ~>~ ay = |y| */
        if (iy > ix) {
                ax = fabs(y);
                ay = fabs(x);
                i = ix;
                ix = iy;
                iy = i;
                i = lx;
                lx = ly;
                ly = i;
        } else {
                ax = fabs(x);
                ay = fabs(y);
        }
        nx = ix >> 20;
        ny = iy >> 20;
        j  = nx - ny;

        if (nx >= 0x5f3) {
                /* x >= 2^500 (x*x or y*y may overflow) */
                if (nx == 0x7ff) {
                        /* inf or NaN, signal of sNaN */
                        if (((ix - 0x7ff00000) | lx) == 0)
                                return ((ax == ay)? ay : ax);
                        else if (((iy - 0x7ff00000) | ly) == 0)
                                return ((ay == ax)? ax : ay);
                        else
                                return (ax * ay);
                } else if (j > 32) {
                        /* x >> y */
                        if (j <= 53)
                                ay *= twom53;
                        ax += ay;
                        return (ax);
                }
                ax *= twom768;
                ay *= twom768;
                iscale = 2;
                ix -= 768 << 20;
                iy -= 768 << 20;
        } else if (ny < 0x23d) {
                /* y < 2^-450 (x*x or y*y may underflow) */
                if ((ix | lx) == 0)
                        return (ay);
                if ((iy | ly) == 0)
                        return (ax);
                if (j > 53)             /* x >> y */
                        return (ax + ay);
                iscale = 1;
                ax *= two768;
                ay *= two768;
                if (nx == 0) {
                        if (ax == zero) /* guard subnormal flush to zero */
                                return (ax);
                        ix = ((int *)&ax)[HIWORD];
                } else {
                        ix += 768 << 20;
                }
                if (ny == 0) {
                        if (ay == zero) /* guard subnormal flush to zero */
                                return (ax * twom768);
                        iy = ((int *)&ay)[HIWORD];
```

```
128                 } else {
129                         iy += 768 << 20;
130                 }
131                 j = (ix >> 20) - (iy >> 20);
132                 if (j > 32) {
133                         /* x >> y */
134                         if (j <= 53)
135                                 ay *= twom53;
136                         return ((ax + ay) * twom768);
137                 }
138         } else if (j > 32) {
139                 /* x >> y */
140                 if (j <= 53)
141                         ay *= twom53;
142                 return (ax + ay);
143         }
144
145         /*
146          * Medium range ax and ay with max{|ax/ay|,|ay/ax|} bounded by 2^32.
147          * First check rounding mode by comparing onep1u*onep1u with onep1u
148          * + twom53.  Make sure the computation is done at run-time.
149          */
150         if (((lx | ly) << 5) == 0) {
151                 ay = ay * ay;
152                 ax += ay / (ax + sqrt(ax * ax + ay));
153         } else if (onep1u * onep1u != onep1u + twom53) {
154                 /* round-to-zero, positive, negative mode */
155                 /* magic formula with less than an ulp error */
156                 w = sqrt(ax * ax + ay * ay);
157                 ax += ay / ((ax + w) / ay);
158         } else {
159                 /* round-to-nearest mode */
160                 w = ax - ay;
161                 if (w > ay) {
162                         ((int *)&xh)[HIWORD] = ix;
163                         ((int *)&xh)[LOWORD] = 0;
164                         ay = ay * ay + (ax - xh) * (ax + xh);
165                         ax = sqrt(xh * xh + ay);
166                 } else {
167                         ax = ax + ax;
168                         ((int *)&xh)[HIWORD] = ix + 0x00100000;
169                         ((int *)&xh)[LOWORD] = 0;
170                         ((int *)&yh)[HIWORD] = iy;
171                         ((int *)&yh)[LOWORD] = 0;
172                         ay = w * w + ((ax - xh) * yh + (ay - yh) * ax);
173                         ax = sqrt(xh * yh + ay);
174                 }
175         }
176         if (iscale > 0) {
177                 if (iscale == 1)
178                         ax *= twom768;
179                 else
180                         ax *= two768;   /* must generate side effect here */
181         }
182         return (ax);
183 }
```

```
**********************************************************
    1139 Sat May 10 12:09:16 2014
new/usr/src/lib/libm/common/complex/cabsf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak cabsf = __cabsf

#include "libm.h"
#include "complex_wrapper.h"

float
cabsf(fcomplex z) {
        return (hypotf(F_RE(z), F_IM(z)));
}
```

****
1148 Sat May 10 12:09:16 2014
new/usr/src/lib/libm/common/complex/cabsl.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#pragma weak cabsl = __cabsl

#include "libm.h"
#include "complex_wrapper.h"

long double
cabsl(ldcomplex z) {
        return (hypotl(LD_RE(z), LD_IM(z)));
}
```

```
**********************************************************
   12783 Sat May 10 12:09:16 2014
new/usr/src/lib/libm/common/complex/cacos.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak cacos = __cacos

/* INDENT OFF */
/*
 * dcomplex cacos(dcomplex z);
 *
 * Alogrithm
 * (based on T.E.Hull, Thomas F. Fairgrieve and Ping Tak Peter Tang's
 * paper "Implementing the Complex Arcsine and Arccosine Functins Using
 * Exception Handling", ACM TOMS, Vol 23, pp 299-335)
 *
 * The principal value of complex inverse cosine function cacos(z),
 * where z = x+iy, can be defined by
 *
 *      cacos(z) = acos(B) - i sign(y) log (A + sqrt(A*A-1)),
 *
 * where the log function is the natural log, and
 *                  ____________                ____________
 *       1    /     2    2      1    /     2    2
 *  A = ---  / (x+1)  + y   +  ---  / (x-1)  + y
 *       2 \/                   2 \/
 *                  ____________                ____________
 *       1    /     2    2      1    /     2    2
 *  B = ---  / (x+1)  + y   -  ---  / (x-1)  + y   .
 *       2 \/                   2 \/
 *
 * The Branch cuts are on the real line from -inf to -1 and from 1 to inf.
 * The real and imaginary parts are based on Abramowitz and Stegun
 * [Handbook of Mathematic Functions, 1972].  The sign of the imaginary
 * part is chosen to be the generally considered the principal value of
 * this function.
 *
```



```
 * Notes:1. A is the average of the distances from z to the points (1,0)
 *          and (-1,0) in the complex z-plane, and in particular A>=1.
 *       2. B is in [-1,1], and A*B = x
 *
 * Basic relations
 *    cacos(conj(z)) = conj(cacos(z))
 *    cacos(-z)      = pi   - cacos(z)
 *    cacos( z)      = pi/2 - casin(z)
 *
 * Special cases (conform to ISO/IEC 9899:1999(E)):
 *    cacos(+-0  + i y  ) = pi/2 - i y for y is +-0, +-inf, NaN
 *    cacos( x   + i inf) = pi/2 - i inf for all x
 *    cacos( x   + i NaN) = NaN  + i NaN with invalid for non-zero finite x
 *    cacos(-inf + i y  ) = pi   - i inf for finite +y
 *    cacos( inf + i y  ) = 0    - i inf for finite +y
 *    cacos(-inf + i inf) = 3pi/4- i inf
 *    cacos( inf + i inf) = pi/4 - i inf
 *    cacos(+-inf+ i NaN) = NaN  - i inf (sign of imaginary is unspecified)
 *    cacos(NaN  + i y  ) = NaN  + i NaN with invalid for finite y
 *    cacos(NaN  + i inf) = NaN  - i inf
 *    cacos(NaN  + i NaN) = NaN  + i NaN
 *
 * Special Regions (better formula for accuracy and for avoiding spurious
 * overflow or underflow) (all x and y are assumed nonnegative):
 *  case 1: y = 0
 *  case 2: tiny y relative to x-1: y <= ulp(0.5)*|x-1|
 *  case 3: tiny y: y < 4 sqrt(u), where u = minimum normal number
 *  case 4: huge y relative to x+1: y >= (1+x)/ulp(0.5)
 *  case 5: huge x and y: x and y >= sqrt(M)/8, where M = maximum normal number
 *  case 6: tiny x: x < 4 sqrt(u)
 *  --------
 *  case        1 & 2. y=0 or y/|x-1| is tiny. We have
 *                  ____________                ____________
 *            /     2    2              /       y    2
 *           / (x+-1)  + y   =  |x+-1| / 1 + (------)
 *         \/                         \/       |x+-1|
 *
 *                                        1     y    2
 *                            ~  |x+-1| ( 1 + --- (------)  )
 *                                        2   |x+-1|
 *
 *                                     2
 *                                    y
 *                            = |x+-1| + --------.
 *                                       2|x+-1|
 *
 *      Consequently, it is not difficult to see that
 *                                    2
 *                                   y
 *                    [ 1 + ------------ ,     if x < 1,
 *                    [      2(1+x)(1-x)
 *                    [
 *                    [
 *                    [ x,                    if x = 1 (y = 0),
 *                    [
 *              A ~=  [            2
 *                    [         x * y
 *                    [ x + ------------ ~ x,  if x > 1
 *                    [      2(x+1)(x-1)
 *
 *      and hence
 *                                 _____                              2
 *                               / 2                    y            y
 *               A + \/ A  - 1  ~  1 + ---------------- + -----------, if x < 1,
 *                                     sqrt((x+1)(1-x))   2(x+1)(1-x)
 *
```

```
 *
 *                              ~  x + sqrt((x-1)*(x+1)),            if x >= 1.
 *
 *                                      2
 *                                     y
 *                           [ x(1 - -----------) ~ x,  if x < 1,
 *                           [       2(1+x)(1-x)
 *              B = x/A  ~   [
 *                           [ 1,                       if x = 1,
 *                           [
 *                           [           2
 *                           [          y
 *                           [ 1 - ------------ ,       if x > 1,
 *                           [      2(x+1)(x-1)
 *      Thus
 *                             [ acos(x) - i y/sqrt((x-1)*(x+1)),     if x < 1,
 *                             [
 *              cacos(x+i*y)~  [ 0 - i 0,                             if x = 1,
 *                             [
 *                             [ y/sqrt(x*x-1) - i log(x+sqrt(x*x-1)), if x > 1.
 *
 *      Note: y/sqrt(x*x-1) ~ y/x when x >= 2**26.
 *  case 3. y < 4 sqrt(u), where u = minimum normal x.
 *      After case 1 and 2, this will only occurs when x=1. When x=1, we have
 *         A = (sqrt(4+y*y)+y)/2 ~ 1 + y/2 + y^2/8 + ...
 *      and
 *         B = 1/A = 1 - y/2 + y^2/8 + ...
 *      Since
 *         cos(sqrt(y)) ~ 1 - y/2 + ...
 *      we have, for the real part,
 *         acos(B) ~ acos(1 - y/2) ~ sqrt(y)
 *      For the imaginary part,
 *         log(A+sqrt(A*A-1)) ~ log(1+y/2+sqrt(2*y/2))
 *                            = log(1+y/2+sqrt(y))
 *                            = (y/2+sqrt(y)) - (y/2+sqrt(y))^2/2 + ...
 *                            ~ sqrt(y) - y*(sqrt(y)+y/2)/2
 *                            ~ sqrt(y)
 *
 *  case 4. y >= (x+1)/ulp(0.5). In this case, A ~ y and B ~ x/y. Thus
 *         real part = acos(B) ~ pi/2
 *      and
 *         imag part = log(y+sqrt(y*y-one))
 *
 *  case 5. Both x and y are large: x and y > sqrt(M)/8, where M = maximum x
 *      In this case,
 *         A ~ sqrt(x*x+y*y)
 *         B ~ x/sqrt(x*x+y*y).
 *      Thus
 *         real part = acos(B) = atan(y/x),
 *         imag part = log(A+sqrt(A*A-1)) ~ log(2A)
 *                   = log(2) + 0.5*log(x*x+y*y)
 *                   = log(2) + log(y) + 0.5*log(1+(x/y)^2)
 *
 *  case 6. x < 4 sqrt(u). In this case, we have
 *         A ~ sqrt(1+y*y), B = x/sqrt(1+y*y).
 *      Since B is tiny, we have
 *          real part = acos(B) ~ pi/2
 *          imag part = log(A+sqrt(A*A-1)) = log (A+sqrt(y*y))
 *                    = log(y+sqrt(1+y*y))
 *                    = 0.5*log(y^2+2ysqrt(1+y^2)+1+y^2)
 *                    = 0.5*log(1+2y(y+sqrt(1+y^2)));
 *                    = 0.5*log1p(2y(y+A));
 *
 *      cacos(z) = acos(B) - i sign(y) log (A + sqrt(A*A-1)),
 */
/* INDENT ON */
```



```
#include "libm.h"
#include "complex_wrapper.h"

/* INDENT OFF */
static const double
        zero = 0.0,
        one = 1.0,
        E = 1.1102230246251565404236e-16,                /* 2**-53 */
        ln2 = 6.9314718055994528622676e-01,
        pi = 3.1415926535897931159979634685,
        pi_l = 1.2246467991473531772e-16,
        pi_2 = 1.5707963267948966558e+00,
        pi_2_l = 6.1232339957367658860e-17,
        pi_4 = 0.7853981633974482789994,
        pi_4_l = 3.0616169978683829430e-17,
        pi3_4 = 2.3561944901923448369980,
        pi3_4_l = 9.1848509936051488291950e-17,
        Foursqrtu = 5.9666725849601653946320e-154,       /* 2**(-509) */
        Acrossover = 1.5,
        Bcrossover = 0.6417,
        half = 0.5;
/* INDENT ON */

dcomplex
cacos(dcomplex z) {
        double x, y, t, R, S, A, Am1, B, y2, xm1, xp1, Apx;
        int ix, iy, hx, hy;
        unsigned lx, ly;
        dcomplex ans;

        x = D_RE(z);
        y = D_IM(z);
        hx = HI_WORD(x);
        lx = LO_WORD(x);
        hy = HI_WORD(y);
        ly = LO_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;

        /* x is 0 */
        if ((ix | lx) == 0) {
                if (((iy | ly) == 0) || (iy >= 0x7ff00000)) {
                        D_RE(ans) = pi_2;
                        D_IM(ans) = -y;
                        return (ans);
                }
        }

        /* |y| is inf or NaN */
        if (iy >= 0x7ff00000) {
                if (ISINF(iy, ly)) {    /* cacos( x + i inf ) = pi/2  - i inf */
                        D_IM(ans) = -y;
                        if (ix < 0x7ff00000) {
                                D_RE(ans) = pi_2 + pi_2_l;
                        } else if (ISINF(ix, lx)) {
                                if (hx >= 0)
                                        D_RE(ans) = pi_4 + pi_4_l;
                                else
                                        D_RE(ans) = pi3_4 + pi3_4_l;
                        } else {
                                D_RE(ans) = x;
                        }
                } else {                /* cacos( x + i NaN ) = NaN  + i NaN */
                        D_RE(ans) = y + x;
                        if (ISINF(ix, lx))
```

```
260                             D_IM(ans) = -fabs(x);
261                     else
262                             D_IM(ans) = y;
263             }
264             return (ans);
265     }

267     x = fabs(x);
268     y = fabs(y);

270     /* x is inf or NaN */
271     if (ix >= 0x7ff00000) { /* x is inf or NaN */
272             if (ISINF(ix, lx)) {    /* x is INF */
273                     D_IM(ans) = -x;
274                     if (iy >= 0x7ff00000) {
275                             if (ISINF(iy, ly)) {
276                                     /* INDENT OFF */
277                                     /* cacos(inf + i inf) = pi/4 - i inf */
278                                     /* cacos(-inf+ i inf) =3pi/4 - i inf */
279                                     /* INDENT ON */
280                                     if (hx >= 0)
281                                             D_RE(ans) = pi_4 + pi_4_l;
282                                     else
283                                             D_RE(ans) = pi3_4 + pi3_4_l;
284                             } else
285                                     /* INDENT OFF */
286                                     /* cacos(inf + i NaN) = NaN  - i inf  */
287                                     /* INDENT ON */
288                                     D_RE(ans) = y + y;
289                     } else
290                             /* INDENT OFF */
291                             /* cacos( inf + iy  ) = 0  - i inf */
292                             /* cacos(-inf+ iy   ) = pi - i inf */
293                             /* INDENT ON */
294                     if (hx >= 0)
295                             D_RE(ans) = zero;
296                     else
297                             D_RE(ans) = pi + pi_l;
298             } else {                        /* x is NaN */
299                     /* INDENT OFF */
300                     /*
301                      * cacos(NaN + i inf) = NaN  - i inf
302                      * cacos(NaN + i y  ) = NaN  + i NaN
303                      * cacos(NaN + i NaN) = NaN  + i NaN
304                      */
305                     /* INDENT ON */
306                     D_RE(ans) = x + y;
307                     if (iy >= 0x7ff00000) {
308                             D_IM(ans) = -y;
309                     } else {
310                             D_IM(ans) = x;
311                     }
312             }
313             if (hy < 0)
314                     D_IM(ans) = -D_IM(ans);
315             return (ans);
316     }

318     if ((iy | ly) == 0) {   /* region 1: y=0 */
319             if (ix < 0x3ff00000) {  /* |x| < 1 */
320                     D_RE(ans) = acos(x);
321                     D_IM(ans) = zero;
322             } else {
323                     D_RE(ans) = zero;
324                     if (ix >= 0x43500000)   /* |x| >= 2**54 */
325                             D_IM(ans) = ln2 + log(x);
```



```
326                     else if (ix >= 0x3ff80000)      /* x > Acrossover */
327                             D_IM(ans) = log(x + sqrt((x - one) * (x +
328                                     one)));
329                     else {
330                             xm1 = x - one;
331                             D_IM(ans) = log1p(xm1 + sqrt(xm1 * (x + one)));
332                     }
333             }
334     } else if (y <= E * fabs(x - one)) {    /* region 2: y < tiny*|x-1| */
335             if (ix < 0x3ff00000) {  /* x < 1 */
336                     D_RE(ans) = acos(x);
337                     D_IM(ans) = y / sqrt((one + x) * (one - x));
338             } else if (ix >= 0x43500000) {  /* |x| >= 2**54 */
339                     D_RE(ans) = y / x;
340                     D_IM(ans) = ln2 + log(x);
341             } else {
342                     t = sqrt((x - one) * (x + one));
343                     D_RE(ans) = y / t;
344                     if (ix >= 0x3ff80000)   /* x > Acrossover */
345                             D_IM(ans) = log(x + t);
346                     else
347                             D_IM(ans) = log1p((x - one) + t);
348             }
349     } else if (y < Foursqrtu) {     /* region 3 */
350             t = sqrt(y);
351             D_RE(ans) = t;
352             D_IM(ans) = t;
353     } else if (E * y - one >= x) {  /* region 4 */
354             D_RE(ans) = pi_2;
355             D_IM(ans) = ln2 + log(y);
356     } else if (ix >= 0x5fc00000 || iy >= 0x5fc00000) {      /* x,y>2**509 */
357             /* region 5: x+1 or y is very large (>= sqrt(max)/8) */
358             t = x / y;
359             D_RE(ans) = atan(y / x);
360             D_IM(ans) = ln2 + log(y) + half * log1p(t * t);
361     } else if (x < Foursqrtu) {
362             /* region 6: x is very small, < 4sqrt(min) */
363             D_RE(ans) = pi_2;
364             A = sqrt(one + y * y);
365             if (iy >= 0x3ff80000)   /* if y > Acrossover */
366                     D_IM(ans) = log(y + A);
367             else
368                     D_IM(ans) = half * log1p((y + y) * (y + A));
369     } else {        /* safe region */
370             y2 = y * y;
371             xp1 = x + one;
372             xm1 = x - one;
373             R = sqrt(xp1 * xp1 + y2);
374             S = sqrt(xm1 * xm1 + y2);
375             A = half * (R + S);
376             B = x / A;
377             if (B <= Bcrossover)
378                     D_RE(ans) = acos(B);
379             else {          /* use atan and an accurate approx to a-x */
380                     Apx = A + x;
381                     if (x <= one)
382                             D_RE(ans) = atan(sqrt(half * Apx * (y2 / (R +
383                                     xp1) + (S - xm1))) / x);
384                     else
385                             D_RE(ans) = atan((y * sqrt(half * (Apx / (R +
386                                     xp1) + Apx / (S + xm1)))) / x);
387             }
388             if (A <= Acrossover) {
389                     /* use log1p and an accurate approx to A-1 */
390                     if (x < one)
391                             Am1 = half * (y2 / (R + xp1) + y2 / (S - xm1));
```

```
392                         else
393                                 Am1 = half * (y2 / (R + xp1) + (S + xm1));
394                         D_IM(ans) = log1p(Am1 + sqrt(Am1 * (A + one)));
395                 } else {
396                         D_IM(ans) = log(A + sqrt(A * A - one));
397                 }
398         }
399         if (hx < 0)
400                 D_RE(ans) = pi - D_RE(ans);
401         if (hy >= 0)
402                 D_IM(ans) = -D_IM(ans);
403         return (ans);
404 }
```

```
**********************************************************
    1313 Sat May 10 12:09:16 2014
new/usr/src/lib/libm/common/complex/cacosf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak cacosf = __cacosf

#include "libm.h"
#include "complex_wrapper.h"

fcomplex
cacosf(fcomplex z) {
        dcomplex dz, dans;
        fcomplex ans;

        D_RE(dz) = (double) (F_RE(z));
        D_IM(dz) = (double) (F_IM(z));
        dans = cacos(dz);
        F_RE(ans) = (float) (D_RE(dans));
        F_IM(ans) = (float) (D_IM(dans));
        return (ans);
}
```

```
**********************************************************
    1735 Sat May 10 12:09:17 2014
new/usr/src/lib/libm/common/complex/cacosh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak cacosh = __cacosh

/* INDENT OFF */
/*
 * dcomplex cacosh(dcomplex z);
 *      cacosh z = +-i cacos z .
 * In order to make conj(cacosh(z))=cacosh(conj(z)),
 * we define
 *      cacosh z = sign(Im(z))*i cacos z .
 *
 */
/* INDENT ON */

#include "libm.h"       /* fabs/isnan/isinf/signbit */
#include "complex_wrapper.h"

/* need to work on special cases according to spec */

dcomplex
cacosh(dcomplex z) {
        dcomplex w, ans;
        double x, y;

        w = cacos(z);
        x = D_RE(z);
        y = D_IM(z);
        if (isnan(y)) {
                D_IM(ans) = y + y;
                if (isinf(x))
                        D_RE(ans) = fabs(x);
                else
                        D_RE(ans) = y;
```



```
        } else if (signbit(y) == 0) {
                D_RE(ans) = -D_IM(w);
                D_IM(ans) = D_RE(w);
        } else {
                D_RE(ans) = D_IM(w);
                D_IM(ans) = -D_RE(w);
        }
        return (ans);
}
```

```
**********************************************************
    1372 Sat May 10 12:09:17 2014
new/usr/src/lib/libm/common/complex/cacoshf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak cacoshf = __cacoshf

#include "libm.h"
#include "complex_wrapper.h"

/* need to work on special cases according to spec */

fcomplex
cacoshf(fcomplex z) {
        dcomplex dz, dans;
        fcomplex ans;

        D_RE(dz) = (double) (F_RE(z));
        D_IM(dz) = (double) (F_IM(z));
        dans = cacosh(dz);
        F_RE(ans) = (float) (D_RE(dans));
        F_IM(ans) = (float) (D_IM(dans));
        return (ans);
}
```

```
**********************************************************
    1740 Sat May 10 12:09:17 2014
new/usr/src/lib/libm/common/complex/cacoshl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

#pragma weak cacoshl = __cacoshl

#include "libm.h"       /* fabsl/isnanl/isinfl/signbitl */
#include "complex_wrapper.h"
#include "longdouble.h"

/* INDENT OFF */
/*
 * ldcomplex cacoshl(ldcomplex z);
 *      cacosh z = +-i cacos z .
 * In order to make conj(cacosh(z))=cacosh(conj(z)),
 * we define
 *      cacosh z = sign(Im(z))*i cacos z .
 *
 */
/* INDENT ON */

ldcomplex
cacoshl(ldcomplex z) {
        ldcomplex w, ans;
        long double x, y;

        w = cacosl(z);
        x = LD_RE(z);
        y = LD_IM(z);
        if (isnanl(y)) {
                LD_IM(ans) = y + y;
                if (isinfl(x))
                        LD_RE(ans) = fabsl(x);
                else
                        LD_RE(ans) = y;
        } else if (signbitl(y) == 0) {
```



```
                LD_RE(ans) = -LD_IM(w);
                LD_IM(ans) = LD_RE(w);
        } else {
                LD_RE(ans) = LD_IM(w);
                LD_IM(ans) = -LD_RE(w);
        }
        return (ans);
}
```

```
**********************************************************
    7689 Sat May 10 12:09:17 2014
new/usr/src/lib/libm/common/complex/cacosl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

#pragma weak cacosl = __cacosl

#include "libm.h"              /* acosl/atanl/fabsl/isinfl/log1pl/logl/sqrtl */
#include "complex_wrapper.h"
#include "longdouble.h"

/* INDENT OFF */
static const long double
zero = 0.0L,
one = 1.0L,
Acrossover = 1.5L,
Bcrossover = 0.6417L,
half = 0.5L,
ln2 = 6.93147180559945309417232121458176568075e-0001L,
Foursqrtu = 7.33441547021938866248564956819393266382 55e-2466L,  /* 2**-8189 */
#if defined(__x86)
E = 5.42101086242752217003726400434970855712 89e-20L,            /* 2**-64 */
pi = 3.14159265358979323829596852490908531763125211000442504882 8125L,
pi_l = 1.66674858370417566565917289370680772146819592307 8e-19L,
pi_2 = 1.57079632679489661914798426245454265881562 60L,
pi_2_l = 8.33374291852087832829586446853403860736 09796e-20L,
pi_4 = 0.78539816339744830957399213122727132940781302750110626220703125L,
pi_4_l = 4.16687145926043916414793223426701930367048980 7695410e-20L,
pi3_4 = 2.35619449019234492872197639368181398822343908250331878662109375L,
pi3_4_l = 1.25006143777813174924437967028010579110114694230 8e-19L;
#else
E = 9.62964972193617926527988971292463659269 05e-35L,            /* 2**-113 */
pi = 3.14159265358979323846264338327950279747906809813729557300450433 18L,
pi_l = 8.67181013012378102479704402604335196876232334625653034177593568 62e-35L,
pi_2 = 1.57079632679489661923132169163975139873953 40L,
pi_2_l = 4.33590506506189051239852201302167595843811616e-35L,
```



```
pi_4 = 0.78539816339744830961566084581987569936976702453432389325 1126L,
pi_4_l = 2.16795253253094525619926100651083799219058083656413258544 3e-35L,
pi3_4 = 2.35619449019234492884698253745962709810930107360297167975337824L,
pi3_4_l = 6.50385759759283576859778301953251397657174250969239775633 1e-35L;
#endif
/* INDENT ON */

#if defined(__x86)
static const int ip1 = 0x40400000;      /* 2**65 */
#else
static const int ip1 = 0x40710000;      /* 2**114 */
#endif

ldcomplex
cacosl(ldcomplex z) {
        long double x, y, t, R, S, A, Am1, B, y2, xm1, xp1, Apx;
        int ix, iy, hx, hy;
        ldcomplex ans;

        x = LD_RE(z);
        y = LD_IM(z);
        hx = HI_XWORD(x);
        hy = HI_XWORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;

        /* x is 0 */
        if (x == zero) {
                if (y == zero || (iy >= 0x7fff0000)) {
                        LD_RE(ans) = pi_2 + pi_2_l;
                        LD_IM(ans) = -y;
                        return (ans);
                }
        }

        /* |y| is inf or NaN */
        if (iy >= 0x7fff0000) {
                if (isinfl(y)) {        /* cacos( x + i inf ) =  pi/2 - i inf */
                        LD_IM(ans) = -y;
                        if (ix < 0x7fff0000) {
                                LD_RE(ans) = pi_2 + pi_2_l;
                        } else if (isinfl(x)) {
                                if (hx >= 0)
                                        LD_RE(ans) = pi_4 + pi_4_l;
                                else
                                        LD_RE(ans) = pi3_4 + pi3_4_l;
                        } else {
                                LD_RE(ans) = x;
                        }
                } else {                /* cacos( x + i NaN ) = NaN  + i NaN */
                        LD_RE(ans) = y + x;
                        if (isinfl(x))
                                LD_IM(ans) = -fabsl(x);
                        else
                                LD_IM(ans) = y;
                }
                return (ans);
        }

        y = fabsl(y);

        if (ix >= 0x7fff0000) { /* x is inf or NaN */
                if (isinfl(x)) {        /* x is INF */
                        LD_IM(ans) = -fabsl(x);
                        if (iy >= 0x7fff0000) {
                                if (isinfl(y)) {
```

```
127                                     /* INDENT OFF */
128                                     /* cacos(inf + i inf) = pi/4 - i inf */
129                                     /* cacos(-inf+ i inf) =3pi/4 - i inf */
130                                     /* INDENT ON */
131                                     if (hx >= 0)
132                                             LD_RE(ans) = pi_4 + pi_4_l;
133                                     else
134                                             LD_RE(ans) = pi3_4 + pi3_4_l;
135                                 } else
136                                     /* INDENT OFF */
137                                     /* cacos(inf + i NaN) = NaN  - i inf  */
138                                     /* INDENT ON */
139                                     LD_RE(ans) = y + y;
140                             } else {
141                                     /* INDENT OFF */
142                                     /* cacos( inf + iy  ) = 0  - i inf */
143                                     /* cacos(-inf+ iy   ) = pi - i inf */
144                                     /* INDENT ON */
145                                     if (hx >= 0)
146                                             LD_RE(ans) = zero;
147                                     else
148                                             LD_RE(ans) = pi + pi_l;
149                             }
150                     } else {                /* x is NaN */
151                             /* INDENT OFF */
152                             /*
153                              * cacos(NaN + i inf) = NaN  - i inf
154                              * cacos(NaN + i y  ) = NaN  + i NaN
155                              * cacos(NaN + i NaN) = NaN  + i NaN
156                              */
157                             /* INDENT ON */
158                             LD_RE(ans) = x + y;
159                             if (iy >= 0x7fff0000) {
160                                     LD_IM(ans) = -y;
161                             } else {
162                                     LD_IM(ans) = x;
163                             }
164                     }
165                     if (hy < 0)
166                             LD_IM(ans) = -LD_IM(ans);
167                     return (ans);
168             }

170             if (y == zero) {        /* region 1: y=0 */
171                     if (ix < 0x3fff0000) {  /* |x| < 1 */
172                             LD_RE(ans) = acosl(x);
173                             LD_IM(ans) = zero;
174                     } else {
175                             LD_RE(ans) = zero;
176                             x = fabsl(x);
177                             if (ix >= ip1)  /* i386 ? 2**65 : 2**114 */
178                                     LD_IM(ans) = ln2 + logl(x);
179                             else if (ix >= 0x3fff8000)      /* x > Acrossover */
180                                     LD_IM(ans) = logl(x + sqrtl((x - one) * (x +
181                                         one)));
182                             else {
183                                     xm1 = x - one;
184                                     LD_IM(ans) = log1pl(xm1 + sqrtl(xm1 * (x +
185                                         one)));
186                             }
187                     }
188             } else if (y <= E * fabsl(fabsl(x) - one)) {
189                     /* region 2: y < tiny*||x|-1| */
190                     if (ix < 0x3fff0000) {  /* x < 1 */
191                             LD_RE(ans) = acosl(x);
192                             x = fabsl(x);
```



```
193                             LD_IM(ans) = y / sqrtl((one + x) * (one - x));
194                     } else if (ix >= ip1) { /* i386 ? 2**65 : 2**114 */
195                             if (hx >= 0)
196                                     LD_RE(ans) = y / x;
197                             else {
198                                     if (ix >= ip1 + 0x00040000)
199                                             LD_RE(ans) = pi + pi_l;
200                                     else {
201                                             t = pi_l + y / x;
202                                             LD_RE(ans) = pi + t;
203                                     }
204                             }
205                             LD_IM(ans) = ln2 + logl(fabsl(x));
206                     } else {
207                             x = fabsl(x);
208                             t = sqrtl((x - one) * (x + one));
209                             LD_RE(ans) = (hx >= 0)? y / t : pi - (y / t - pi_l);
210                             if (ix >= 0x3fff8000)   /* x > Acrossover */
211                                     LD_IM(ans) = logl(x + t);
212                             else
213                                     LD_IM(ans) = log1pl(t - (one - x));
214                     }
215             } else if (y < Foursqrtu) {     /* region 3 */
216                     t = sqrtl(y);
217                     LD_RE(ans) = (hx >= 0)? t : pi + pi_l;
218                     LD_IM(ans) = t;
219             } else if (E * y - one >= fabsl(x)) {   /* region 4 */
220                     LD_RE(ans) = pi_2 + pi_2_l;
221                     LD_IM(ans) = ln2 + logl(y);
222             } else if (ix >= 0x5ffb0000 || iy >= 0x5ffb0000) {
223                     /* region 5: x+1 and y are both (>= sqrt(max)/8) i.e. 2**8188 */
224                     t = x / y;
225                     LD_RE(ans) = atan2l(y, x);
226                     LD_IM(ans) = ln2 + logl(y) + half * log1pl(t * t);
227             } else if (fabsl(x) < Foursqrtu) {
228                     /* region 6: x is very small, < 4sqrt(min) */
229                     LD_RE(ans) = pi_2 + pi_2_l;
230                     A = sqrtl(one + y * y);
231                     if (iy >= 0x3fff8000)   /* if y > Acrossover */
232                             LD_IM(ans) = logl(y + A);
233                     else
234                             LD_IM(ans) = half * log1pl((y + y) * (y + A));
235             } else {                /* safe region */
236                     t = fabsl(x);
237                     y2 = y * y;
238                     xp1 = t + one;
239                     xm1 = t - one;
240                     R = sqrtl(xp1 * xp1 + y2);
241                     S = sqrtl(xm1 * xm1 + y2);
242                     A = half * (R + S);
243                     B = t / A;

245                     if (B <= Bcrossover)
246                             LD_RE(ans) = (hx >= 0)? acosl(B) : acosl(-B);
247                     else {          /* use atan and an accurate approx to a-x */
248                             Apx = A + t;
249                             if (t <= one)
250                                     LD_RE(ans) = atan2l(sqrtl(half * Apx * (y2 /
251                                         (R + xp1) + (S - xm1))), x);
252                             else
253                                     LD_RE(ans) = atan2l((y * sqrtl(half * (Apx /
254                                         (R + xp1) + Apx / (S + xm1)))), x);
255                     }
256                     if (A <= Acrossover) {
257                             /* use log1p and an accurate approx to A-1 */
258                             if (ix < 0x3fff0000)
```

```
259                                 Am1 = half * (y2 / (R + xp1) + y2 / (S - xm1));
260                         else
261                                 Am1 = half * (y2 / (R + xp1) + (S + xm1));
262                         LD_IM(ans) = log1pl(Am1 + sqrtl(Am1 * (A + one)));
263                 } else {
264                         LD_IM(ans) = logl(A + sqrtl(A * A - one));
265                 }
266         }

268         if (hy >= 0)
269                 LD_IM(ans) = -LD_IM(ans);

271         return (ans);
272 }
```

```
**********************************************************
    1574 Sat May 10 12:09:17 2014
new/usr/src/lib/libm/common/complex/carg.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak carg = __carg

#include "libm_synonyms.h"
#include <math.h>               /* atan2 */
#include "complex_wrapper.h"

static const double
        pi      = 3.14159265358979311600e+00,
        pi_lo   = 1.22464679914735320717e-16;

double
carg(dcomplex z) {
        int     ix, iy;

        ix = ((int *)&(D_RE(z)))[HIWORD];
        iy = ((int *)&(D_IM(z)))[HIWORD];
        if ((((ix | iy) & ~0x80000000) | ((int *)&(D_RE(z)))[LOWORD] |
            ((int *)&(D_IM(z)))[LOWORD]) == 0) {
                /* x and y are both zero */
                if (ix == 0)
                        return (D_IM(z));
                return ((iy == 0)? pi + pi_lo : -pi - pi_lo);
        }
        return (atan2(D_IM(z), D_RE(z)));
}
```

```
**********************************************************
    1154 Sat May 10 12:09:17 2014
new/usr/src/lib/libm/common/complex/cargf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak cargf = __cargf

#include "libm.h"                       /* atan2f */
#include "complex_wrapper.h"

float
cargf(fcomplex z) {
        return (atan2f(F_IM(z), F_RE(z)));
}
```

```
**********************************************************
    1148 Sat May 10 12:09:17 2014
new/usr/src/lib/libm/common/complex/cargl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak cargl = __cargl

#include "libm.h"
#include "complex_wrapper.h"

long double
cargl(ldcomplex z) {
        return (atan2l(LD_IM(z), LD_RE(z)));
}
```

```
**********************************************************
   12218 Sat May 10 12:09:17 2014
new/usr/src/lib/libm/common/complex/casin.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak casin = __casin

/* INDENT OFF */
/*
 * dcomplex casin(dcomplex z);
 *
 * Alogrithm
 * (based on T.E.Hull, Thomas F. Fairgrieve and Ping Tak Peter Tang's
 * paper "Implementing the Complex Arcsine and Arccosine Functins Using
 * Exception Handling", ACM TOMS, Vol 23, pp 299-335)
 *
 * The principal value of complex inverse sine function casin(z),
 * where z = x+iy, can be defined by
 *
 *      casin(z) = asin(B) + i sign(y) log (A + sqrt(A*A-1)),
 *
 * where the log function is the natural log, and
 *                    _____________           _____________
 *       1    /     2    2      1    /     2    2
 *  A = ---  / (x+1)  + y   +  ---  / (x-1)  + y
 *       2 \/                   2 \/
 *                    _____________           _____________
 *       1    /     2    2      1    /     2    2
 *  B = ---  / (x+1)  + y   -  ---  / (x-1)  + y   .
 *       2 \/                   2 \/
 *
 * The Branch cuts are on the real line from -inf to -1 and from 1 to inf.
 * The real and imaginary parts are based on Abramowitz and Stegun
 * [Handbook of Mathematic Functions, 1972].  The sign of the imaginary
 * part is chosen to be the generally considered the principal value of
 * this function.
 *
```



```
 * Notes:1. A is the average of the distances from z to the points (1,0)
 *          and (-1,0) in the complex z-plane, and in particular A>=1.
 *       2. B is in [-1,1], and A*B = x.
 *
 * Special notes: if casin( x, y) = ( u, v), then
 *                  casin(-x, y) = (-u, v),
 *                  casin( x,-y) = ( u,-v),
 *    in general, we have casin(conj(z))     =  conj(casin(z))
 *                        casin(-z)          = -casin(z)
 *                        casin(z)           =  pi/2 - cacos(z)
 *
 * EXCEPTION CASES (conform to ISO/IEC 9899:1999(E)):
 *    casin( 0 + i 0   ) =  0    + i 0
 *    casin( 0 + i NaN ) =  0    + i NaN
 *    casin( x + i inf ) =  0    + i inf for finite x
 *    casin( x + i NaN ) =  NaN  + i NaN with invalid for finite x!=0
 *    casin(inf + iy   ) =  pi/2 + i inf finite y
 *    casin(inf + i inf) =  pi/4 + i inf
 *    casin(inf + i NaN) =  NaN  + i inf
 *    casin(NaN + i y  ) =  NaN  + i NaN for finite y
 *    casin(NaN + i inf) =  NaN  + i inf
 *    casin(NaN + i NaN) =  NaN  + i NaN
 *
 * Special Regions (better formula for accuracy and for avoiding spurious
 * overflow or underflow) (all x and y are assumed nonnegative):
 *  case 1: y = 0
 *  case 2: tiny y relative to x-1: y <= ulp(0.5)*|x-1|
 *  case 3: tiny y: y < 4 sqrt(u), where u = minimum normal number
 *  case 4: huge y relative to x+1: y >= (1+x)/ulp(0.5)
 *  case 5: huge x and y: x and y >= sqrt(M)/8, where M = maximum normal number
 *  case 6: tiny x: x < 4 sqrt(u)
 *  --------
 *  case        1 & 2. y=0 or y/|x-1| is tiny. We have
 *                    _____________                 _____________
 *              /     2    2                 /       y    2
 *           / (x+-1)  + y   =  |x+-1| / 1 + (------)
 *         \/                          \/       |x+-1|
 *
 *                                          1     y   2
 *                            ~  |x+-1| ( 1 + --- (------)  )
 *                                          2   |x+-1|
 *
 *                                        2
 *                                       y
 *                            =  |x+-1| + --------.
 *                                       2|x+-1|
 *
 *      Consequently, it is not difficult to see that
 *                                    2
 *                                   y
 *                    [ 1 + ------------ ,  if x < 1,
 *                    [      2(1+x)(1-x)
 *                    [
 *                    [
 *                    [ x,                 if x = 1 (y = 0),
 *                    [
 *              A ~=  [             2
 *                    [        x * y
 *                    [ x + ------------ ,  if x > 1
 *                    [      2(1+x)(x-1)
 *
 *      and hence
 *                                 _____                                 2
 *                              / 2                    y               y
 *               A + \/ A  - 1  ~  1 + ---------------- + -----------, if x < 1,
 *                                     sqrt((x+1)(1-x))   2(x+1)(1-x)
 *
```

```
 *
 *                             ~  x + sqrt((x-1)*(x+1)),             if x >= 1.
 *
 *                                      2
 *                                     y
 *                           [ x(1 - ------------), if x < 1,
 *                           [       2(1+x)(1-x)
 *              B = x/A  ~   [
 *                           [ 1,                  if x = 1,
 *                           [
 *                           [          2
 *                           [         y
 *                           [ 1 - ------------ ,   if x > 1,
 *                           [      2(1+x)(1-x)
 *      Thus
 *                             [ asin(x) + i y/sqrt((x-1)*(x+1)), if x <  1
 *              casin(x+i*y)=[
 *                             [ pi/2    + i log(x+sqrt(x*x-1)),  if x >= 1
 *
 *  case 3. y < 4 sqrt(u), where u = minimum normal x.
 *      After case 1 and 2, this will only occurs when x=1. When x=1, we have
 *         A = (sqrt(4+y*y)+y)/2 ~ 1 + y/2 + y^2/8 + ...
 *      and
 *         B = 1/A = 1 - y/2 + y^2/8 + ...
 *      Since
 *         asin(x) = pi/2-2*asin(sqrt((1-x)/2))
 *         asin(x) = x + x^3/6 + x^5*3/40 + x^7*15/336 + ...
 *      we have, for the real part asin(B),
 *         asin(1-y/2) ~ pi/2 - 2 asin(sqrt(y/4))
 *                     ~ pi/2 - sqrt(y)
 *      For the imaginary part,
 *         log(A+sqrt(A*A-1)) ~ log(1+y/2+sqrt(2*y/2))
 *                            = log(1+y/2+sqrt(y))
 *                            = (y/2+sqrt(y)) - (y/2+sqrt(y))^2/2 + ...
 *                            ~ sqrt(y) - y*(sqrt(y)+y/2)/2
 *                            ~ sqrt(y)
 *
 *  case 4. y >= (x+1)ulp(0.5). In this case, A ~ y and B ~ x/y. Thus
 *        real part = asin(B) ~ x/y (be careful, x/y may underflow)
 *      and
 *         imag part = log(y+sqrt(y*y-one))
 *
 *
 *  case 5. Both x and y are large: x and y > sqrt(M)/8, where M = maximum x
 *      In this case,
 *         A ~ sqrt(x*x+y*y)
 *         B ~ x/sqrt(x*x+y*y).
 *      Thus
 *         real part = asin(B) = atan(x/y),
 *         imag part = log(A+sqrt(A*A-1)) ~ log(2A)
 *                   = log(2) + 0.5*log(x*x+y*y)
 *                   = log(2) + log(y) + 0.5*log(1+(x/y)^2)
 *
 *  case 6. x < 4 sqrt(u). In this case, we have
 *          A ~ sqrt(1+y*y), B = x/sqrt(1+y*y).
 *      Since B is tiny, we have
 *          real part = asin(B) ~ B = x/sqrt(1+y*y)
 *          imag part = log(A+sqrt(A*A-1)) = log (A+sqrt(y*y))
 *                    = log(y+sqrt(1+y*y))
 *                    = 0.5*log(y^2+2ysqrt(1+y^2)+1+y^2)
 *                    = 0.5*log(1+2y(y+sqrt(1+y^2)));
 *                    = 0.5*log1p(2y(y+A));
 *
 *      casin(z) = asin(B) + i sign(y) log (A + sqrt(A*A-1)),
 */
```



```
/* INDENT ON */

#include "libm.h"               /* asin/atan/fabs/log/log1p/sqrt */
#include "complex_wrapper.h"

/* INDENT OFF */
static const double
        zero = 0.0,
        one = 1.0,
        E = 1.1102230246251565404e-16,                  /* 2**-53 */
        ln2 = 6.93147180559945286227e-01,
        pi_2 = 1.57079632679489656e+00,
        pi_2_l = 6.12323399573676588e-17,
        pi_4 = 7.85398163397448278999e-01,
        Foursqrtu = 5.96667258496016539463e-154,        /* 2**(-509) */
        Acrossover = 1.5,
        Bcrossover = 0.6417,
        half = 0.5;
/* INDENT ON */

dcomplex
casin(dcomplex z) {
        double x, y, t, R, S, A, Am1, B, y2, xm1, xp1, Apx;
        int ix, iy, hx, hy;
        unsigned lx, ly;
        dcomplex ans;

        x = D_RE(z);
        y = D_IM(z);
        hx = HI_WORD(x);
        lx = LO_WORD(x);
        hy = HI_WORD(y);
        ly = LO_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        x = fabs(x);
        y = fabs(y);

        /* special cases */

        /* x is inf or NaN */
        if (ix >= 0x7ff00000) { /* x is inf or NaN */
                if (ISINF(ix, lx)) {    /* x is INF */
                        D_IM(ans) = x;
                        if (iy >= 0x7ff00000) {
                                if (ISINF(iy, ly))
                                        /* casin(inf + i inf) = pi/4 + i inf */
                                        D_RE(ans) = pi_4;
                                else    /* casin(inf + i NaN) = NaN  + i inf  */
                                        D_RE(ans) = y + y;
                        } else  /* casin(inf + iy) = pi/2 + i inf */
                                D_RE(ans) = pi_2;
                } else {                /* x is NaN */
                        if (iy >= 0x7ff00000) {
                                /* INDENT OFF */
                                /*
                                 * casin(NaN + i inf) = NaN + i inf
                                 * casin(NaN + i NaN) = NaN + i NaN
                                 */
                                /* INDENT ON */
                                D_IM(ans) = y + y;
                                D_RE(ans) = x + x;
                        } else {
                                /* casin(NaN + i y  ) = NaN  + i NaN */
                                D_IM(ans) = D_RE(ans) = x + y;
                        }
```

```
260                 }
261                 if (hx < 0)
262                         D_RE(ans) = -D_RE(ans);
263                 if (hy < 0)
264                         D_IM(ans) = -D_IM(ans);
265                 return (ans);
266         }

268         /* casin(+0 + i 0   ) =  0   + i 0. */
269         if ((ix | lx | iy | ly) == 0)
270                 return (z);

272         if (iy >= 0x7ff00000) { /* y is inf or NaN */
273                 if (ISINF(iy, ly)) {    /* casin( x + i inf ) =  0   + i inf */
274                         D_IM(ans) = y;
275                         D_RE(ans) = zero;
276                 } else {                /* casin( x + i NaN ) = NaN  + i NaN */
277                         D_IM(ans) = x + y;
278                         if ((ix | lx) == 0)
279                                 D_RE(ans) = x;
280                         else
281                                 D_RE(ans) = y;
282                 }
283                 if (hx < 0)
284                         D_RE(ans) = -D_RE(ans);
285                 if (hy < 0)
286                         D_IM(ans) = -D_IM(ans);
287                 return (ans);
288         }

290         if ((iy | ly) == 0) {   /* region 1: y=0 */
291                 if (ix < 0x3ff00000) {  /* |x| < 1 */
292                         D_RE(ans) = asin(x);
293                         D_IM(ans) = zero;
294                 } else {
295                         D_RE(ans) = pi_2;
296                         if (ix >= 0x43500000)   /* |x| >= 2**54 */
297                                 D_IM(ans) = ln2 + log(x);
298                         else if (ix >= 0x3ff80000)      /* x > Acrossover */
299                                 D_IM(ans) = log(x + sqrt((x - one) * (x +
300                                         one)));
301                         else {
302                                 xm1 = x - one;
303                                 D_IM(ans) = log1p(xm1 + sqrt(xm1 * (x + one)));
304                         }
305                 }
306         } else if (y <= E * fabs(x - one)) {    /* region 2: y < tiny*|x-1| */
307                 if (ix < 0x3ff00000) {  /* x < 1 */
308                         D_RE(ans) = asin(x);
309                         D_IM(ans) = y / sqrt((one + x) * (one - x));
310                 } else {
311                         D_RE(ans) = pi_2;
312                         if (ix >= 0x43500000) { /* |x| >= 2**54 */
313                                 D_IM(ans) = ln2 + log(x);
314                         } else if (ix >= 0x3ff80000)    /* x > Acrossover */
315                                 D_IM(ans) = log(x + sqrt((x - one) * (x +
316                                         one)));
317                         else
318                                 D_IM(ans) = log1p((x - one) + sqrt((x - one) *
319                                         (x + one)));
320                 }
321         } else if (y < Foursqrtu) {     /* region 3 */
322                 t = sqrt(y);
323                 D_RE(ans) = pi_2 - (t - pi_2_l);
324                 D_IM(ans) = t;
325         } else if (E * y - one >= x) {  /* region 4 */
```



```
326                 D_RE(ans) = x / y;      /* need to fix underflow cases */
327                 D_IM(ans) = ln2 + log(y);
328         } else if (ix >= 0x5fc00000 || iy >= 0x5fc00000) {      /* x,y>2**509 */
329                 /* region 5: x+1 or y is very large (>= sqrt(max)/8) */
330                 t = x / y;
331                 D_RE(ans) = atan(t);
332                 D_IM(ans) = ln2 + log(y) + half * log1p(t * t);
333         } else if (x < Foursqrtu) {
334                 /* region 6: x is very small, < 4sqrt(min) */
335                 A = sqrt(one + y * y);
336                 D_RE(ans) = x / A;      /* may underflow */
337                 if (iy >= 0x3ff80000)   /* if y > Acrossover */
338                         D_IM(ans) = log(y + A);
339                 else
340                         D_IM(ans) = half * log1p((y + y) * (y + A));
341         } else {        /* safe region */
342                 y2 = y * y;
343                 xp1 = x + one;
344                 xm1 = x - one;
345                 R = sqrt(xp1 * xp1 + y2);
346                 S = sqrt(xm1 * xm1 + y2);
347                 A = half * (R + S);
348                 B = x / A;

350                 if (B <= Bcrossover)
351                         D_RE(ans) = asin(B);
352                 else {          /* use atan and an accurate approx to a-x */
353                         Apx = A + x;
354                         if (x <= one)
355                                 D_RE(ans) = atan(x / sqrt(half * Apx * (y2 /
356                                         (R + xp1) + (S - xm1))));
357                         else
358                                 D_RE(ans) = atan(x / (y * sqrt(half * (Apx /
359                                         (R + xp1) + Apx / (S + xm1)))));
360                 }
361                 if (A <= Acrossover) {
362                         /* use log1p and an accurate approx to A-1 */
363                         if (x < one)
364                                 Am1 = half * (y2 / (R + xp1) + y2 / (S - xm1));
365                         else
366                                 Am1 = half * (y2 / (R + xp1) + (S + xm1));
367                         D_IM(ans) = log1p(Am1 + sqrt(Am1 * (A + one)));
368                 } else {
369                         D_IM(ans) = log(A + sqrt(A * A - one));
370                 }
371         }

373         if (hx < 0)
374                 D_RE(ans) = -D_RE(ans);
375         if (hy < 0)
376                 D_IM(ans) = -D_IM(ans);

378         return (ans);
379 }
```

```
**********************************************************
    1313 Sat May 10 12:09:17 2014
new/usr/src/lib/libm/common/complex/casinf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak casinf = __casinf

#include "libm.h"
#include "complex_wrapper.h"

fcomplex
casinf(fcomplex z) {
        dcomplex dz, dans;
        fcomplex ans;

        D_RE(dz) = (double) (F_RE(z));
        D_IM(dz) = (double) (F_IM(z));
        dans = casin(dz);
        F_RE(ans) = (float) (D_RE(dans));
        F_IM(ans) = (float) (D_IM(dans));
        return (ans);
}
```

```
**********************************************************
    1348 Sat May 10 12:09:18 2014
new/usr/src/lib/libm/common/complex/casinh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

#pragma weak casinh = __casinh

/* INDENT OFF */
/*
 * dcomplex casinh(dcomplex z);
 * casinh z = -i casin iz .
 */
/* INDENT ON */

#include "libm.h"
#include "complex_wrapper.h"

dcomplex
casinh(dcomplex z) {
        dcomplex w, r, ans;

        D_RE(w) = -D_IM(z);
        D_IM(w) = D_RE(z);
        r = casin(w);
        D_RE(ans) = D_IM(r);
        D_IM(ans) = -D_RE(r);
        return (ans);
}
```

```
**********************************************************
    1251 Sat May 10 12:09:18 2014
new/usr/src/lib/libm/common/complex/casinhf.c
patch01 - 693 import Sun Devpro Math Library
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```

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 */

#pragma weak casinhf = __casinhf

#include "libm.h"
#include "complex_wrapper.h"

fcomplex
casinhf(fcomplex z) {
        fcomplex w, r, ans;

        F_RE(w) = -F_IM(z);
        F_IM(w) = F_RE(z);
        r = casinf(w);
        F_RE(ans) = F_IM(r);
        F_IM(ans) = -F_RE(r);
        return (ans);
}
```

```
**********************************************************
    1262 Sat May 10 12:09:18 2014
new/usr/src/lib/libm/common/complex/casinhl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak casinhl = __casinhl

#include "libm.h"
#include "complex_wrapper.h"

ldcomplex
casinhl(ldcomplex z) {
        ldcomplex w, r, ans;

        LD_RE(w) = -LD_IM(z);
        LD_IM(w) = LD_RE(z);
        r = casinl(w);
        LD_RE(ans) = LD_IM(r);
        LD_IM(ans) = -LD_RE(r);
        return (ans);
}
```

```
**********************************************************
    6443 Sat May 10 12:09:18 2014
new/usr/src/lib/libm/common/complex/casinl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak casinl = __casinl

#include "libm.h"              /* asinl/atanl/fabsl/isinfl/log1pl/logl/sqrtl */
#include "complex_wrapper.h"
#include "longdouble.h"

/* INDENT OFF */
static const long double
zero = 0.0L,
one = 1.0L,
Acrossover = 1.5L,
Bcrossover = 0.6417L,
half = 0.5L,
ln2 = 6.93147180559945309417232121458176568075e-0001L,
Foursqrtu = 7.33441547021938866248564956819393266382555e-2466L,  /* 2**-8189 */
#if defined(__x86)
E = 5.42101086242752217003726400434970855712890e-20L,    /* 2**-64 */
pi_4 = 0.78539816339744830957399213122727132940781300L,
pi_4_l = 4.16687145926043916414793223426701930367048980e-20L,
pi_2 = 1.57079632679489661914798426245454265881562600L,
pi_2_l = 8.33374291852087832829586446853403860734097960e-20L;

#else
E = 9.62964972193617926527988971292463659269050e-35L,    /* 2**-113 */
pi_4 = 0.78539816339744830961566084581987569936976700L,
pi_4_l = 2.16795253253094525619926100651083799219058080e-35L,
pi_2 = 1.57079632679489661923132169163975139873953400L,
pi_2_l = 4.33590506506189051239852201302167598438116160e-35L;

#endif
/* INDENT ON */
```



```
#if defined(__x86)
static const int ip1 = 0x40400000;      /* 2**65 */
#else
static const int ip1 = 0x40710000;      /* 2**114 */
#endif

ldcomplex
casinl(ldcomplex z) {
        long double x, y, t, R, S, A, Am1, B, y2, xm1, xp1, Apx;
        int ix, iy, hx, hy;
        ldcomplex ans;

        x = LD_RE(z);
        y = LD_IM(z);
        hx = HI_XWORD(x);
        hy = HI_XWORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        x = fabsl(x);
        y = fabsl(y);

        /* special cases */

        /* x is inf or NaN */
        if (ix >= 0x7fff0000) { /* x is inf or NaN */
                if (isinfl(x)) {        /* x is INF */
                        LD_IM(ans) = x;
                        if (iy >= 0x7fff0000) {
                                if (isinfl(y))
                                        /* casin(inf + i inf) = pi/4 + i inf */
                                        LD_RE(ans) = pi_4 + pi_4_l;
                                else    /* casin(inf + i NaN) = NaN + i inf */
                                        LD_RE(ans) = y + y;
                        } else  /* casin(inf + iy) = pi/2 + i inf */
                                LD_RE(ans) = pi_2 + pi_2_l;
                } else {                /* x is NaN */
                        if (iy >= 0x7fff0000) {
                                /* INDENT OFF */
                                /*
                                 * casin(NaN + i inf) = NaN  + i inf
                                 * casin(NaN + i NaN) = NaN  + i NaN
                                 */
                                /* INDENT ON */
                                LD_IM(ans) = y + y;
                                LD_RE(ans) = x + x;
                        } else {
                                /* INDENT OFF */
                                /* casin(NaN + i y  ) = NaN  + i NaN */
                                /* INDENT ON */
                                LD_IM(ans) = LD_RE(ans) = x + y;
                        }
                }
                if (hx < 0)
                        LD_RE(ans) = -LD_RE(ans);
                if (hy < 0)
                        LD_IM(ans) = -LD_IM(ans);
                return (ans);
        }

        /* casin(+0 + i 0) = 0 + i 0. */
        if (x == zero && y == zero)
                return (z);

        if (iy >= 0x7fff0000) { /* y is inf or NaN */
                if (isinfl(y)) {        /* casin( x + i inf ) = 0 + i inf */
```

```
127                     LD_IM(ans) = y;
128                     LD_RE(ans) = zero;
129             } else {                /* casin( x + i NaN ) = NaN + i NaN */
130                     LD_IM(ans) = x + y;
131                     if (x == zero)
132                             LD_RE(ans) = x;
133                     else
134                             LD_RE(ans) = y;
135             }
136             if (hx < 0)
137                     LD_RE(ans) = -LD_RE(ans);
138             if (hy < 0)
139                     LD_IM(ans) = -LD_IM(ans);
140             return (ans);
141     }

143     if (y == zero) {        /* region 1: y=0 */
144             if (ix < 0x3fff0000) {  /* |x| < 1 */
145                     LD_RE(ans) = asinl(x);
146                     LD_IM(ans) = zero;
147             } else {
148                     LD_RE(ans) = pi_2 + pi_2_l;
149                     if (ix >= ip1)  /* |x| >= i386 ? 2**65 : 2**114 */
150                             LD_IM(ans) = ln2 + logl(x);
151                     else if (ix >= 0x3fff8000)      /* x > Acrossover */
152                             LD_IM(ans) = logl(x + sqrtl((x - one) * (x +
153                                     one)));
154                     else {
155                             xm1 = x - one;
156                             LD_IM(ans) = log1pl(xm1 + sqrtl(xm1 * (x +
157                                     one)));
158                     }
159             }
160     } else if (y <= E * fabsl(x - one)) {   /* region 2: y < tiny*|x-1| */
161             if (ix < 0x3fff0000) {  /* x < 1 */
162                     LD_RE(ans) = asinl(x);
163                     LD_IM(ans) = y / sqrtl((one + x) * (one - x));
164             } else {
165                     LD_RE(ans) = pi_2 + pi_2_l;
166                     if (ix >= ip1)  /* i386 ? 2**65 : 2**114 */
167                             LD_IM(ans) = ln2 + logl(x);
168                     else if (ix >= 0x3fff8000)      /* x > Acrossover */
169                             LD_IM(ans) = logl(x + sqrtl((x - one) * (x +
170                                     one)));
171                     else
172                             LD_IM(ans) = log1pl((x - one) + sqrtl((x -
173                                     one) * (x + one)));
174             }
175     } else if (y < Foursqrtu) {     /* region 3 */
176             t = sqrtl(y);
177             LD_RE(ans) = pi_2 - (t - pi_2_l);
178             LD_IM(ans) = t;
179     } else if (E * y - one >= x) {  /* region 4 */
180             LD_RE(ans) = x / y;     /* need to fix underflow cases */
181             LD_IM(ans) = ln2 + logl(y);
182     } else if (ix >= 0x5ffb0000 || iy >= 0x5ffb0000) {
183             /* region 5: x+1 and y are both (>= sqrt(max)/8) i.e. 2**8188 */
184             t = x / y;
185             LD_RE(ans) = atanl(t);
186             LD_IM(ans) = ln2 + logl(y) + half * log1pl(t * t);
187     } else if (x < Foursqrtu) {
188             /* region 6: x is very small, < 4sqrt(min) */
189             A = sqrtl(one + y * y);
190             LD_RE(ans) = x / A;     /* may underflow */
191             if (iy >= 0x3fff8000)   /* if y > Acrossover */
192                     LD_IM(ans) = logl(y + A);
```



```
193                 else
194                         LD_IM(ans) = half * log1pl((y + y) * (y + A));
195         } else {        /* safe region */
196                 y2 = y * y;
197                 xp1 = x + one;
198                 xm1 = x - one;
199                 R = sqrtl(xp1 * xp1 + y2);
200                 S = sqrtl(xm1 * xm1 + y2);
201                 A = half * (R + S);
202                 B = x / A;
203                 if (B <= Bcrossover)
204                         LD_RE(ans) = asinl(B);
205                 else {          /* use atan and an accurate approx to a-x */
206                         Apx = A + x;
207                         if (x <= one)
208                                 LD_RE(ans) = atanl(x / sqrtl(half * Apx * (y2 /
209                                         (R + xp1) + (S - xm1))));
210                         else
211                                 LD_RE(ans) = atanl(x / (y * sqrtl(half * (Apx /
212                                         (R + xp1) + Apx / (S + xm1)))));
213                 }
214                 if (A <= Acrossover) {
215                         /* use log1p and an accurate approx to A-1 */
216                         if (x < one)
217                                 Am1 = half * (y2 / (R + xp1) + y2 / (S - xm1));
218                         else
219                                 Am1 = half * (y2 / (R + xp1) + (S + xm1));
220                         LD_IM(ans) = log1pl(Am1 + sqrtl(Am1 * (A + one)));
221                 } else {
222                         LD_IM(ans) = logl(A + sqrtl(A * A - one));
223                 }
224         }

226         if (hx < 0)
227                 LD_RE(ans) = -LD_RE(ans);
228         if (hy < 0)
229                 LD_IM(ans) = -LD_IM(ans);

231         return (ans);
232 }
```

```
**********************************************************
    8746 Sat May 10 12:09:18 2014
new/usr/src/lib/libm/common/complex/catan.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak catan = __catan

/* INDENT OFF */
/*
 * dcomplex catan(dcomplex z);
 *
 * If
 *     z = x + iy,
 *
 * then
 *          1       (    2x     )    1                2    2
 * Re w  =  - arctan(-----------)  = - ATAN2(2x, 1 - x  - y )
 *          2       (     2    2)    2
 *                  (1 - x  - y )
 *
 *              ( 2         2)
 *          1   (x  +  (y+1) )      1                 4y
 * Im w  =  - log(------------) .=  --- log [ 1 + ------------ ]
 *          4   ( 2         2)      4               2         2
 *              (x  +  (y-1) )                   x  +  (y-1)
 *
 *                2    16  3                        y
 *        = t - 2t   + -- t  - ..., where t = -----------------
 *                     3                     x*x + (y-1)*(y-1)
 *
 * Note that: if catan( x, y) = ( u, v), then
 *              catan(-x, y) = (-u, v)
 *              catan( x,-y) = ( u,-v)
 *
 * Also,   catan(x,y) = -i*catanh(-y,x), or
 *        catanh(x,y) =  i*catan(-y,x)
 * So, if catanh(y,x) = (v,u), then catan(x,y) = -i*(-v,u) = (u,v), i.e.,
```



```
 *        catan(x,y) = (u,v)
 *
 * EXCEPTION CASES (conform to ISO/IEC 9899:1999(E)):
 *    catan( 0  , 0   ) =  (0    ,  0   )
 *    catan( NaN, 0   ) =  (NaN  ,  0   )
 *    catan( 0  , 1   ) =  (0    ,  +inf) with divide-by-zero
 *    catan( inf, y   ) =  (pi/2 ,  0   ) for finite +y
 *    catan( NaN, y   ) =  (NaN  ,  NaN ) with invalid for finite y!=0
 *    catan( x  , inf ) =  (pi/2 ,  0   ) for finite +x
 *    catan( inf, inf ) =  (pi/2 ,  0   )
 *    catan( NaN, inf ) =  (NaN  ,  0   )
 *    catan( x  , NaN ) =  (NaN  ,  NaN ) with invalid for finite x
 *    catan( inf, NaN ) =  (pi/2 ,  +-0 )
 */
/* INDENT ON */

#include "libm.h"               /* atan/atan2/fabs/log/log1p */
#include "complex_wrapper.h"

/* INDENT OFF */
static const double
        pi_2 = 1.57079632679489656e+00,
        zero = 0.0,
        half = 0.5,
        two = 2.0,
        ln2 = 6.93147180559945309417232121458176568075e-0001,
        one = 1.0;
/* INDENT ON */

dcomplex
catan(dcomplex z) {
        dcomplex ans;
        double x, y, ax, ay, t;
        int hx, hy, ix, iy;
        unsigned lx, ly;

        x = D_RE(z);
        y = D_IM(z);
        ax = fabs(x);
        ay = fabs(y);
        hx = HI_WORD(x);
        lx = LO_WORD(x);
        hy = HI_WORD(y);
        ly = LO_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;

        /* x is inf or NaN */
        if (ix >= 0x7ff00000) {
                if (ISINF(ix, lx)) {
                        D_RE(ans) = pi_2;
                        D_IM(ans) = zero;
                } else {
                        D_RE(ans) = x + x;
                        if ((iy | ly) == 0 || (ISINF(iy, ly)))
                                D_IM(ans) = zero;
                        else
                                D_IM(ans) = (fabs(y) - ay) / (fabs(y) - ay);
                }
        } else if (iy >= 0x7ff00000) {
                /* y is inf or NaN */
                if (ISINF(iy, ly)) {
                        D_RE(ans) = pi_2;
                        D_IM(ans) = zero;
                } else {
                        D_RE(ans) = (fabs(x) - ax) / (fabs(x) - ax);
```

```
128                     D_IM(ans) = y;
129             }
130         } else if ((ix | lx) == 0) {
131                 /* INDENT OFF */
132                 /*
133                  * x = 0
134                  *      1                                1
135                  * A = --- * atan2(2x, 1-x*x-y*y) = --- atan2(0,1-|y|)
136                  *      2                                2
137                  *
138                  *     1     [  (y+1)*(y+1) ]   1          2      1         2y
139                  * B = - log [ ------------ ] = - log (1+ ---) or - log(1+ ----)
140                  *     4     [  (y-1)*(y-1) ]   2         y-1     2         1-y
141                  */
142                 /* INDENT ON */
143                 t = one - ay;
144                 if (((iy - 0x3ff00000) | ly) == 0) {
145                         /* y=1: catan(0,1)=(0,+inf) with 1/0 signal */
146                         D_IM(ans) = ay / ax;
147                         D_RE(ans) = zero;
148                 } else if (iy >= 0x3ff00000) {  /* y>1 */
149                         D_IM(ans) = half * log1p(two / (-t));
150                         D_RE(ans) = pi_2;
151                 } else {                        /* y<1 */
152                         D_IM(ans) = half * log1p((ay + ay) / t);
153                         D_RE(ans) = zero;
154                 }
155         } else if (iy < 0x3e200000 || ((ix - iy) >> 20) >= 30) {
156         /* INDENT OFF */
157         /*
158          * Tiny y (relative to 1+|x|)
159          *     |y| < E*(1+|x|)
160          * where E=2**-29, -35, -60 for double, double extended, quad precision
161          *
162          *      1                                [ x<=1:   atan(x)
163          * A = --- * atan2(2x, 1-x*x-y*y) ~ [       1                1+x
164          *      2                                [ x>=1: - atan2(2,(1-x)*(-----))
165          *                                       2                 x
166          *
167          *                                 y/x
168          * B ~ t*(1-2t), where t = ----------------- is tiny
169          *                          x + (y-1)*(y-1)/x
170          */
171                 /* INDENT ON */
172                 if (ix < 0x3ff00000)
173                         D_RE(ans) = atan(ax);
174                 else
175                         D_RE(ans) = half * atan2(two, (one - ax) * (one +
176                             one / ax));
177                 if ((iy | ly) == 0) {
178                         D_IM(ans) = ay;
179                 } else {
180                         if (ix < 0x3e200000)
181                                 t = ay / ((ay - one) * (ay - one));
182                         else if (ix > 0x41c00000)
183                                 t = (ay / ax) / ax;
184                         else
185                                 t = ay / (ax * ax + (ay - one) * (ay - one));
186                         D_IM(ans) = t * (one - (t + t));
187                 }
188         } else if (iy >= 0x41c00000 && ((iy - ix) >> 20) >= 30) {
189                 /* INDENT OFF */
190                 /*
191                  * Huge y relative to 1+|x|
192                  *           |y| > Einv*(1+|x|), where Einv~2**(prec/2+3),
193                  *           1
```



```
194                  *       A ~ --- * atan2(2x, -y*y) ~ pi/2
195                  *           2
196                  *                                    y
197                  *       B ~ t*(1-2t), where t = --------------- is tiny
198                  *                                 (y-1)*(y-1)
199                  */
200                 /* INDENT ON */
201                 D_RE(ans) = pi_2;
202                 t = (ay / (ay - one)) / (ay - one);
203                 D_IM(ans) = t * (one - (t + t));
204         } else if (((iy - 0x3ff00000) | ly) == 0) {
205                 /* INDENT OFF */
206                 /*
207                  * y = 1
208                  *      1                          1
209                  * A = --- * atan2(2x, -x*x) = --- atan2(2,-x)
210                  *      2                          2
211                  *
212                  *     1     [x*x + 4]   1          4     [ 0.5(log2-logx) if
213                  * B = - log [-------] = - log (1+ ---) = [ |x|<E, else 0.25*
214                  *     4     [  x*x  ]   4         x*x    [ log1p((2/x)*(2/x))
215                  */
216                 /* INDENT ON */
217                 D_RE(ans) = half * atan2(two, -ax);
218                 if (ix < 0x3e200000)
219                         D_IM(ans) = half * (ln2 - log(ax));
220                 else {
221                         t = two / ax;
222                         D_IM(ans) = 0.25 * log1p(t * t);
223                 }
224         } else if (ix >= 0x43900000) {
225                 /* INDENT OFF */
226                 /*
227                  * Huge x:
228                  * when |x| > 1/E^2,
229                  *      1                          pi
230                  * A ~ --- * atan2(2x, -x*x-y*y) ~ ---
231                  *      2                          2
232                  *                                y                 y/x
233                  * B ~ t*(1-2t), where t = --------------- = (-------------- )/x
234                  *                         x*x+(y-1)*(y-1)     1+((y-1)/x)^2
235                  */
236                 /* INDENT ON */
237                 D_RE(ans) = pi_2;
238                 t = ((ay / ax) / (one + ((ay - one) / ax) * ((ay - one) /
239                     ax))) / ax;
240                 D_IM(ans) = t * (one - (t + t));
241         } else if (ix < 0x38b00000) {
242                 /* INDENT OFF */
243                 /*
244                  * Tiny x:
245                  * when |x| < E^4,  (note that y!=1)
246                  *      1                          1
247                  * A = --- * atan2(2x, 1-x*x-y*y) ~ --- * atan2(2x,(1-y)*(1+y))
248                  *      2                          2
249                  *
250                  *     1     [(y+1)*(y+1)]   1          2      1         2y
251                  * B = - log [-----------] = - log (1+ ---) or - log(1+ ----)
252                  *     4     [(y-1)*(y-1)]   2         y-1     2         1-y
253                  */
254                 /* INDENT ON */
255                 D_RE(ans) = half * atan2(ax + ax, (one - ay) * (one + ay));
256                 if (iy >= 0x3ff00000)
257                         D_IM(ans) = half * log1p(two / (ay - one));
258                 else
259                         D_IM(ans) = half * log1p((ay + ay) / (one - ay));
```

```
260         } else {
261                 /* INDENT OFF */
262                 /*
263                  * normal x,y
264                  *      1
265                  * A = --- * atan2(2x, 1-x*x-y*y)
266                  *      2
267                  *
268                  *     1     [x*x+(y+1)*(y+1)]   1               4y
269                  * B = - log [---------------] = - log (1+ -----------------)
270                  *     4     [x*x+(y-1)*(y-1)]   4         x*x + (y-1)*(y-1)
271                  */
272                 /* INDENT ON */
273                 t = one - ay;
274                 if (iy >= 0x3fe00000 && iy < 0x40000000) {
275                         /* y close to 1 */
276                         D_RE(ans) = half * (atan2((ax + ax), (t * (one + ay) -
277                             ax * ax)));
278                 } else if (ix >= 0x3fe00000 && ix < 0x40000000) {
279                         /* x close to 1 */
280                         D_RE(ans) = half * atan2((ax + ax), ((one - ax) *
281                                 (one + ax) - ay * ay));
282                 } else
283                         D_RE(ans) = half * atan2((ax + ax), ((one - ax * ax) -
284                             ay * ay));
285                 D_IM(ans) = 0.25 * log1p((4.0 * ay) / (ax * ax + t * t));
286         }
287         if (hx < 0)
288                 D_RE(ans) = -D_RE(ans);
289         if (hy < 0)
290                 D_IM(ans) = -D_IM(ans);
291         return (ans);
292 }
```

```
**********************************************************
    3576 Sat May 10 12:09:18 2014
new/usr/src/lib/libm/common/complex/catanf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */
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 */

#pragma weak catanf = __catanf

#include "libm.h"
#include "complex_wrapper.h"

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const float
        pi_2 = 1.570796326794896558e+00F,
        zero = 0.0F,
        half = 0.5F,
        two = 2.0F,
        one = 1.0F;

fcomplex
catanf(fcomplex z) {
        fcomplex        ans;
        float           x, y, ax, ay, t;
        double          dx, dy, dt;
        int             hx, hy, ix, iy;

        x = F_RE(z);
        y = F_IM(z);
        ax = fabsf(x);
        ay = fabsf(y);
        hx = THE_WORD(x);
        hy = THE_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;

        if (ix >= 0x7f800000) {         /* x is inf or NaN */
```



```
                if (ix == 0x7f800000) {
                        F_RE(ans) = pi_2;
                        F_IM(ans) = zero;
                } else {
                        F_RE(ans) = x * x;
                        if (iy == 0 || iy == 0x7f800000)
                                F_IM(ans) = zero;
                        else
                                F_IM(ans) = (fabsf(y) - ay) / (fabsf(y) - ay);
                }
        } else if (iy >= 0x7f800000) {  /* y is inf or NaN */
                if (iy == 0x7f800000) {
                        F_RE(ans) = pi_2;
                        F_IM(ans) = zero;
                } else {
                        F_RE(ans) = (fabsf(x) - ax) / (fabsf(x) - ax);
                        F_IM(ans) = y * y;
                }
        } else if (ix == 0) {
                /* INDENT OFF */
                /*
                 * x = 0
                 *      1                               1
                 * A = --- * atan2(2x, 1-x*x-y*y) = --- atan2(0,1-|y|)
                 *      2                               2
                 *
                 *     1     [ (y+1)*(y+1) ]   1          2      1          2y
                 * B = - log [ ----------- ] = - log (1+ ---) or - log(1+ ----)
                 *     4     [ (y-1)*(y-1) ]   2         y-1     2         1-y
                 */
                /* INDENT ON */
                t = one - ay;
                if (iy == 0x3f800000) {
                        /* y=1: catan(0,1)=(0,+inf) with 1/0 signal */
                        F_IM(ans) = ay / ax;
                        F_RE(ans) = zero;
                } else if (iy > 0x3f800000) {   /* y>1 */
                        F_IM(ans) = half * log1pf(two / (-t));
                        F_RE(ans) = pi_2;
                } else {                        /* y<1 */
                        F_IM(ans) = half * log1pf((ay + ay) / t);
                        F_RE(ans) = zero;
                }
        } else {
                /* INDENT OFF */
                /*
                 * use double precision x,y
                 *      1
                 * A = --- * atan2(2x, 1-x*x-y*y)
                 *      2
                 *
                 *     1     [ x*x+(y+1)*(y+1) ]   1              4y
                 * B = - log [ --------------- ] = - log (1+ -----------------)
                 *     4     [ x*x+(y-1)*(y-1) ]   4         x*x + (y-1)*(y-1)
                 */
                /* INDENT ON */
#if defined(__i386) && !defined(__amd64)
                int     rp = __swapRP(fp_extended);
#endif
                dx = (double)ax;
                dy = (double)ay;
                F_RE(ans) = (float)(0.5 * atan2(dx + dx,
                    1.0 - dx * dx - dy * dy));
                dt = dy - 1.0;
                F_IM(ans) = (float)(0.25 * log1p(4.0 * dy /
                    (dx * dx + dt * dt)));
```

```
#if defined(__i386) && !defined(__amd64)
                if (rp != fp_extended)
                        (void) __swapRP(rp);
#endif
        }
        if (hx < 0)
                F_RE(ans) = -F_RE(ans);
        if (hy < 0)
                F_IM(ans) = -F_IM(ans);
        return (ans);
}
```

```
**********************************************************
    1428 Sat May 10 12:09:18 2014
new/usr/src/lib/libm/common/complex/catanh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak catanh = __catanh

/* INDENT OFF */
/*
 * z := x + iy
 * catanh(z)    = -i catan(iz)
 *              = -i catan(-y+ix)
 *              = (Im(catan(-y+ix)), -Re(catan(-y+ix)))
 */
/* INDENT ON */

#include "libm.h"
#include "complex_wrapper.h"

dcomplex
catanh(dcomplex z) {
        double x, y;
        dcomplex ans, ct;

        x = D_RE(z);
        y = D_IM(z);
        D_RE(z) = -y;
        D_IM(z) = x;
        ct = catan(z);
        D_RE(ans) = D_IM(ct);
        D_IM(ans) = -D_RE(ct);
        return (ans);
}
```

```
**********************************************************
    1281 Sat May 10 12:09:18 2014
new/usr/src/lib/libm/common/complex/catanhf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak catanhf = __catanhf

#include "libm.h"
#include "complex_wrapper.h"

fcomplex
catanhf(fcomplex z) {
        float x, y;
        fcomplex ans, ct;

        x = F_RE(z);
        y = F_IM(z);
        F_RE(z) = -y;
        F_IM(z) = x;
        ct = catanf(z);
        F_RE(ans) = F_IM(ct);
        F_IM(ans) = -F_RE(ct);
        return (ans);
}
```

```
**********************************************************
    1298 Sat May 10 12:09:19 2014
new/usr/src/lib/libm/common/complex/catanhl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak catanhl = __catanhl

#include "libm.h"
#include "complex_wrapper.h"

ldcomplex
catanhl(ldcomplex z) {
        long double x, y;
        ldcomplex ans, ct;

        x = LD_RE(z);
        y = LD_IM(z);
        LD_RE(z) = -y;
        LD_IM(z) = x;
        ct = catanl(z);
        LD_RE(ans) = LD_IM(ct);
        LD_IM(ans) = -LD_RE(ct);
        return (ans);
}
```

```
**********************************************************
   10202 Sat May 10 12:09:19 2014
new/usr/src/lib/libm/common/complex/catanl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak catanl = __catanl

/* INDENT OFF */
/*
 * ldcomplex catanl(ldcomplex z);
 *
 * Atan(z) return A + Bi where,
 *              1
 *      A = --- * atan2(2x, 1-x*x-y*y)
 *              2
 *
 *              1      [ x*x + (y+1)*(y+1) ]   1              4y
 *       B = --- log [ ----------------- ] = - log (1+ -----------------)
 *              4      [ x*x + (y-1)*(y-1) ]   4         x*x + (y-1)*(y-1)
 *
 *                   2    16  3                        y
 *         = t - 2t   + -- t  - ..., where t = -----------------
 *                      3                      x*x + (y-1)*(y-1)
 * Proof:
 * Let w = atan(z=x+yi) = A + B i. Then tan(w) = z.
 * Since sin(w) = (exp(iw)-exp(-iw))/(2i), cos(w)=(exp(iw)+exp(-iw))/(2),
 * Let p = exp(iw), then z = tan(w) = ((p-1/p)/(p+1/p))/i, or
 * iz = (p*p-1)/(p*p+1), or, after simplification,
 *      p*p = (1+iz)/(1-iz)                                  ... (1)
 * LHS of (1) = exp(2iw) = exp(2i(A+Bi)) = exp(-2B)*exp(2iA)
 *            = exp(-2B)*(cos(2A)+i*sin(2A))                 ... (2)
 *              1-y+ix   (1-y+ix)*(1+y+ix)   1-x*x-y*y + 2xi
 * RHS of (1) = ------ = ---------------- = -------------- ... (3)
 *              1+y-ix    (1+y)**2 + x**2    (1+y)**2 + x**2
 *
 * Comparing the real and imaginary parts of (2) and (3), we have:
```



```
 *      cos(2A) : 1-x*x-y*y = sin(2A) : 2x
 * and hence
 *      tan(2A) = 2x/(1-x*x-y*y), or
 *      A = 0.5 * atan2(2x, 1-x*x-y*y)                    ... (4)
 *
 * For the imaginary part B, Note that |p*p| = exp(-2B), and
 *      |1+iz|   |i-z|   hypot(x,(y-1))
 *       |---| = |---| = --------------
 *      |1-iz|   |i+z|   hypot(x,(y+1))
 * Thus
 *                 x*x + (y+1)*(y+1)
 *      exp(4B) = -----------------, or
 *                 x*x + (y-1)*(y-1)
 *
 *           1     [x^2+(y+1)^2]   1             4y
 *       B =  - log [-----------] = - log(1+ -------------)  ... (5)
 *           4     [x^2+(y-1)^2]   4         x^2+(y-1)^2
 *
 * QED.
 *
 * Note that: if catan( x, y) = ( u, v), then
 *              catan(-x, y) = (-u, v)
 *              catan( x,-y) = ( u,-v)
 *
 * Also,   catan(x,y) = -i*catanh(-y,x), or
 *        catanh(x,y) =  i*catan(-y,x)
 * So, if catanh(y,x) = (v,u), then catan(x,y) = -i*(-v,u) = (u,v), i.e.,
 *         catan(x,y) = (u,v)
 *
 * EXCEPTION CASES (conform to ISO/IEC 9899:1999(E)):
 *    catan( 0  , 0   ) =  (0    ,  0   )
 *    catan( NaN, 0   ) =  (NaN  ,  0   )
 *    catan( 0  , 1   ) =  (0    ,  +inf) with divide-by-zero
 *    catan( inf, y   ) =  (pi/2 ,  0   ) for finite +y
 *    catan( NaN, y   ) =  (NaN  ,  NaN ) with invalid for finite y!=0
 *    catan( x  , inf ) =  (pi/2 ,  0   ) for finite +x
 *    catan( inf, inf ) =  (pi/2 ,  0   )
 *    catan( NaN, inf ) =  (NaN  ,  0   )
 *    catan( x  , NaN ) =  (NaN  ,  NaN ) with invalid for finite x
 *    catan( inf, NaN ) =  (pi/2 ,  +-0 )
 */
/* INDENT ON */

#include "libm.h"       /* atan2l/atanl/fabsl/isinfl/iszerol/log1pl/logl */
#include "complex_wrapper.h"
#include "longdouble.h"

/* INDENT OFF */
static const long double
zero = 0.0L,
one = 1.0L,
two = 2.0L,
half = 0.5L,
ln2 = 6.93147180559945309417232121458176568075e-0001L,
pi_2 = 1.57079632679489661923132169163975144209858469968755291048747 2L,
#if defined(__x86)
E = 2.91038304567337036132812500000000000000e-11L,     /* 2**-35 */
Einv = 3.43597383680000000000000000000000000000e+10L;  /* 2**+35 */
#else
E = 8.67361737988403547205962240695953369140 6e-19L,     /* 2**-60 */
Einv = 1.15292150460684697600000000000000000000e18L;   /* 2**+60 */
#endif
/* INDENT ON */

ldcomplex
catanl(ldcomplex z) {
```

```
127         ldcomplex ans;
128         long double x, y, t1, ax, ay, t;
129         int hx, hy, ix, iy;

131         x = LD_RE(z);
132         y = LD_IM(z);
133         ax = fabsl(x);
134         ay = fabsl(y);
135         hx = HI_XWORD(x);
136         hy = HI_XWORD(y);
137         ix = hx & 0x7fffffff;
138         iy = hy & 0x7fffffff;

140         /* x is inf or NaN */
141         if (ix >= 0x7fff0000) {
142                 if (isinfl(x)) {
143                         LD_RE(ans) = pi_2;
144                         LD_IM(ans) = zero;
145                 } else {
146                         LD_RE(ans) = x + x;
147                         if (iszerol(y) || (isinfl(y)))
148                                 LD_IM(ans) = zero;
149                         else
150                                 LD_IM(ans) = (fabsl(y) - ay) / (fabsl(y) - ay);
151                 }
152         } else if (iy >= 0x7fff0000) {
153                 /* y is inf or NaN */
154                 if (isinfl(y)) {
155                         LD_RE(ans) = pi_2;
156                         LD_IM(ans) = zero;
157                 } else {
158                         LD_RE(ans) = (fabsl(x) - ax) / (fabsl(x) - ax);
159                         LD_IM(ans) = y;
160                 }
161         } else if (iszerol(x)) {
162                 /* INDENT OFF */
163                 /*
164                  * x = 0
165                  *      1                               1
166                  * A = --- * atan2(2x, 1-x*x-y*y) = --- atan2(0,1-|y|)
167                  *      2                               2
168                  *
169                  *     1     [ (y+1)*(y+1) ]   1          2      1         2y
170                  * B = - log [ ----------- ] = - log (1+ ---) or - log(1+ ----)
171                  *     4     [ (y-1)*(y-1) ]   2         y-1     2         1-y
172                  */
173                 /* INDENT ON */
174                 t = one - ay;
175                 if (ay == one) {
176                         /* y=1: catan(0,1)=(0,+inf) with 1/0 signal */
177                         LD_IM(ans) = ay / ax;
178                         LD_RE(ans) = zero;
179                 } else if (ay > one) {  /* y>1 */
180                         LD_IM(ans) = half * log1pl(two / (-t));
181                         LD_RE(ans) = pi_2;
182                 } else {                /* y<1 */
183                         LD_IM(ans) = half * log1pl((ay + ay) / t);
184                         LD_RE(ans) = zero;
185                 }
186         } else if (ay < E * (one + ax)) {
187                 /* INDENT OFF */
188                 /*
189                  * Tiny y (relative to 1+|x|)
190                  *     |y| < E*(1+|x|)
191                  * where E=2**-29, -35, -60 for double, extended, quad precision
192                  *
```



```
193                  *     1                               [x<=1:   atan(x)
194                  * A = - * atan2(2x,1-x*x-y*y) ~ [      1                  1+x
195                  *     2                               [x>=1: - atan2(2,(1-x)*(-----))
196                  *                                           2                  x
197                  *
198                  *                                    y/x
199                  * B ~ t*(1-2t), where t = ------------------ is tiny
200                  *                           x + (y-1)*(y-1)/x
201                  *
202                  *                             y
203                  * (when x < 2**-60, t = ----------- )
204                  *                          (y-1)*(y-1)
205                  */
206                 /* INDENT ON */
207                 if (ay == zero)
208                         LD_IM(ans) = ay;
209                 else {
210                         t1 = ay - one;
211                         if (ix < 0x3fc30000)
212                                 t = ay / (t1 * t1);
213                         else if (ix > 0x403b0000)
214                                 t = (ay / ax) / ax;
215                         else
216                                 t = ay / (ax * ax + t1 * t1);
217                         LD_IM(ans) = t * (one - two * t);
218                 }
219                 if (ix < 0x3fff0000)
220                         LD_RE(ans) = atanl(ax);
221                 else
222                         LD_RE(ans) = half * atan2l(two, (one - ax) * (one +
223                                 one / ax));

225         } else if (ay > Einv * (one + ax)) {
226                 /* INDENT OFF */
227                 /*
228                  * Huge y relative to 1+|x|
229                  *     |y| > Einv*(1+|x|), where Einv~2**(prec/2+3),
230                  *     1
231                  * A ~ --- * atan2(2x, -y*y) ~ pi/2
232                  *     2
233                  *                              y
234                  * B ~ t*(1-2t), where t = ---------------- is tiny
235                  *                          (y-1)*(y-1)
236                  */
237                 /* INDENT ON */
238                 LD_RE(ans) = pi_2;
239                 t = (ay / (ay - one)) / (ay - one);
240                 LD_IM(ans) = t * (one - (t + t));
241         } else if (ay == one) {
242                 /* INDENT OFF */
243                 /*
244                  * y=1
245                  *     1                         1
246                  * A = - * atan2(2x, -x*x) = --- atan2(2,-x)
247                  *     2                         2
248                  *
249                  *     1     [ x*x+4]   1          4     [ 0.5(log2-logx) if
250                  * B = - log [ -----] = - log (1+ ---) = [ |x|<E, else 0.25*
251                  *     4     [  x*x ]   4         x*x    [ log1p((2/x)*(2/x))
252                  */
253                 /* INDENT ON */
254                 LD_RE(ans) = half * atan2l(two, -ax);
255                 if (ax < E)
256                         LD_IM(ans) = half * (ln2 - logl(ax));
257                 else {
258                         t = two / ax;
```

```
259                     LD_IM(ans) = 0.25L * log1pl(t * t);
260             }
261         } else if (ax > Einv * Einv) {
262                 /* INDENT OFF */
263                 /*
264                  * Huge x:
265                  * when |x| > 1/E^2,
266                  *      1                           pi
267                  * A ~ --- * atan2(2x, -x*x-y*y) ~ ---
268                  *      2                           2
269                  *                             y                y/x
270                  * B ~ t*(1-2t), where t = --------------- = (------------- )/x
271                  *                         x*x+(y-1)*(y-1)     1+((y-1)/x)^2
272                  */
273                 /* INDENT ON */
274                 LD_RE(ans) = pi_2;
275                 t = ((ay / ax) / (one + ((ay - one) / ax) * ((ay - one) /
276                         ax))) / ax;
277                 LD_IM(ans) = t * (one - (t + t));
278         } else if (ax < E * E * E * E) {
279                 /* INDENT OFF */
280                 /*
281                  * Tiny x:
282                  * when |x| < E^4,  (note that y!=1)
283                  *      1                           1
284                  * A = --- * atan2(2x, 1-x*x-y*y) ~ --- * atan2(2x,1-y*y)
285                  *      2                           2
286                  *
287                  *     1     [ (y+1)*(y+1) ]   1          2      1         2y
288                  * B = - log [ ----------- ] = - log (1+ ---) or - log(1+ ----)
289                  *     4     [ (y-1)*(y-1) ]   2         y-1     2         1-y
290                  */
291                 /* INDENT ON */
292                 LD_RE(ans) = half * atan2l(ax + ax, (one - ay) * (one + ay));
293                 if (ay > one)   /* y>1 */
294                         LD_IM(ans) = half * log1pl(two / (ay - one));
295                 else            /* y<1 */
296                         LD_IM(ans) = half * log1pl((ay + ay) / (one - ay));
297         } else {
298                 /* INDENT OFF */
299                 /*
300                  * normal x,y
301                  *      1
302                  * A = --- * atan2(2x, 1-x*x-y*y)
303                  *      2
304                  *
305                  *     1     [ x*x+(y+1)*(y+1) ]   1              4y
306                  * B = - log [ --------------- ] = - log (1+ -----------------)
307                  *     4     [ x*x+(y-1)*(y-1) ]   4         x*x + (y-1)*(y-1)
308                  */
309                 /* INDENT ON */
310                 t = one - ay;
311                 if (iy >= 0x3ffe0000 && iy < 0x40000000) {
312                         /* y close to 1 */
313                         LD_RE(ans) = half * (atan2l((ax + ax), (t * (one +
314                                 ay) - ax * ax)));
315                 } else if (ix >= 0x3ffe0000 && ix < 0x40000000) {
316                         /* x close to 1 */
317                         LD_RE(ans) = half * atan2l((ax + ax), ((one - ax) *
318                                 (one + ax) - ay * ay));
319                 } else
320                         LD_RE(ans) = half * atan2l((ax + ax), ((one - ax *
321                                 ax) - ay * ay));
322                 LD_IM(ans) = 0.25L * log1pl((4.0L * ay) / (ax * ax + t * t));
323         }
324         if (hx < 0)
```



```
325                 LD_RE(ans) = -LD_RE(ans);
326         if (hy < 0)
327                 LD_IM(ans) = -LD_IM(ans);
328         return (ans);
329 }
```

```
**********************************************************
    1420 Sat May 10 12:09:19 2014
new/usr/src/lib/libm/common/complex/ccos.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak ccos = __ccos

/* INDENT OFF */
/*
 * dcomplex ccos(dcomplex z);
 *
 * z := x+iy; since ccos(iz) = cosh(z), we have
 * ccos(z)      = ccos((-1)*(-z)) = ccos(i*i*(-z))
 *              = ccosh(i*(-z)) = ccosh(i*(-x-yi))
 *              = ccosh(y-ix)
 */
/* INDENT ON */

#include "libm.h"
#include "complex_wrapper.h"

dcomplex
ccos(dcomplex z) {
        double x, y;

        x = D_RE(z);
        y = D_IM(z);
        D_RE(z) = y;
        D_IM(z) = -x;
        return (ccosh(z));
}
```

```
**********************************************************
    1198 Sat May 10 12:09:19 2014
new/usr/src/lib/libm/common/complex/ccosf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak ccosf = __ccosf

#include "libm.h"
#include "complex_wrapper.h"

fcomplex
ccosf(fcomplex z) {
        float x, y;

        x = F_RE(z);
        y = F_IM(z);
        F_RE(z) = y;
        F_IM(z) = -x;
        return (ccoshf(z));
}
```

```
**********************************************************
    3894 Sat May 10 12:09:19 2014
new/usr/src/lib/libm/common/complex/ccosh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak ccosh = __ccosh

/* INDENT OFF */
/*
 * dcomplex ccosh(dcomplex z);
 *
 *             z      -z       x                    -x
 *            e   +  e        e  (cos(y)+i*sin(y)) + e  (cos(-y)+i*sin(-y))
 * cosh z = -------------- =  ----------------------------------------
 *                2                          2
 *                    x    -x              x    -x
 *           cos(y) ( e  + e  )  + i*sin(y) (e  - e  )
 *       = ----------------------------------------
 *                           2
 *
 *       =  cos(y) cosh(x)  + i sin(y) sinh(x)
 *
 * Implementation Note
 * -------------------
 *
 *            |x|    -|x|   |x|        -2|x|       -2|x|    -P-4
 * Note that  e   +- e    = e   ( 1 +- e     ). If e      < 2     , where
 *
 * P stands for the number of significant bits of the machine precision,
 *                                    |x|
 * then the result will be rounded to e   . Therefore, we have
 *
 *                z
 *               e
 *     cosh z = -----  if |x| >= (P/2 + 2)*ln2
 *               2
 *
```



```
 * EXCEPTION (conform to ISO/IEC 9899:1999(E)):
 *      ccosh(0,0)=(1,0)
 *      ccosh(0,inf)=(NaN,+-0)
 *      ccosh(0,NaN)=(NaN,+-0)
 *      ccosh(x,inf) = (NaN,NaN) for finite non-zero x
 *      ccosh(x,NaN) = (NaN,NaN) for finite non-zero x
 *      ccosh(inf,0) = (inf, 0)
 *      ccosh(inf,y) = (inf*cos(y),inf*sin(y)) for finite non-zero y
 *      ccosh(inf,inf) = (+-inf,NaN)
 *      ccosh(inf,NaN) = (+inf,NaN)
 *      ccosh(NaN,0) = (NaN,+-0)
 *      ccosh(NaN,y) = (NaN,NaN) for non-zero y
 *      ccosh(NaN,NaN) = (NaN,NaN)
 */
/* INDENT ON */

#include "libm.h"               /* cosh/exp/fabs/scalbn/sinh/sincos/__k_cexp */
#include "complex_wrapper.h"

dcomplex
ccosh(dcomplex z) {
        double t, x, y, S, C;
        int hx, ix, lx, hy, iy, ly, n;
        dcomplex ans;

        x = D_RE(z);
        y = D_IM(z);
        hx = HI_WORD(x);
        lx = LO_WORD(x);
        ix = hx & 0x7fffffff;
        hy = HI_WORD(y);
        ly = LO_WORD(y);
        iy = hy & 0x7fffffff;
        x = fabs(x);
        y = fabs(y);

        (void) sincos(y, &S, &C);
        if (ix >= 0x403c0000) { /* |x| > 28 = prec/2 (14,28,34,60) */
                if (ix >= 0x40862E42) { /* |x| > 709.78... ~ log(2**1024) */
                        if (ix >= 0x7ff00000) { /* |x| is inf or NaN */
                                if ((iy | ly) == 0) {
                                        D_RE(ans) = x;
                                        D_IM(ans) = y;
                                } else if (iy >= 0x7ff00000) {
                                        D_RE(ans) = x;
                                        D_IM(ans) = x - y;
                                } else {
                                        D_RE(ans) = C * x;
                                        D_IM(ans) = S * x;
                                }
                        } else {
                                t = __k_cexp(x, &n);
                                                /* return exp(x)=t*2**n */
                                D_RE(ans) = scalbn(C * t, n - 1);
                                D_IM(ans) = scalbn(S * t, n - 1);
                        }
                } else {
                        t = exp(x) * 0.5;
                        D_RE(ans) = C * t;
                        D_IM(ans) = S * t;
                }
        } else {
                if ((ix | lx) == 0) {   /* x = 0, return (C,0) */
                        D_RE(ans) = C;
                        D_IM(ans) = 0.0;
                } else {
```

```
128                         D_RE(ans) = C * cosh(x);
129                         D_IM(ans) = S * sinh(x);
130                 }
131         }
132         if ((hx ^ hy) < 0)
133                 D_IM(ans) = -D_IM(ans);
134         return (ans);
135 }
```

```
**********************************************************
    2523 Sat May 10 12:09:19 2014
new/usr/src/lib/libm/common/complex/ccoshf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak ccoshf = __ccoshf

#include "libm.h"
#include "complex_wrapper.h"

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const float zero = 0.0F, half = 0.5F;

fcomplex
ccoshf(fcomplex z) {
        float           t, x, y, S, C;
        double          w;
        int             hx, ix, hy, iy, n;
        fcomplex        ans;

        x = F_RE(z);
        y = F_IM(z);
        hx = THE_WORD(x);
        ix = hx & 0x7fffffff;
        hy = THE_WORD(y);
        iy = hy & 0x7fffffff;
        x = fabsf(x);
        y = fabsf(y);

        sincosf(y, &S, &C);
        if (ix >= 0x41600000) { /* |x| > 14 = prec/2 (14,28,34,60) */
                if (ix >= 0x42B171AA) { /* |x| > 88.722... ~ log(2**128) */
                        if (ix >= 0x7f800000) { /* |x| is inf or NaN */
                                if (iy == 0) {
                                        F_RE(ans) = x;
```



```
                                        F_IM(ans) = y;
                                } else if (iy >= 0x7f800000) {
                                        F_RE(ans) = x;
                                        F_IM(ans) = x - y;
                                } else {
                                        F_RE(ans) = C * x;
                                        F_IM(ans) = S * x;
                                }
                        } else {
#if defined(__i386) && !defined(__amd64)
                                int     rp = __swapRP(fp_extended);
#endif
                                /* return (C, S) * exp(x) / 2 */
                                w = __k_cexp((double)x, &n);
                                F_RE(ans) = (float)scalbn(C * w, n - 1);
                                F_IM(ans) = (float)scalbn(S * w, n - 1);
#if defined(__i386) && !defined(__amd64)
                                if (rp != fp_extended)
                                        (void) __swapRP(rp);
#endif
                        }
                } else {
                        t = expf(x) * half;
                        F_RE(ans) = C * t;
                        F_IM(ans) = S * t;
                }
        } else {
                if (ix == 0) {  /* x = 0, return (C,0) */
                        F_RE(ans) = C;
                        F_IM(ans) = zero;
                } else {
                        F_RE(ans) = C * coshf(x);
                        F_IM(ans) = S * sinhf(x);
                }
        }
        if ((hx ^ hy) < 0)
                F_IM(ans) = -F_IM(ans);
        return (ans);
}
```

```
**********************************************************
    2363 Sat May 10 12:09:19 2014
new/usr/src/lib/libm/common/complex/ccoshl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak ccoshl = __ccoshl

#include "libm.h"       /* coshl/expl/fabsl/scalbnl/sincosl/sinhl/__k_cexpl */
#include "complex_wrapper.h"

/* INDENT OFF */
static const long double zero = 0.0L, half = 0.5L;
/* INDENT ON */

ldcomplex
ccoshl(ldcomplex z) {
        long double t, x, y, S, C;
        int hx, ix, hy, iy, n;
        ldcomplex ans;

        x = LD_RE(z);
        y = LD_IM(z);
        hx = HI_XWORD(x);
        ix = hx & 0x7fffffff;
        hy = HI_XWORD(y);
        iy = hy & 0x7fffffff;
        x = fabsl(x);
        y = fabsl(y);

        (void) sincosl(y, &S, &C);
        if (ix >= 0x4004e000) { /* |x| > 60 = prec/2 (14,28,34,60) */
                if (ix >= 0x400C62E4) { /* |x| > 11356.52... ~ log(2**16384) */
                        if (ix >= 0x7fff0000) { /* |x| is inf or NaN */
                                if (y == zero) {
                                        LD_RE(ans) = x;
                                        LD_IM(ans) = y;
                                } else if (iy >= 0x7fff0000) {
```



```
                                        LD_RE(ans) = x;
                                        LD_IM(ans) = x - y;
                                } else {
                                        LD_RE(ans) = C * x;
                                        LD_IM(ans) = S * x;
                                }
                        } else {
                                t = __k_cexpl(x, &n);
                                                /* return exp(x)=t*2**n */
                                LD_RE(ans) = scalbnl(C * t, n - 1);
                                LD_IM(ans) = scalbnl(S * t, n - 1);
                        }
                } else {
                        t = expl(x) * half;
                        LD_RE(ans) = C * t;
                        LD_IM(ans) = S * t;
                }
        } else {
                if (x == zero) {        /* x = 0, return (C,0) */
                        LD_RE(ans) = C;
                        LD_IM(ans) = zero;
                } else {
                        LD_RE(ans) = C * coshl(x);
                        LD_IM(ans) = S * sinhl(x);
                }
        }
        if ((hx ^ hy) < 0)
                LD_IM(ans) = -LD_IM(ans);
        return (ans);
}
```

```
**********************************************************
    1210 Sat May 10 12:09:19 2014
new/usr/src/lib/libm/common/complex/ccosl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak ccosl = __ccosl

#include "libm.h"
#include "complex_wrapper.h"

ldcomplex
ccosl(ldcomplex z) {
        long double x, y;

        x = LD_RE(z);
        y = LD_IM(z);
        LD_RE(z) = y;
        LD_IM(z) = -x;
        return (ccoshl(z));
}
```

```
**********************************************************
    3080 Sat May 10 12:09:19 2014
new/usr/src/lib/libm/common/complex/cexp.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak cexp = __cexp

/* INDENT OFF */
/*
 * dcomplex cexp(dcomplex z);
 *
 *  x+iy    x
 * e     = e  (cos(y)+i*sin(y))
 *
 * Over/underflow issue
 * --------------------
 * exp(x) may be huge but cos(y) or sin(y) may be tiny. So we use
 * function __k_cexp(x,&n) to return exp(x) = __k_cexp(x,&n)*2**n.
 * Thus if exp(x+iy) = A + Bi and t = __k_cexp(x,&n), then
 *         A = t*cos(y)*2**n,   B = t*sin(y)*2**n
 *
 * Purge off all exceptional arguments:
 *      (x,0) --> (exp(x),0)         for all x, include inf and NaN
 *      (+inf, y) --> (+inf, NaN)    for inf, nan
 *      (-inf, y) --> (+-0, +-0)     for y = inf, nan
 *      (x,+-inf/NaN) --> (NaN,NaN)  for finite x
 * For all other cases, return
 *      (x,y) --> exp(x)*cos(y)+i*exp(x)*sin(y))
 *
 * Algorithm for out of range x and finite y
 *      1. compute exp(x) in factor form (t=__k_cexp(x,&n))*2**n
 *      2. compute sincos(y,&s,&c)
 *      3. compute t*s+i*(t*c), then scale back to 2**n and return.
 */
/* INDENT ON */

#include "libm.h"               /* exp/scalbn/sincos/__k_cexp */
```



```
#include "complex_wrapper.h"

static const double zero = 0.0;

dcomplex
cexp(dcomplex z) {
        dcomplex ans;
        double x, y, t, c, s;
        int n, ix, iy, hx, hy, lx, ly;

        x = D_RE(z);
        y = D_IM(z);
        hx = HI_WORD(x);
        lx = LO_WORD(x);
        hy = HI_WORD(y);
        ly = LO_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        if ((iy | ly) == 0) {   /* y = 0 */
                D_RE(ans) = exp(x);
                D_IM(ans) = y;
        } else if (ISINF(ix, lx)) {     /* x is +-inf */
                if (hx < 0) {
                        if (iy >= 0x7ff00000) {
                                D_RE(ans) = zero;
                                D_IM(ans) = zero;
                        } else {
                                sincos(y, &s, &c);
                                D_RE(ans) = zero * c;
                                D_IM(ans) = zero * s;
                        }
                } else {
                        if (iy >= 0x7ff00000) {
                                D_RE(ans) = x;
                                D_IM(ans) = y - y;
                        } else {
                                (void) sincos(y, &s, &c);
                                D_RE(ans) = x * c;
                                D_IM(ans) = x * s;
                        }
                }
        } else {
                (void) sincos(y, &s, &c);
                if (ix >= 0x40862E42) { /* |x| > 709.78... ~ log(2**1024) */
                        t = __k_cexp(x, &n);
                        D_RE(ans) = scalbn(t * c, n);
                        D_IM(ans) = scalbn(t * s, n);
                } else {
                        t = exp(x);
                        D_RE(ans) = t * c;
                        D_IM(ans) = t * s;
                }
        }
        return (ans);
}
```

```
**********************************************************
    2356 Sat May 10 12:09:20 2014
new/usr/src/lib/libm/common/complex/cexpf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak cexpf = __cexpf

#include "libm.h"
#include "complex_wrapper.h"

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const float zero = 0.0F;

fcomplex
cexpf(fcomplex z) {
        fcomplex        ans;
        float           x, y, c, s;
        double          t;
        int             n, ix, iy, hx, hy;

        x = F_RE(z);
        y = F_IM(z);
        hx = THE_WORD(x);
        hy = THE_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        if (iy == 0) {          /* y = 0 */
                F_RE(ans) = expf(x);
                F_IM(ans) = y;
        } else if (ix == 0x7f800000) {  /* x is +-inf */
                if (hx < 0) {
                        if (iy >= 0x7f800000) {
                                F_RE(ans) = zero;
                                F_IM(ans) = zero;
                        } else {
```



```
                                sincosf(y, &s, &c);
                                F_RE(ans) = zero * c;
                                F_IM(ans) = zero * s;
                        }
                } else {
                        if (iy >= 0x7f800000) {
                                F_RE(ans) = x;
                                F_IM(ans) = y - y;
                        } else {
                                sincosf(y, &s, &c);
                                F_RE(ans) = x * c;
                                F_IM(ans) = x * s;
                        }
                }
        } else {
                sincosf(y, &s, &c);
                if (ix >= 0x42B171AA) { /* |x| > 88.722... ~ log(2**128) */
#if defined(__i386) && !defined(__amd64)
                        int     rp = __swapRP(fp_extended);
#endif
                        t = __k_cexp(x, &n);
                        F_RE(ans) = (float)scalbn(t * (double)c, n);
                        F_IM(ans) = (float)scalbn(t * (double)s, n);
#if defined(__i386) && !defined(__amd64)
                        if (rp != fp_extended)
                                (void) __swapRP(rp);
#endif
                } else {
                        t = expf(x);
                        F_RE(ans) = t * c;
                        F_IM(ans) = t * s;
                }
        }
        return (ans);
}
```

```
**********************************************************
    2248 Sat May 10 12:09:20 2014
new/usr/src/lib/libm/common/complex/cexpl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#pragma weak cexpl = __cexpl

#include "libm.h"               /* expl/isinfl/iszerol/scalbnl/sincosl */
#include "complex_wrapper.h"

extern int isinfl(long double);
extern int iszerol(long double);

/* INDENT OFF */
static const long double zero = 0.0L;
/* INDENT ON */

ldcomplex
cexpl(ldcomplex z) {
        ldcomplex ans;
        long double x, y, t, c, s;
        int n, ix, iy, hx, hy;

        x = LD_RE(z);
        y = LD_IM(z);
        hx = HI_XWORD(x);
        hy = HI_XWORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        if (iszerol(y)) {       /* y = 0 */
                LD_RE(ans) = expl(x);
                LD_IM(ans) = y;
        } else if (isinfl(x)) { /* x is +-inf */
                if (hx < 0) {
                        if (iy >= 0x7fff0000) {
                                LD_RE(ans) = zero;
                                LD_IM(ans) = zero;
```



```
                        } else {
                                sincosl(y, &s, &c);
                                LD_RE(ans) = zero * c;
                                LD_IM(ans) = zero * s;
                        }
                } else {
                        if (iy >= 0x7fff0000) {
                                LD_RE(ans) = x;
                                LD_IM(ans) = y - y;
                        } else {
                                (void) sincosl(y, &s, &c);
                                LD_RE(ans) = x * c;
                                LD_IM(ans) = x * s;
                        }
                }
        } else {
                (void) sincosl(y, &s, &c);
                if (ix >= 0x400C62E4) { /* |x| > 11356.52... ~ log(2**16384) */
                        t = __k_cexpl(x, &n);
                        LD_RE(ans) = scalbnl(t * c, n);
                        LD_IM(ans) = scalbnl(t * s, n);
                } else {
                        t = expl(x);
                        LD_RE(ans) = t * c;
                        LD_IM(ans) = t * s;
                }
        }
        return (ans);
}
```

****
1123 Sat May 10 12:09:20 2014
new/usr/src/lib/libm/common/complex/cimag.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#pragma weak cimag = __cimag

#include "libm.h"
#include "complex_wrapper.h"

double
cimag(dcomplex z) {
        return (D_IM(z));
}
```

```
**********************************************************
    1125 Sat May 10 12:09:20 2014
new/usr/src/lib/libm/common/complex/cimagf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#pragma weak cimagf = __cimagf

#include "libm.h"
#include "complex_wrapper.h"

float
cimagf(fcomplex z) {
        return (F_IM(z));
}
```

```
**********************************************************
    1133 Sat May 10 12:09:20 2014
new/usr/src/lib/libm/common/complex/cimagl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak cimagl = __cimagl

#include "libm.h"
#include "complex_wrapper.h"

long double
cimagl(ldcomplex z) {
        return (LD_IM(z));
}
```

```
**********************************************************
    3801 Sat May 10 12:09:20 2014
new/usr/src/lib/libm/common/complex/clog.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak clog = __clog

/* INDENT OFF */
/*
 * dcomplex clog(dcomplex z);
 *
 *                      _________
 *                    / 2    2          -1   y
 * log(x+iy) = log(\/ x  + y    ) + i tan   (---)
 *                                        x
 *
 *              1       2    2         -1   y
 *           = --- log(x  + y ) + i tan   (---)
 *              2                       x
 *
 * Note that the arctangent ranges from -PI to +PI, thus the imaginary
 * part of clog is atan2(y,x).
 *
 * EXCEPTION CASES (conform to ISO/IEC 9899:1999(E)):
 *    clog(-0 + i 0   ) =  -inf + i pi
 *    clog( 0 + i 0   ) =  -inf + i 0
 *    clog( x + i inf ) =  -inf + i pi/2, for finite x
 *    clog( x + i NaN ) =  NaN  + i NaN with invalid for finite x
 *    clog(-inf + iy   )=  +inf + i pi, for finite positive-signed y
 *    clog(+inf + iy   )=  +inf + i 0 , for finite positive-signed y
 *    clog(-inf + i inf)=  inf  + i 3pi/4
 *    clog(+inf + i inf)=  inf  + i pi/4
 *    clog(+-inf+ i NaN)=  inf  + i NaN
 *    clog(NaN  + i y  )=  NaN  + i NaN for finite y
 *    clog(NaN  + i inf)=  inf  + i NaN
 *    clog(NaN  + i NaN)=  NaN  + i NaN
 */
/* INDENT ON */
```



```
#include "libm_synonyms.h"
#include <math.h>               /* atan2/fabs/log/log1p */
#include "complex_wrapper.h"
#include "libm_protos.h"        /* __k_clog_r */


static const double half = 0.5, one = 1.0;

dcomplex
clog(dcomplex z) {
        dcomplex        ans;
        double          x, y, t, ax, ay, w;
        int             n, ix, iy, hx, hy;
        unsigned        lx, ly;

        x = D_RE(z);
        y = D_IM(z);
        hx = HI_WORD(x);
        lx = LO_WORD(x);
        hy = HI_WORD(y);
        ly = LO_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        ay = fabs(y);
        ax = fabs(x);
        D_IM(ans) = carg(z);
        if (ix < iy || (ix == iy && lx < ly)) {
                /* swap x and y to force ax >= ay */
                t = ax;
                ax = ay;
                ay = t;
                n = ix, ix = iy;
                iy = n;
                n = lx, lx = ly;
                ly = n;
        }
        n = (ix - iy) >> 20;
        if (ix >= 0x7ff00000) { /* x or y is Inf or NaN */
                if (ISINF(ix, lx))
                        D_RE(ans) = ax;
                else if (ISINF(iy, ly))
                        D_RE(ans) = ay;
                else
                        D_RE(ans) = ax * ay;
        } else if ((iy | ly) == 0) {
                D_RE(ans) = ((ix | lx) == 0)? -one / ax : log(ax);
        } else if (((0x7fffffff - ix) ^ (ix - 0x3fe00000)) >= 0) {
                /* 0.5 <= x < 2 */
                if (ix >= 0x3ff00000) {
                        if (((ix - 0x3ff00000) | lx) == 0)
                                D_RE(ans) = half * log1p(ay * ay);
                        else if (n >= 60)
                                D_RE(ans) = log(ax);
                        else
                                D_RE(ans) = half * (log1p(ay * ay + (ax -
                                    one) * (ax + one)));
                } else if (n >= 60) {
                        D_RE(ans) = log(ax);
                } else {
                        D_RE(ans) = __k_clog_r(ax, ay, &w);
                }
        } else if (n >= 30) {
                D_RE(ans) = log(ax);
        } else if (ix < 0x5f300000 && iy >= 0x20b00000) {
                /* 2**-500< y < x < 2**500 */
```

```
128                 D_RE(ans) = half * log(ax * ax + ay * ay);
129         } else {
130                 t = ay / ax;
131                 D_RE(ans) = log(ax) + half * log1p(t * t);
132         }
133         return (ans);
134 }
```

```
**********************************************************
    2129 Sat May 10 12:09:20 2014
new/usr/src/lib/libm/common/complex/clogf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak clogf = __clogf

#include "libm.h"
#include "complex_wrapper.h"

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

fcomplex
clogf(fcomplex z) {
        fcomplex        ans;
        float           x, y, ax, ay;
        double          dx, dy;
        int             ix, iy, hx, hy;

        x = F_RE(z);
        y = F_IM(z);
        hx = THE_WORD(x);
        hy = THE_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        ay = fabsf(y);
        ax = fabsf(x);
        F_IM(ans) = atan2f(y, x);
        if (ix >= 0x7f800000 || iy >= 0x7f800000) {
                /* x or y is Inf or NaN */
                if (iy == 0x7f800000)
                        F_RE(ans) = ay;
                else if (ix == 0x7f800000)
                        F_RE(ans) = ax;
                else
                        F_RE(ans) = ax + ay;
```



```
        } else {
#if defined(__i386) && !defined(__amd64)
                int     rp = __swapRP(fp_extended);
#endif
                dx = (double)ax;
                dy = (double)ay;
                if (ix == 0x3f800000)
                        F_RE(ans) = (float)(0.5 * log1p(dy * dy));
                else if (iy == 0x3f800000)
                        F_RE(ans) = (float)(0.5 * log1p(dx * dx));
                else if ((ix | iy) == 0)
                        F_RE(ans) = -1.0f / ax;
                else
                        F_RE(ans) = (float)(0.5 * log(dx * dx + dy * dy));
#if defined(__i386) && !defined(__amd64)
                if (rp != fp_extended)
                        (void) __swapRP(rp);
#endif
        }
        return (ans);
}
```

```
**********************************************************
    2709 Sat May 10 12:09:20 2014
new/usr/src/lib/libm/common/complex/clogl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak clogl = __clogl

#include "libm.h"       /* atan2l/fabsl/isinfl/log1pl/logl/__k_clog_rl */
#include "complex_wrapper.h"
#include "longdouble.h"

#if defined(__sparc)
#define SIGP7   120
#define HSIGP7  60
#elif defined(__x86)
#define SIGP7   70
#define HSIGP7  35
#endif

/* INDENT OFF */
static const long double zero = 0.0L, half = 0.5L, one = 1.0L;
/* INDENT ON */

ldcomplex
clogl(ldcomplex z) {
        ldcomplex ans;
        long double x, y, t, ax, ay;
        int n, ix, iy, hx, hy;

        x = LD_RE(z);
        y = LD_IM(z);
        hx = HI_XWORD(x);
        hy = HI_XWORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        ay = fabsl(y);
        ax = fabsl(x);
```



```
        LD_IM(ans) = atan2l(y, x);
        if (ix < iy || (ix == iy && ix < 0x7fff0000 && ax < ay)) {
                /* swap x and y to force ax>=ay */
                t = ax;
                ax = ay;
                ay = t;
                n = ix, ix = iy;
                iy = n;
        }
        n = (ix - iy) >> 16;
        if (ix >= 0x7fff0000) { /* x or y is Inf or NaN */
                if (isinfl(ax))
                        LD_RE(ans) = ax;
                else if (isinfl(ay))
                        LD_RE(ans) = ay;
                else
                        LD_RE(ans) = ax + ay;
        } else if (ay == zero)
                LD_RE(ans) = logl(ax);
        else if (((0x3fffffff - ix) ^ (ix - 0x3ffe0000)) >= 0) {
                                                        /* 0.5 <= x < 2 */
                if (ix >= 0x3fff0000) {
                        if (ax == one)
                                LD_RE(ans) = half * log1pl(ay * ay);
                        else if (n >= SIGP7)
                                LD_RE(ans) = logl(ax);
                        else
                                LD_RE(ans) = half * (log1pl(ay * ay + (ax -
                                        one) * (ax + one)));
                } else if (n >= SIGP7)
                        LD_RE(ans) = logl(ax);
                else
                        LD_RE(ans) = __k_clog_rl(x, y, &t);
        } else if (n >= HSIGP7)
                LD_RE(ans) = logl(ax);
        else if (ix < 0x5f3f0000 && iy >= 0x20bf0000)
                /* 2**-8000 < y < x < 2**8000 */
                LD_RE(ans) = half * logl(ax * ax + ay * ay);
        else {
                t = ay / ax;
                LD_RE(ans) = logl(ax) + half * log1pl(t * t);
        }
        return (ans);
}
```

```
**********************************************************
    2720 Sat May 10 12:09:21 2014
new/usr/src/lib/libm/common/complex/complex_wrapper.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#ifndef _COMPLEX_WRAPPER_H
#define _COMPLEX_WRAPPER_H

#pragma ident   "@(#)complex_wrapper.h  1.7     06/01/31 SMI"

#if defined(__GNUC__)
#define dcomplex double _Complex
#define fcomplex float _Complex
#define ldcomplex long double _Complex
#define D_RE(x) __real__ x
#define D_IM(x) __imag__ x
#define F_RE(x) __real__ x
#define F_IM(x) __imag__ x
#define LD_RE(x) __real__ x
#define LD_IM(x) __imag__ x

#include <complex.h>
#else

#define dcomplex        double complex
#define fcomplex        float complex
#define ldcomplex       long double complex
#define _X_RE(__t, __z) ((__t *) &__z)[0]
#define _X_IM(__t, __z) ((__t *) &__z)[1]
#define D_RE(__z)       _X_RE(double, __z)
#define D_IM(__z)       _X_IM(double, __z)
#define F_RE(__z)       _X_RE(float, __z)
#define F_IM(__z)       _X_IM(float, __z)
#define LD_RE(__z)      _X_RE(long double, __z)
#define LD_IM(__z)      _X_IM(long double, __z)

#include <complex.h>
```



```
#endif

#if defined(__sparc)
#define HIWORD  0
#define LOWORD  1
#define HI_XWORD(x)     ((unsigned *) &x)[0]
#define XFSCALE(x, n)   ((unsigned *) &x)[0] += n << 16 /* signbitl(x) == 0 */
#define CHOPPED(x)      ((long double) ((double) (x)))
#elif defined(__x86)
#define HIWORD  1
#define LOWORD  0
#define HI_XWORD(x)     ((((int *) &x)[2] << 16) | \
                        (0xffff & ((unsigned *) &x)[1] >> 15))
#define XFSCALE(x, n)   ((unsigned short *) &x)[4] += n /* signbitl(x) == 0 */
#define CHOPPED(x)      ((long double) ((float) (x)))
#else
#error Unknown architecture
#endif
#define HI_WORD(x)      ((int *) &x)[HIWORD]    /* for double */
#define LO_WORD(x)      ((int *) &x)[LOWORD]    /* for double */
#define THE_WORD(x)     ((int *) &x)[0]         /* for float */

/*
 * iy:ly must have the sign bit already cleared
 */
#define ISINF(iy, ly)   (((iy - 0x7ff00000) | ly) == 0)

#endif  /* _COMPLEX_WRAPPER_H */
```

```
**********************************************************
    1137 Sat May 10 12:09:21 2014
new/usr/src/lib/libm/common/complex/conj.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak conj = __conj

#include "libm.h"
#include "complex_wrapper.h"

dcomplex
conj(dcomplex z) {
        D_IM(z) = -D_IM(z);
        return (z);
}
```

```
**********************************************************
    1140 Sat May 10 12:09:21 2014
new/usr/src/lib/libm/common/complex/conjf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak conjf = __conjf

#include "libm.h"
#include "complex_wrapper.h"

fcomplex
conjf(fcomplex z) {
        F_IM(z) = -F_IM(z);
        return (z);
}
```

****
1144 Sat May 10 12:09:21 2014
new/usr/src/lib/libm/common/complex/conjl.c
patch01 - 693 import Sun Devpro Math Library
****

```
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#pragma weak conjl = __conjl

#include "libm.h"
#include "complex_wrapper.h"

ldcomplex
conjl(ldcomplex z) {
        LD_IM(z) = -LD_IM(z);
        return (z);
}
```

```
**********************************************************
    9501 Sat May 10 12:09:21 2014
new/usr/src/lib/libm/common/complex/cpow.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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#pragma weak cpow = __cpow

/* INDENT OFF */
/*
 * dcomplex cpow(dcomplex z);
 *
 * z**w analytically equivalent to
 *
 * cpow(z,w) = cexp(w clog(z))
 *
 * Let z = x+iy, w = u+iv.
 * Since
 *                                  _________
 *                                 / 2    2          -1   y
 *     log(x+iy) = log(\/ x  + y    ) + i tan   (---)
 *                                              x
 *
 *                    1       2    2         -1   y
 *                = --- log(x  + y ) + i tan   (---)
 *                    2                      x
 *                         u       2    2         -1  y
 * (u+iv)* log(x+iy) =  --- log(x  + y ) - v tan  (---)  +          (1)
 *                         2                      x
 *
 *                               v       2    2         -1  y
 *                        i * [ --- log(x  + y ) + u tan  (---) ]      (2)
 *                               2                      x
 *
 *                    = r + i q
 *
 * Therefore,
```



```
 *      w     r+iq    r
 *     z  =  e     = e  (cos(q)+i*sin(q))
 *                                  _____
 *                                 / 2   2
 *       r                        \/ x + y     -v*atan2(y,x)
 * Here e  can be expressed as:  u          * e
 *
 * Special cases (in the order of appearance):
 *      1.  (anything) ** 0  is 1
 *      2.  (anything) ** 1  is itself
 *      3.  When v = 0, y = 0:
 *            If x is finite and negative, and u is finite, then
 *               x ** u = exp(u*pi i) * pow(|x|, u);
 *            otherwise,
 *               x ** u = pow(x, u);
 *      4.  When v = 0, x = 0 or |x| = |y| or x is inf or y is inf:
 *               (x + y i) ** u = r * exp(q i)
 *           where
 *               r = hypot(x,y) ** u
 *               q = u * atan2pi(y, x)
 *
 *      5.  otherwise, z**w is NAN if any x, y, u, v is a Nan or inf
 *
 *      Note: many results of special cases are obtained in terms of
 *      polar coordinate. In the conversion from polar to rectangle:
 *                   r exp(q i) = r * cos(q) + r * sin(q) i,
 *      we regard r * 0 is 0 except when r is a NaN.
 */
/* INDENT ON */

#include "libm.h"       /* atan2/exp/fabs/hypot/log/pow/scalbn */
                        /* atan2pi/exp2/sincos/sincospi/__k_clog_r/__k_atan2 */
#include "complex_wrapper.h"

extern void sincospi(double, double *, double *);

static const double
        huge = 1e300,
        tiny = 1e-300,
        invln2 = 1.44269504088896338700e+00,
        ln2hi = 6.93147180369123816490e-01,   /* 0x3fe62e42, 0xfee00000 */
        ln2lo = 1.90821492927058770002e-10,   /* 0x3dea39ef, 0x35793c76 */
        one = 1.0,
        zero = 0.0;

static const int hiinf = 0x7ff00000;
extern double atan2pi(double, double);

/*
 * Assuming |t[0]| > |t[1]| and |t[2]| > |t[3]|, sum4fp subroutine
 * compute t[0] + t[1] + t[2] + t[3] into two double fp numbers.
 */
static double
sum4fp(double ta[], double *w) {
        double t1, t2, t3, t4, w1, w2, t;
        t1 = ta[0]; t2 = ta[1]; t3 = ta[2]; t4 = ta[3];
        /*
         * Rearrange ti so that |t1| >= |t2| >= |t3| >= |t4|
         */
        if (fabs(t4) > fabs(t1)) {
                t = t1; t1 = t3; t3 = t;
                t = t2; t2 = t4; t4 = t;
        } else if (fabs(t3) > fabs(t1)) {
                t = t1; t1 = t3;
                if (fabs(t4) > fabs(t2)) {
                        t3 = t4; t4 = t2; t2 = t;
```

```
127                 } else {
128                         t3 = t2; t2 = t;
129                 }
130         } else if (fabs(t3) > fabs(t2)) {
131                 t = t2; t2 = t3;
132                 if (fabs(t4) > fabs(t2)) {
133                         t3 = t4; t4 = t;
134                 } else
135                         t3 = t;
136         }
137         /* summing r = t1 + t2 + t3 + t4 to w1 + w2 */
138         w1 = t3 + t4;
139         w2 = t4 - (w1 - t3);
140         t  = t2 + w1;
141         w2 += w1 - (t - t2);
142         w1 = t + w2;
143         w2 += t - w1;
144         t  = t1 + w1;
145         w2 += w1 - (t - t1);
146         w1 = t + w2;
147         *w = w2 - (w1 - t);
148         return (w1);
149 }

151 dcomplex
152 cpow(dcomplex z, dcomplex w) {
153         dcomplex ans;
154         double x, y, u, v, t, c, s, r, x2, y2;
155         double b[4], t1, t2, t3, t4, w1, w2, u1, v1, x1, y1;
156         int ix, iy, hx, lx, hy, ly, hv, hu, iu, iv, lu, lv;
157         int i, j, k;

159         x = D_RE(z);
160         y = D_IM(z);
161         u = D_RE(w);
162         v = D_IM(w);
163         hx = ((int *) &x)[HIWORD];
164         lx = ((int *) &x)[LOWORD];
165         hy = ((int *) &y)[HIWORD];
166         ly = ((int *) &y)[LOWORD];
167         hu = ((int *) &u)[HIWORD];
168         lu = ((int *) &u)[LOWORD];
169         hv = ((int *) &v)[HIWORD];
170         lv = ((int *) &v)[LOWORD];
171         ix = hx & 0x7fffffff;
172         iy = hy & 0x7fffffff;
173         iu = hu & 0x7fffffff;
174         iv = hv & 0x7fffffff;

176         j = 0;
177         if ((iv | lv) == 0) {   /* z**(real) */
178                 if (((hu - 0x3ff00000) | lu) == 0) {    /* z ** 1 = z */
179                         D_RE(ans) = x;
180                         D_IM(ans) = y;
181                 } else if ((iu | lu) == 0) {    /* z ** 0 = 1 */
182                         D_RE(ans) = one;
183                         D_IM(ans) = zero;
184                 } else if ((iy | ly) == 0) {    /* (real)**(real) */
185                         D_IM(ans) = zero;
186                         if (hx < 0 && ix < hiinf && iu < hiinf) {
187                                 /* -x ** u  is exp(i*pi*u)*pow(x,u) */
188                                 r = pow(-x, u);
189                                 sincospi(u, &s, &c);
190                                 D_RE(ans) = (c == zero)? c: c * r;
191                                 D_IM(ans) = (s == zero)? s: s * r;
192                         } else
```



```
193                                 D_RE(ans) = pow(x, u);
194                 } else if (((ix | lx) == 0) || ix >= hiinf || iy >= hiinf) {
195                         if (isnan(x) || isnan(y) || isnan(u))
196                                 D_RE(ans) = D_IM(ans) = x + y + u;
197                         else {
198                                 if ((ix | lx) == 0)
199                                         r = fabs(y);
200                                 else
201                                         r = fabs(x) + fabs(y);
202                                 t = atan2pi(y, x);
203                                 sincospi(t * u, &s, &c);
204                                 D_RE(ans) = (c == zero)? c: c * r;
205                                 D_IM(ans) = (s == zero)? s: s * r;
206                         }
207                 } else if (((ix - iy) | (lx - ly)) == 0) {   /* |x| = |y| */
208                         if (hx >= 0) {
209                                 t = (hy >= 0)? 0.25 : -0.25;
210                                 sincospi(t * u, &s, &c);
211                         } else if ((lu & 3) == 0) {
212                                 t = (hy >= 0)? 0.75 : -0.75;
213                                 sincospi(t * u, &s, &c);
214                         } else {
215                                 r = (hy >= 0)? u : -u;
216                                 t = -0.25 * r;
217                                 w1 = r + t;
218                                 w2 = t - (w1 - r);
219                                 sincospi(w1, &t1, &t2);
220                                 sincospi(w2, &t3, &t4);
221                                 s = t1 * t4 + t3 * t2;
222                                 c = t2 * t4 - t1 * t3;
223                         }
224                         if (ix < 0x3fe00000)    /* |x| < 1/2 */
225                                 r = pow(fabs(x + x), u) * exp2(-0.5 * u);
226                         else if (ix >= 0x3ff00000 || iu < 0x408ff800)
227                                 /* |x| >= 1 or |u| < 1023 */
228                                 r = pow(fabs(x), u) * exp2(0.5 * u);
229                         else   /* special treatment */
230                                 j = 2;
231                         if (j == 0) {
232                                 D_RE(ans) = (c == zero)? c: c * r;
233                                 D_IM(ans) = (s == zero)? s: s * r;
234                         }
235                 } else
236                         j = 1;
237                 if (j == 0)
238                         return (ans);
239         }
240         if (iu >= hiinf || iv >= hiinf || ix >= hiinf || iy >= hiinf) {
241                 /*
242                  * non-zero imag part(s) with inf component(s) yields NaN
243                  */
244                 t = fabs(x) + fabs(y) + fabs(u) + fabs(v);
245                 D_RE(ans) = D_IM(ans) = t - t;
246         } else {
247                 k = 0;  /* no scaling */
248                 if (iu > 0x7f000000 || iv > 0x7f000000) {
249                         u *= .0009765625; /* scale 2**-10 to avoid overflow */
250                         v *= .0009765625;
251                         k = 1;  /* scale by 2**-10 */
252                 }
253                 /*
254                  * Use similated higher precision arithmetic to compute:
255                  * r = u * log(hypot(x, y)) - v * atan2(y, x)
256                  * q = u * atan2(y, x) + v * log(hypot(x, y))
257                  */
258                 t1 = __k_clog_r(x, y, &t2);
```

```
259                 t3 = __k_atan2(y, x, &t4);
260                 x1 = t1;
261                 y1 = t3;
262                 u1 = u;
263                 v1 = v;
264                 ((int *) &u1)[LOWORD] &= 0xf8000000;
265                 ((int *) &v1)[LOWORD] &= 0xf8000000;
266                 ((int *) &x1)[LOWORD] &= 0xf8000000;
267                 ((int *) &y1)[LOWORD] &= 0xf8000000;
268                 x2 = t2 - (x1 - t1);    /* log(hypot(x,y)) = x1 + x2 */
269                 y2 = t4 - (y1 - t3);    /* atan2(y,x) = y1 + y2 */
270                 /* compute q = u * atan2(y, x) + v * log(hypot(x, y)) */
271                 if (j != 2) {
272                         b[0] = u1 * y1;
273                         b[1] = (u - u1) * y1 + u * y2;
274                         if (j == 1) {   /* v = 0 */
275                                 w1 = b[0] + b[1];
276                                 w2 = b[1] - (w1 - b[0]);
277                         } else {
278                                 b[2] = v1 * x1;
279                                 b[3] = (v - v1) * x1 + v * x2;
280                                 w1 = sum4fp(b, &w2);
281                         }
282                         sincos(w1, &t1, &t2);
283                         sincos(w2, &t3, &t4);
284                         s = t1 * t4 + t3 * t2;
285                         c = t2 * t4 - t1 * t3;
286                         if (k == 1)
287                         /*
288                          * square (cos(q) + i sin(q)) k times to get
289                          * (cos(2^k * q + i sin(2^k * q)
290                          */
291                                 for (i = 0; i < 10; i++) {
292                                         t1 = s * c;
293                                         c = (c + s) * (c - s);
294                                         s = t1 + t1;
295                                 }
296                 }
297                 /* compute r = u * (t1, t2) - v * (t3, t4) */
298                 b[0] = u1 * x1;
299                 b[1] = (u - u1) * x1 + u * x2;
300                 if (j == 1) {   /* v = 0 */
301                         w1 = b[0] + b[1];
302                         w2 = b[1] - (w1 - b[0]);
303                 } else {
304                         b[2] = -v1 * y1;
305                         b[3] = (v1 - v) * y1 - v * y2;
306                         w1 = sum4fp(b, &w2);
307                 }
308                 /* check over/underflow for exp(w1 + w2) */
309                 if (k && fabs(w1) < 1000.0) {
310                         w1 *= 1024; w2 *= 1024; k = 0;
311                 }
312                 hx = ((int *) &w1)[HIWORD];
313                 lx = ((int *) &w1)[LOWORD];
314                 ix = hx & 0x7fffffff;
315                 /* compute exp(w1 + w2) */
316                 if (ix < 0x3c900000) /* exp(tiny < 2**-54) = 1 */
317                         r = one;
318                 else if (ix >= 0x40880000) /* overflow/underflow */
319                         r = (hx < 0)? tiny * tiny : huge * huge;
320                 else {  /* compute exp(w1 + w2) */
321                         k = (int) (invln2 * w1 + ((hx >= 0)? 0.5 : -0.5));
322                         t1 = (double) k;
323                         t2 = w1 - t1 * ln2hi;
324                         t3 = w2 - t1 * ln2lo;
```



```
325                         r = exp(t2 + t3);
326                 }
327                 if (c != zero) c *= r;
328                 if (s != zero) s *= r;
329                 if (k != 0) {
330                         c = scalbn(c, k);
331                         s = scalbn(s, k);
332                 }
333                 D_RE(ans) = c;
334                 D_IM(ans) = s;
335         }
336         return (ans);
337 }
```

```
**********************************************************
    4751 Sat May 10 12:09:21 2014
new/usr/src/lib/libm/common/complex/cpowf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak cpowf = __cpowf

#include "libm.h"
#include "complex_wrapper.h"

extern void sincospi(double, double *, double *);
extern void sincospif(float, float *, float *);
extern double atan2pi(double, double);
extern float atan2pif(float, float);

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const double
        dpi = 3.14159265358979311600E0,  /* Hex 2^ 1 * 1.921FB54442D18 */
        dhalf = 0.5,
        dsqrt2 = 1.41421356237309514547,        /* 3FF6A09E 667F3BCD */
        dinvpi = 0.31830988618379067153776752;

static const float one = 1.0F, zero = 0.0F;

#define hiinf   0x7f800000

fcomplex
cpowf(fcomplex z, fcomplex w) {
        fcomplex        ans;
        float           x, y, u, v, t, c, s;
        double          dx, dy, du, dv, dt, dc, ds, dp, dq, dr;
        int             ix, iy, hx, hy, hv, hu, iu, iv, j;

        x = F_RE(z);
        y = F_IM(z);
```



```
        u = F_RE(w);
        v = F_IM(w);
        hx = THE_WORD(x);
        hy = THE_WORD(y);
        hu = THE_WORD(u);
        hv = THE_WORD(v);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        iu = hu & 0x7fffffff;
        iv = hv & 0x7fffffff;

        j = 0;
        if (iv == 0) {          /* z**(real) */
                if (hu == 0x3f800000) { /* (anything) ** 1  is itself */
                        F_RE(ans) = x;
                        F_IM(ans) = y;
                } else if (iu == 0) {   /* (anything) ** 0  is 1 */
                        F_RE(ans) = one;
                        F_IM(ans) = zero;
                } else if (iy == 0) {   /* (real)**(real) */
                        F_IM(ans) = zero;
                        if (hx < 0 && ix < hiinf && iu < hiinf) {
                                /* -x ** u  is exp(i*pi*u)*pow(x,u) */
                                t = powf(-x, u);
                                sincospif(u, &s, &c);
                                F_RE(ans) = (c == zero)? c: c * t;
                                F_IM(ans) = (s == zero)? s: s * t;
                        } else {
                                F_RE(ans) = powf(x, u);
                        }
                } else if (ix == 0 || ix >= hiinf || iy >= hiinf) {
                        if (ix > hiinf || iy > hiinf || iu > hiinf) {
                                F_RE(ans) = F_IM(ans) = x + y + u;
                        } else {
                                v = fabsf(y);
                                if (ix != 0)
                                        v += fabsf(x);
                                t = atan2pif(y, x);
                                sincospif(t * u, &s, &c);
                                F_RE(ans) = (c == zero)? c: c * v;
                                F_IM(ans) = (s == zero)? s: s * v;
                        }
                } else if (ix == iy) {  /* if |x| == |y| */
#if defined(__i386) && !defined(__amd64)
                        int     rp = __swapRP(fp_extended);
#endif
                        dx = (double)x;
                        du = (double)u;
                        dt = (hx >= 0)? 0.25 : 0.75;
                        if (hy < 0)
                                dt = -dt;
                        dr = pow(dsqrt2 * dx, du);
                        sincospi(dt * du, &ds, &dc);
                        F_RE(ans) = (float)(dr * dc);
                        F_IM(ans) = (float)(dr * ds);
#if defined(__i386) && !defined(__amd64)
                        if (rp != fp_extended)
                                (void) __swapRP(rp);
#endif
                } else {
                        j = 1;
                }
                if (j == 0)
                        return (ans);
        }
        if (iu >= hiinf || iv >= hiinf || ix >= hiinf || iy >= hiinf) {
```

```
128                 /*
129                  * non-zero imaginery part(s) with inf component(s) yields NaN
130                  */
131                 t = fabsf(x) + fabsf(y) + fabsf(u) + fabsf(v);
132                 F_RE(ans) = F_IM(ans) = t - t;
133         } else {
134 #if defined(__i386) && !defined(__amd64)
135                 int     rp = __swapRP(fp_extended);
136 #endif
137                 /* INDENT OFF */
138                 /*
139                  * r = u*log(hypot(x,y))-v*atan2(y,x),
140                  * q = u*atan2(y,x)+v*log(hypot(x,y))
141                  * or
142                  * r = u*log(hypot(x,y))-v*pi*atan2pi(y,x),
143                  * q/pi = u*atan2pi(y,x)+v*log(hypot(x,y))/pi
144                  * ans = exp(r)*(cospi(q/pi)  + i sinpi(q/pi))
145                  */
146                 /* INDENT ON */
147                 dx = (double)x;
148                 dy = (double)y;
149                 du = (double)u;
150                 dv = (double)v;
151                 if (ix > 0x3f000000 && ix < 0x40000000) /* .5 < |x| < 2 */
152                         dt = dhalf * log1p((dx - 1.0) * (dx + 1.0) + dy * dy);
153                 else if (iy > 0x3f000000 && iy < 0x40000000) /* .5 < |y| < 2 */
154                         dt = dhalf * log1p((dy - 1.0) * (dy + 1.0) + dx * dx);
155                 else
156                         dt = dhalf * log(dx * dx + dy * dy);
157                 dp = atan2pi(dy, dx);
158                 if (iv == 0) {  /* dv = 0 */
159                         dr = exp(du * dt);
160                         dq = du * dp;
161                 } else {
162                         dr = exp(du * dt - dv * dp * dpi);
163                         dq = du * dp + dv * dt * dinvpi;
164                 }
165                 sincospi(dq, &ds, &dc);
166                 F_RE(ans) = (float)(dr * dc);
167                 F_IM(ans) = (float)(dr * ds);
168 #if defined(__i386) && !defined(__amd64)
169                 if (rp != fp_extended)
170                         (void) __swapRP(rp);
171 #endif
172         }
173         return (ans);
174 }
```

```
**********************************************************
    7658 Sat May 10 12:09:21 2014
new/usr/src/lib/libm/common/complex/cpowl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#pragma weak cpowl = __cpowl

#include "libm.h"                               /* __k_clog_rl/__k_atan2l */
/* atan2l/atan2pil/exp2l/expl/fabsl/hypotl/isinfl/logl/powl/sincosl/sincospil */
#include "complex_wrapper.h"
#include "longdouble.h"

#if defined(__sparc)
#define HALF(x)  ((int *) &x)[3] = 0; ((int *) &x)[2] &= 0xfe000000
#define LAST(x)  ((int *) &x)[3]
#elif defined(__x86)
#define HALF(x)  ((int *) &x)[0] = 0
#define LAST(x)  ((int *) &x)[0]
#endif

/* INDENT OFF */
static const int hiinf = 0x7fff0000;
static const long double
        tiny = 1.0e-4000L,
        huge = 1.0e4000L,
#if defined(__x86)
                /* 43 significant bits, 21 trailing zeros */
        ln2hil = 0.693147180559890330187045037746429443359375L,
        ln2lol = 5.4979230187083711747124716125134360255254120 68e-14L,
#else   /* sparc */
                /* 0x3FF962E4 2FEFA39E F35793C7 00000000 */
        ln2hil = 0.693147180559945309417231592858066493070671489074L,
        ln2lol = 5.2860011007500482864528623582064673010680244656615 3e-25L,
#endif
        invln2  = 1.442695040888963407359924681001892137427e+0000L,
        one = 1.0L,
        zero = 0.0L;
/* INDENT ON */

/*
 * Assuming |t[0]| > |t[1]| and |t[2]| > |t[3]|, sum4fpl subroutine
 * compute t[0] + t[1] + t[2] + t[3] into two long double fp numbers.
 */
static long double sum4fpl(long double ta[], long double *w)
{
        long double t1, t2, t3, t4, w1, w2, t;
        t1 = ta[0]; t2 = ta[1]; t3 = ta[2]; t4 = ta[3];
        /*
         * Rearrange ti so that |t1| >= |t2| >= |t3| >= |t4|
         */
        if (fabsl(t4) > fabsl(t1)) {
                t = t1; t1 = t3; t3 = t;
                t = t2; t2 = t4; t4 = t;
        } else if (fabsl(t3) > fabsl(t1)) {
                t = t1; t1 = t3;
                if (fabsl(t4) > fabsl(t2)) {
                        t3 = t4; t4 = t2; t2 = t;
                } else {
                        t3 = t2; t2 = t;
                }
        } else if (fabsl(t3) > fabsl(t2)) {
                t = t2; t2 = t3;
                if (fabsl(t4) > fabsl(t2)) {
                        t3 = t4; t4 = t;
                } else
                        t3 = t;
        }
        /* summing r = t1 + t2 + t3 + t4 to w1 + w2 */
        w1 = t3 + t4;
        w2 = t4 - (w1 - t3);
        t  = t2 + w1;
        w2 += w1 - (t - t2);
        w1 = t + w2;
        w2 += t - w1;
        t  = t1 + w1;
        w2 += w1 - (t - t1);
        w1 = t + w2;
        *w = w2 - (w1 - t);
        return (w1);
}

ldcomplex
cpowl(ldcomplex z, ldcomplex w) {
        ldcomplex ans;
        long double x, y, u, v, t, c, s, r;
        long double t1, t2, t3, t4, x1, x2, y1, y2, u1, v1, b[4], w1, w2;
        int ix, iy, hx, hy, hv, hu, iu, iv, i, j, k;

        x = LD_RE(z);
        y = LD_IM(z);
        u = LD_RE(w);
        v = LD_IM(w);
        hx = HI_XWORD(x);
        hy = HI_XWORD(y);
        hu = HI_XWORD(u);
        hv = HI_XWORD(v);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        iu = hu & 0x7fffffff;
        iv = hv & 0x7fffffff;

        j = 0;
```

```
127         if (v == zero) {        /* z**(real) */
128                 if (u == one) { /* (anything) ** 1  is itself */
129                         LD_RE(ans) = x;
130                         LD_IM(ans) = y;
131                 } else if (u == zero) { /* (anything) ** 0  is 1 */
132                         LD_RE(ans) = one;
133                         LD_IM(ans) = zero;
134                 } else if (y == zero) { /* real ** real */
135                         LD_IM(ans) = zero;
136                         if (hx < 0 && ix < hiinf && iu < hiinf) {
137                         /* -x ** u  is exp(i*pi*u)*pow(x,u) */
138                                 r = powl(-x, u);
139                                 sincospil(u, &s, &c);
140                                 LD_RE(ans) = (c == zero)? c: c * r;
141                                 LD_IM(ans) = (s == zero)? s: s * r;
142                         } else
143                                 LD_RE(ans) = powl(x, u);
144                 } else if (x == zero || ix >= hiinf || iy >= hiinf) {
145                         if (isnanl(x) || isnanl(y) || isnanl(u))
146                                 LD_RE(ans) = LD_IM(ans) = x + y + u;
147                         else {
148                                 if (x == zero)
149                                         r = fabsl(y);
150                                 else
151                                         r = fabsl(x) + fabsl(y);
152                                 t = atan2pil(y, x);
153                                 sincospil(t * u, &s, &c);
154                                 LD_RE(ans) = (c == zero)? c: c * r;
155                                 LD_IM(ans) = (s == zero)? s: s * r;
156                         }
157                 } else if (fabsl(x) == fabsl(y)) {    /* |x| = |y| */
158                         if (hx >= 0) {
159                                 t = (hy >= 0)? 0.25L : -0.25L;
160                                 sincospil(t * u, &s, &c);
161                         } else if ((LAST(u) & 3) == 0) {
162                                 t = (hy >= 0)? 0.75L : -0.75L;
163                                 sincospil(t * u, &s, &c);
164                         } else {
165                                 r = (hy >= 0)? u : -u;
166                                 t = -0.25L * r;
167                                 w1 = r + t;
168                                 w2 = t - (w1 - r);
169                                 sincospil(w1, &t1, &t2);
170                                 sincospil(w2, &t3, &t4);
171                                 s = t1 * t4 + t3 * t2;
172                                 c = t2 * t4 - t1 * t3;
173                         }
174                         if (ix < 0x3ffe0000)    /* |x| < 1/2 */
175                                 r = powl(fabsl(x + x), u) * exp2l(-0.5L * u);
176                         else if (ix >= 0x3fff0000 || iu < 0x400cfff8)
177                                 /* |x| >= 1 or |u| < 16383 */
178                                 r = powl(fabsl(x), u) * exp2l(0.5L * u);
179                         else   /* special treatment */
180                                 j = 2;
181                         if (j == 0) {
182                                 LD_RE(ans) = (c == zero)? c: c * r;
183                                 LD_IM(ans) = (s == zero)? s: s * r;
184                         }
185                 } else
186                         j = 1;
187                 if (j == 0)
188                         return (ans);
189         }
190         if (iu >= hiinf || iv >= hiinf || ix >= hiinf || iy >= hiinf) {
191                 /*
192                  * non-zero imag part(s) with inf component(s) yields NaN
```



```
193                  */
194                 t = fabsl(x) + fabsl(y) + fabsl(u) + fabsl(v);
195                 LD_RE(ans) = LD_IM(ans) = t - t;
196         } else {
197                 k = 0;  /* no scaling */
198                 if (iu > 0x7ffe0000 || iv > 0x7ffe0000) {
199                         u *= 1.52587890625000000000e-05L;
200                         v *= 1.52587890625000000000e-05L;
201                         k = 1;  /* scale u and v by 2**-16 */
202                 }
203                 /*
204                  * Use similated higher precision arithmetic to compute:
205                  * r = u * log(hypot(x, y)) - v * atan2(y, x)
206                  * q = u * atan2(y, x) + v * log(hypot(x, y))
207                  */

209                 t1 = __k_clog_rl(x, y, &t2);
210                 t3 = __k_atan2l(y, x, &t4);
211                 x1 = t1; HALF(x1);
212                 y1 = t3; HALF(y1);
213                 u1 = u; HALF(u1);
214                 v1 = v; HALF(v1);
215                 x2 = t2 - (x1 - t1);    /* log(hypot(x,y)) = x1 + x2 */
216                 y2 = t4 - (y1 - t3);    /* atan2(y,x) = y1 + y2 */
217                 /* compute q = u * atan2(y, x) + v * log(hypot(x, y)) */
218                 if (j != 2) {
219                         b[0] = u1 * y1;
220                         b[1] = (u - u1) * y1 + u * y2;
221                         if (j == 1) {   /* v = 0 */
222                                 w1 = b[0] + b[1];
223                                 w2 = b[1] - (w1 - b[0]);
224                         } else {
225                                 b[2] = v1 * x1;
226                                 b[3] = (v - v1) * x1 + v * x2;
227                                 w1 = sum4fpl(b, &w2);
228                         }
229                         sincosl(w1, &t1, &t2);
230                         sincosl(w2, &t3, &t4);
231                         s = t1 * t4 + t3 * t2;
232                         c = t2 * t4 - t1 * t3;
233                         if (k == 1)     /* square j times */
234                                 for (i = 0; i < 10; i++) {
235                                         t1 = s * c;
236                                         c = (c + s) * (c - s);
237                                         s = t1 + t1;
238                                 }
239                 }
240                 /* compute r = u * (t1, t2) - v * (t3, t4) */
241                 b[0] = u1 * x1;
242                 b[1] = (u - u1) * x1 + u * x2;
243                 if (j == 1) {   /* v = 0 */
244                         w1 = b[0] + b[1];
245                         w2 = b[1] - (w1 - b[0]);
246                 } else {
247                         b[2] = -v1 * y1;
248                         b[3] = (v1 - v) * y1 - v * y2;
249                         w1 = sum4fpl(b, &w2);
250                 }
251                 /* scale back unless w1 is large enough to cause exception */
252                 if (k != 0 && fabsl(w1) < 20000.0L) {
253                         w1 *= 65536.0L; w2 *= 65536.0L;
254                 }
255                 hx = HI_XWORD(w1);
256                 ix = hx & 0x7fffffff;
257                 /* compute exp(w1 + w2) */
258                 k = 0;
```

```
259                 if (ix < 0x3f8c0000) /* exp(tiny < 2**-115) = 1 */
260                         r = one;
261                 else if (ix >= 0x400c6760) /* overflow/underflow */
262                         r = (hx < 0)? tiny * tiny : huge * huge;
263                 else {  /* compute exp(w1 + w2) */
264                         k = (int) (invln2 * w1 + ((hx >= 0)? 0.5L : -0.5L));
265                         t1 = (long double) k;
266                         t2 = w1 - t1 * ln2hil;
267                         t3 = w2 - t1 * ln2lol;
268                         r = expl(t2 + t3);
269                 }
270                 if (c != zero) c *= r;
271                 if (s != zero) s *= r;
272                 if (k != 0) {
273                         c = scalbnl(c, k);
274                         s = scalbnl(s, k);
275                 }
276                 LD_RE(ans) = c;
277                 LD_IM(ans) = s;
278         }
279         return (ans);
280 }
```

```
**********************************************************
    1721 Sat May 10 12:09:21 2014
new/usr/src/lib/libm/common/complex/cproj.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak cproj = __cproj

/* INDENT OFF */
/*
 * dcomplex cproj(dcomplex z);
 *
 * If one of the component of z = (x,y) is an inf, then
 *      cproj(z) = (+inf, copysign(0,y));
 * otherwise,
 *      cproj(z) = z
 */
/* INDENT ON */

#include "libm.h"                       /* fabs */
#include "complex_wrapper.h"

static const double zero = 0.0;

dcomplex
cproj(dcomplex z) {
        double x, y;
        int ix, iy, hx, hy, lx, ly;

        x = D_RE(z);
        y = D_IM(z);
        hx = HI_WORD(x);
        lx = LO_WORD(x);
        hy = HI_WORD(y);
        ly = LO_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        if (ISINF(iy, ly)) {
```



```
                D_RE(z) = fabs(y);
                D_IM(z) = hy >= 0 ? zero : -zero;
        } else if (ISINF(ix, lx)) {
                D_RE(z) = fabs(x);
                D_IM(z) = hy >= 0 ? zero : -zero;
        }
        return (z);
}
```

```
**********************************************************
    1511 Sat May 10 12:09:21 2014
new/usr/src/lib/libm/common/complex/cprojf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak cprojf = __cprojf

#include "libm.h"
#include "complex_wrapper.h"

/* INDENT OFF */
static const float zero = 0.0F;
/* INDENT ON */

fcomplex
cprojf(fcomplex z) {
        float x, y;
        int ix, iy, hx, hy;

        x = F_RE(z);
        y = F_IM(z);
        hx = THE_WORD(x);
        hy = THE_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        if (iy == 0x7f800000) {
                F_RE(z) = fabsf(y);
                F_IM(z) = hy >= 0 ? zero : -zero;
        } else if (ix == 0x7f800000) {
                F_RE(z) = fabsf(x);
                F_IM(z) = hy >= 0 ? zero : -zero;
        }
        return (z);
}
```

```
**********************************************************
    1542 Sat May 10 12:09:22 2014
new/usr/src/lib/libm/common/complex/cprojl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak cprojl = __cprojl

#include "libm.h"               /* fabsl */
#include "complex_wrapper.h"
#include "longdouble.h"

/* INDENT OFF */
static const long double zero = 0.0L;
/* INDENT ON */

ldcomplex
cprojl(ldcomplex z) {
        long double x, y;
        int hy;

        x = LD_RE(z);
        y = LD_IM(z);
#if defined(__x86)
        hy = ((int *) &y)[2] << 16;
#else
        hy = ((int *) &y)[0];
#endif
        if (isinfl(y)) {
                LD_RE(z) = fabsl(y);
                LD_IM(z) = hy >= 0 ? zero : -zero;
        } else if (isinfl(x)) {
                LD_RE(z) = fabsl(x);
                LD_IM(z) = hy >= 0 ? zero : -zero;
        }
        return (z);
}
```

```
**********************************************************
    1123 Sat May 10 12:09:22 2014
new/usr/src/lib/libm/common/complex/creal.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak creal = __creal

#include "libm.h"
#include "complex_wrapper.h"

double
creal(dcomplex z) {
        return (D_RE(z));
}
```

****
1125 Sat May 10 12:09:22 2014
new/usr/src/lib/libm/common/complex/crealf.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#pragma weak crealf = __crealf

#include "libm.h"
#include "complex_wrapper.h"

float
crealf(fcomplex z) {
        return (F_RE(z));
}
```

```
**********************************************************
    1133 Sat May 10 12:09:22 2014
new/usr/src/lib/libm/common/complex/creall.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak creall = __creall

#include "libm.h"
#include "complex_wrapper.h"

long double
creall(ldcomplex z) {
        return (LD_RE(z));
}
```

```
**********************************************************
    1558 Sat May 10 12:09:22 2014
new/usr/src/lib/libm/common/complex/csin.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak csin = __csin

/* INDENT OFF */
/*
 * dcomplex csin(dcomplex z);
 *
 * If z = x+iy, then since csin(iz) = i*csinh(z),  we have
 *
 * csin(z)      = csin((-1)*(-z)) = csin(i*i*(-z))
 *              = i*csinh(i*(-z)) = i*csinh(i*(-x-yi))
 *              = i*csinh(y-ix)
 *              = -Im(csinh(y-ix))+i*Re(csinh(y-ix))
 */
/* INDENT ON */

#include "libm.h"
#include "complex_wrapper.h"

dcomplex
csin(dcomplex z) {
        double x, y;
        dcomplex ans, ct;

        x = D_RE(z);
        y = D_IM(z);
        D_RE(z) = y;
        D_IM(z) = -x;
        ct = csinh(z);
        D_RE(ans) = -D_IM(ct);
        D_IM(ans) = D_RE(ct);
        return (ans);
}
```

```
**********************************************************
    1275 Sat May 10 12:09:22 2014
new/usr/src/lib/libm/common/complex/csinf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak csinf = __csinf

#include "libm.h"
#include "complex_wrapper.h"

fcomplex
csinf(fcomplex z) {
        float x, y;
        fcomplex ans, ct;

        x = F_RE(z);
        y = F_IM(z);
        F_RE(z) = y;
        F_IM(z) = -x;
        ct = csinhf(z);
        F_RE(ans) = -F_IM(ct);
        F_IM(ans) = F_RE(ct);
        return (ans);
}
```

```
**********************************************************
    3923 Sat May 10 12:09:22 2014
new/usr/src/lib/libm/common/complex/csinh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak csinh = __csinh

/* INDENT OFF */
/*
 * dcomplex csinh(dcomplex z);
 *
 *             z      -z       x                    -x
 *            e   -  e       e  (cos(y)+i*sin(y)) - e  (cos(-y)+i*sin(-y))
 * sinh z = -------------- =  ----------------------------------------
 *                2                            2
 *                  x    -x                 x    -x
 *           cos(y) ( e  - e  )  + i*sin(y) (e  + e  )
 *       = ----------------------------------------
 *                           2
 *
 *       =  cos(y) sinh(x)  + i sin(y) cosh(x)
 *
 * Implementation Note
 * -------------------
 *
 *            |x|    -|x|   |x|        -2|x|       -2|x|    -P-4
 * Note that  e   +- e    = e   ( 1 +- e     ). If e      < 2     , where
 *
 * P stands for the number of significant bits of the machine precision,
 *                                    |x|
 * then the result will be rounded to e   . Therefore, we have
 *
 *                z
 *               e
 *     sinh z = -----  if |x| >= (P/2 + 2)*ln2
 *               2
 *
```



```
 * EXCEPTION (conform to ISO/IEC 9899:1999(E)):
 *      csinh(0,0)=(0,0)
 *      csinh(0,inf)=(+-0,NaN)
 *      csinh(0,NaN)=(+-0,NaN)
 *      csinh(x,inf) = (NaN,NaN) for finite positive x
 *      csinh(x,NaN) = (NaN,NaN) for finite non-zero x
 *      csinh(inf,0) = (inf, 0)
 *      csinh(inf,y) = (inf*cos(y),inf*sin(y)) for positive finite y
 *      csinh(inf,inf) = (+-inf,NaN)
 *      csinh(inf,NaN) = (+-inf,NaN)
 *      csinh(NaN,0) = (NaN,0)
 *      csinh(NaN,y) = (NaN,NaN) for non-zero y
 *      csinh(NaN,NaN) = (NaN,NaN)
 */
/* INDENT ON */

#include "libm.h"               /* cosh/exp/fabs/scalbn/sinh/sincos/__k_cexp */
#include "complex_wrapper.h"

dcomplex
csinh(dcomplex z) {
        double t, x, y, S, C;
        int hx, ix, lx, hy, iy, ly, n;
        dcomplex ans;

        x = D_RE(z);
        y = D_IM(z);
        hx = HI_WORD(x);
        lx = LO_WORD(x);
        ix = hx & 0x7fffffff;
        hy = HI_WORD(y);
        ly = LO_WORD(y);
        iy = hy & 0x7fffffff;
        x = fabs(x);
        y = fabs(y);

        (void) sincos(y, &S, &C);
        if (ix >= 0x403c0000) { /* |x| > 28 = prec/2 (14,28,34,60) */
                if (ix >= 0x40862E42) { /* |x| > 709.78... ~ log(2**1024) */
                        if (ix >= 0x7ff00000) { /* |x| is inf or NaN */
                                if ((iy | ly) == 0) {
                                        D_RE(ans) = x;
                                        D_IM(ans) = y;
                                } else if (iy >= 0x7ff00000) {
                                        D_RE(ans) = x;
                                        D_IM(ans) = x - y;
                                } else {
                                        D_RE(ans) = C * x;
                                        D_IM(ans) = S * x;
                                }
                        } else {
                                /* return exp(x)=t*2**n */
                                t = __k_cexp(x, &n);
                                D_RE(ans) = scalbn(C * t, n - 1);
                                D_IM(ans) = scalbn(S * t, n - 1);
                        }
                } else {
                        t = exp(x) * 0.5;
                        D_RE(ans) = C * t;
                        D_IM(ans) = S * t;
                }
        } else {
                if ((ix | lx) == 0) {   /* x = 0, return (0,S) */
                        D_RE(ans) = 0.0;
                        D_IM(ans) = S;
                } else {
```

```
128                         D_RE(ans) = C * sinh(x);
129                         D_IM(ans) = S * cosh(x);
130                 }
131         }
132         if (hx < 0)
133                 D_RE(ans) = -D_RE(ans);
134         if (hy < 0)
135                 D_IM(ans) = -D_IM(ans);
136         return (ans);
137 }
```

```
**********************************************************
    2552 Sat May 10 12:09:22 2014
new/usr/src/lib/libm/common/complex/csinhf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak csinhf = __csinhf

#include "libm.h"
#include "complex_wrapper.h"

#if defined(__i386) && !defined(__amd64)
extern int __swapRP(int);
#endif

static const float zero = 0.0F, half = 0.5F;

fcomplex
csinhf(fcomplex z) {
        float           x, y, S, C;
        double          t;
        int             hx, ix, hy, iy, n;
        fcomplex        ans;

        x = F_RE(z);
        y = F_IM(z);
        hx = THE_WORD(x);
        ix = hx & 0x7fffffff;
        hy = THE_WORD(y);
        iy = hy & 0x7fffffff;
        x = fabsf(x);
        y = fabsf(y);

        sincosf(y, &S, &C);
        if (ix >= 0x41600000) { /* |x| > 14 = prec/2 (14,28,34,60) */
                if (ix >= 0x42B171AA) { /* |x| > 88.722... ~ log(2**128) */
                        if (ix >= 0x7f800000) { /* |x| is inf or NaN */
                                if (iy == 0) {
                                        F_RE(ans) = x;
```



```
                                        F_IM(ans) = y;
                                } else if (iy >= 0x7f800000) {
                                        F_RE(ans) = x;
                                        F_IM(ans) = x - y;
                                } else {
                                        F_RE(ans) = C * x;
                                        F_IM(ans) = S * x;
                                }
                        } else {
#if defined(__i386) && !defined(__amd64)
                                int     rp = __swapRP(fp_extended);
#endif
                                /* return (C, S) * exp(x) / 2 */
                                t = __k_cexp((double)x, &n);
                                F_RE(ans) = (float)scalbn(C * t, n - 1);
                                F_IM(ans) = (float)scalbn(S * t, n - 1);
#if defined(__i386) && !defined(__amd64)
                                if (rp != fp_extended)
                                        (void) __swapRP(rp);
#endif
                        }
                } else {
                        t = expf(x) * half;
                        F_RE(ans) = C * t;
                        F_IM(ans) = S * t;
                }
        } else {
                if (ix == 0) {  /* x = 0, return (0,S) */
                        F_RE(ans) = zero;
                        F_IM(ans) = S;
                } else {
                        F_RE(ans) = C * sinhf(x);
                        F_IM(ans) = S * coshf(x);
                }
        }
        if (hx < 0)
                F_RE(ans) = -F_RE(ans);
        if (hy < 0)
                F_IM(ans) = -F_IM(ans);
        return (ans);
}
```

```
**********************************************************
    2395 Sat May 10 12:09:23 2014
new/usr/src/lib/libm/common/complex/csinhl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak csinhl = __csinhl

#include "libm.h"       /* coshl/expl/fabsl/scalbnl/sincosl/sinhl/__k_cexpl */
#include "complex_wrapper.h"

/* INDENT OFF */
static const long double zero = 0.0L, half = 0.5L;
/* INDENT ON */

ldcomplex
csinhl(ldcomplex z) {
        long double t, x, y, S, C;
        int hx, ix, hy, iy, n;
        ldcomplex ans;

        x = LD_RE(z);
        y = LD_IM(z);
        hx = HI_XWORD(x);
        ix = hx & 0x7fffffff;
        hy = HI_XWORD(y);
        iy = hy & 0x7fffffff;
        x = fabsl(x);
        y = fabsl(y);

        (void) sincosl(y, &S, &C);
        if (ix >= 0x4004e000) { /* |x| > 60 = prec/2 (14,28,34,60) */
                if (ix >= 0x400C62E4) { /* |x| > 11356.52... ~ log(2**16384) */
                        if (ix >= 0x7fff0000) { /* |x| is inf or NaN */
                                if (y == zero) {
                                        LD_RE(ans) = x;
                                        LD_IM(ans) = y;
                                } else if (iy >= 0x7fff0000) {
```



```
                                        LD_RE(ans) = x;
                                        LD_IM(ans) = x - y;
                                } else {
                                        LD_RE(ans) = C * x;
                                        LD_IM(ans) = S * x;
                                }
                        } else {
                                /* return exp(x)=t*2**n */
                                t = __k_cexpl(x, &n);
                                LD_RE(ans) = scalbnl(C * t, n - 1);
                                LD_IM(ans) = scalbnl(S * t, n - 1);
                        }
                } else {
                        t = expl(x) * half;
                        LD_RE(ans) = C * t;
                        LD_IM(ans) = S * t;
                }
        } else {
                if (x == zero) {        /* x = 0, return (0,S) */
                        LD_RE(ans) = zero;
                        LD_IM(ans) = S;
                } else {
                        LD_RE(ans) = C * sinhl(x);
                        LD_IM(ans) = S * coshl(x);
                }
        }
        if (hx < 0)
                LD_RE(ans) = -LD_RE(ans);
        if (hy < 0)
                LD_IM(ans) = -LD_IM(ans);
        return (ans);
}
```

```
**********************************************************
    1292 Sat May 10 12:09:23 2014
new/usr/src/lib/libm/common/complex/csinl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak csinl = __csinl

#include "libm.h"
#include "complex_wrapper.h"

ldcomplex
csinl(ldcomplex z) {
        long double x, y;
        ldcomplex ans, ct;

        x = LD_RE(z);
        y = LD_IM(z);
        LD_RE(z) = y;
        LD_IM(z) = -x;
        ct = csinhl(z);
        LD_RE(ans) = -LD_IM(ct);
        LD_IM(ans) = LD_RE(ct);
        return (ans);
}
```

```
**********************************************************
    5665 Sat May 10 12:09:23 2014
new/usr/src/lib/libm/common/complex/csqrt.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak csqrt = __csqrt

/* INDENT OFF */
/*
 * dcomplex csqrt(dcomplex z);
 *                                          2    2    2
 * Let w=r+i*s = sqrt(x+iy). Then (r + i s)  = r  - s  + i 2sr = x + i y.
 *
 * Hence x = r*r-s*s, y = 2sr.
 *
 * Note that x*x+y*y = (s*s+r*r)**2. Thus, we have
 *                                    _______
 *           2    2     / 2    2
 *      (1) r  + s  = \/ x  + y  ,
 *
 *           2    2
 *       (2) r  - s  = x
 *
 *      (3) 2sr = y.
 *
 * Perform (1)-(2) and (1)+(2), we obtain
 *
 *             2
 *      (4) 2 r   = hypot(x,y)+x,
 *
 *             2
 *       (5) 2*s   = hypot(x,y)-x
 *                        _______
 *                       / 2    2
 * where hypot(x,y) = \/ x  + y  .
 *
```



```
 * In order to avoid numerical cancellation, we use formula (4) for
 * positive x, and (5) for negative x. The other component is then
 * computed by formula (3).
 *
 *
 * ALGORITHM
 * -----------------
 *
 * (assume x and y are of medium size, i.e., no over/underflow in squaring)
 *
 * If x >=0 then
 *                                  _______
 *                                 /  2    2
 *             2     \/  x  + y    +  x                y
 *            r =   ---------------------,      s = -------;    (6)
 *                                 2                    2 r
 *
 * (note that we choose sign(s) = sign(y) to force r >=0).
 * Otherwise,
 *                                  _______
 *                                 /  2    2
 *             2     \/  x  + y    -  x                y
 *            s =   ---------------------,      r = -------;    (7)
 *                                 2                    2 s
 *
 * EXCEPTION:
 *
 * One may use the polar coordinate of a complex number to justify the
 * following exception cases:
 *
 * EXCEPTION CASES (conform to ISO/IEC 9899:1999(E)):
 *    csqrt(+-0+ i 0   ) =  0    + i 0
 *    csqrt( x + i inf ) =  inf  + i inf for all x (including NaN)
 *    csqrt( x + i NaN ) =  NaN  + i NaN with invalid for finite x
 *    csqrt(-inf+ iy   ) =  0    + i inf for finite positive-signed y
 *    csqrt(+inf+ iy   ) =  inf  + i 0   for finite positive-signed y
 *    csqrt(-inf+ i NaN) =  NaN  +-i inf
 *    csqrt(+inf+ i NaN) =  inf  + i NaN
 *    csqrt(NaN + i y  ) =  NaN  + i NaN for finite y
 *    csqrt(NaN + i NaN) =  NaN  + i NaN
 */
/* INDENT ON */

#include "libm.h"               /* fabs/sqrt */
#include "complex_wrapper.h"

/* INDENT OFF */
static const double
        two300 = 2.037035976334486086627e+90,
        twom300 = 4.909093465297726553310e-91,
        two599 = 2.074757784440496479260e+180,
        twom601 = 1.204959932551442058870e-181,
        two = 2.0,
        zero = 0.0,
        half = 0.5;
/* INDENT ON */

dcomplex
csqrt(dcomplex z) {
        dcomplex ans;
        double x, y, t, ax, ay;
        int n, ix, iy, hx, hy, lx, ly;

        x = D_RE(z);
        y = D_IM(z);
        hx = HI_WORD(x);
```

```
128         lx = LO_WORD(x);
129         hy = HI_WORD(y);
130         ly = LO_WORD(y);
131         ix = hx & 0x7fffffff;
132         iy = hy & 0x7fffffff;
133         ay = fabs(y);
134         ax = fabs(x);
135         if (ix >= 0x7ff00000 || iy >= 0x7ff00000) {
136                 /* x or y is Inf or NaN */
137                 if (ISINF(iy, ly))
138                         D_IM(ans) = D_RE(ans) = ay;
139                 else if (ISINF(ix, lx)) {
140                         if (hx > 0) {
141                                 D_RE(ans) = ax;
142                                 D_IM(ans) = ay * zero;
143                         } else {
144                                 D_RE(ans) = ay * zero;
145                                 D_IM(ans) = ax;
146                         }
147                 } else
148                         D_IM(ans) = D_RE(ans) = ax + ay;
149         } else if ((iy | ly) == 0) {    /* y = 0 */
150                 if (hx >= 0) {
151                         D_RE(ans) = sqrt(ax);
152                         D_IM(ans) = zero;
153                 } else {
154                         D_IM(ans) = sqrt(ax);
155                         D_RE(ans) = zero;
156                 }
157         } else if (ix >= iy) {
158                 n = (ix - iy) >> 20;
159                 if (n >= 30) {  /* x >> y or y=0 */
160                         t = sqrt(ax);
161                 } else if (ix >= 0x5f300000) {  /* x > 2**500 */
162                         ax *= twom601;
163                         y *= twom601;
164                         t = two300 * sqrt(ax + sqrt(ax * ax + y * y));
165                 } else if (iy < 0x20b00000) {   /* y < 2**-500 */
166                         ax *= two599;
167                         y *= two599;
168                         t = twom300 * sqrt(ax + sqrt(ax * ax + y * y));
169                 } else
170                         t = sqrt(half * (ax + sqrt(ax * ax + ay * ay)));
171                 if (hx >= 0) {
172                         D_RE(ans) = t;
173                         D_IM(ans) = ay / (t + t);
174                 } else {
175                         D_IM(ans) = t;
176                         D_RE(ans) = ay / (t + t);
177                 }
178         } else {
179                 n = (iy - ix) >> 20;
180                 if (n >= 30) {  /* y >> x */
181                         if (n >= 60)
182                                 t = sqrt(half * ay);
183                         else if (iy >= 0x7fe00000)
184                                 t = sqrt(half * ay + half * ax);
185                         else if (ix <= 0x00100000)
186                                 t = half * sqrt(two * (ay + ax));
187                         else
188                                 t = sqrt(half * (ay + ax));
189                 } else if (iy >= 0x5f300000) {  /* y > 2**500 */
190                         ax *= twom601;
191                         y *= twom601;
192                         t = two300 * sqrt(ax + sqrt(ax * ax + y * y));
193                 } else if (ix < 0x20b00000) {   /* x < 2**-500 */
```



```
194                         ax *= two599;
195                         y *= two599;
196                         t = twom300 * sqrt(ax + sqrt(ax * ax + y * y));
197                 } else
198                         t = sqrt(half * (ax + sqrt(ax * ax + ay * ay)));
199                 if (hx >= 0) {
200                         D_RE(ans) = t;
201                         D_IM(ans) = ay / (t + t);
202                 } else {
203                         D_IM(ans) = t;
204                         D_RE(ans) = ay / (t + t);
205                 }
206         }
207         if (hy < 0)
208                 D_IM(ans) = -D_IM(ans);
209         return (ans);
210 }
```

```
**********************************************************
    2221 Sat May 10 12:09:23 2014
new/usr/src/lib/libm/common/complex/csqrtf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak csqrtf = __csqrtf

#include "libm.h"               /* sqrt/fabsf/sqrtf */
#include "complex_wrapper.h"

/* INDENT OFF */
static const float zero = 0.0F;
/* INDENT ON */

fcomplex
csqrtf(fcomplex z) {
        fcomplex ans;
        double dt, dx, dy;
        float x, y, t, ax, ay, w;
        int ix, iy, hx, hy;

        x = F_RE(z);
        y = F_IM(z);
        hx = THE_WORD(x);
        hy = THE_WORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        ay = fabsf(y);
        ax = fabsf(x);
        if (ix >= 0x7f800000 || iy >= 0x7f800000) {
                /* x or y is Inf or NaN */
                if (iy == 0x7f800000)
                        F_IM(ans) = F_RE(ans) = ay;
                else if (ix == 0x7f800000) {
                        if (hx > 0) {
                                F_RE(ans) = ax;
                                F_IM(ans) = ay * zero;
```



```
                        } else {
                                F_RE(ans) = ay * zero;
                                F_IM(ans) = ax;
                        }
                } else
                        F_IM(ans) = F_RE(ans) = ax + ay;
        } else if (iy == 0) {
                if (hx >= 0) {
                        F_RE(ans) = sqrtf(ax);
                        F_IM(ans) = zero;
                } else {
                        F_IM(ans) = sqrtf(ax);
                        F_RE(ans) = zero;
                }
        } else {
                dx = (double) ax;
                dy = (double) ay;
                dt = sqrt(0.5 * (sqrt(dx * dx + dy * dy) + dx));
                t = (float) dt;
                w = (float) (dy / (dt + dt));
                if (hx >= 0) {
                        F_RE(ans) = t;
                        F_IM(ans) = w;
                } else {
                        F_IM(ans) = t;
                        F_RE(ans) = w;
                }
        }
        if (hy < 0)
                F_IM(ans) = -F_IM(ans);
        return (ans);
}
```

```
**********************************************************
    3769 Sat May 10 12:09:23 2014
new/usr/src/lib/libm/common/complex/csqrtl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak csqrtl = __csqrtl

#include "libm.h"               /* fabsl/isinfl/sqrtl */
#include "complex_wrapper.h"
#include "longdouble.h"

/* INDENT OFF */
static const long double
        twom9001 = 2.68540027160030349574217651006156930436560e-2710L,
        twom4500 = 2.31749876875924294232632428623815441492520e-1355L,
        two8999 = 9.30959911801223435025823473721632903109340e+2708L,
        two4500 = 4.31499689872709742837778035455717222508060e+1354L,
        zero = 0.0L,
        half = 0.5L,
        two = 2.0L;
/* INDENT ON */

ldcomplex
csqrtl(ldcomplex z) {
        ldcomplex ans;
        long double x, y, t, ax, ay;
        int n, ix, iy, hx, hy;

        x = LD_RE(z);
        y = LD_IM(z);
        hx = HI_XWORD(x);
        hy = HI_XWORD(y);
        ix = hx & 0x7fffffff;
        iy = hy & 0x7fffffff;
        ay = fabsl(y);
        ax = fabsl(x);
```



```
        if (ix >= 0x7fff0000 || iy >= 0x7fff0000) {
                /* x or y is Inf or NaN */
                if (isinfl(y))
                        LD_IM(ans) = LD_RE(ans) = ay;
                else if (isinfl(x)) {
                        if (hx > 0) {
                                LD_RE(ans) = ax;
                                LD_IM(ans) = ay * zero;
                        } else {
                                LD_RE(ans) = ay * zero;
                                LD_IM(ans) = ax;
                        }
                } else
                        LD_IM(ans) = LD_RE(ans) = ax + ay;
        } else if (y == zero) {
                if (hx >= 0) {
                        LD_RE(ans) = sqrtl(ax);
                        LD_IM(ans) = zero;
                } else {
                        LD_IM(ans) = sqrtl(ax);
                        LD_RE(ans) = zero;
                }
        } else if (ix >= iy) {
                n = (ix - iy) >> 16;
#if defined(__x86)              /* 64 significant bits */
                if (n >= 35)
#else                           /* 113 significant bits  */
                if (n >= 60)
#endif
                        t = sqrtl(ax);
                else if (ix >= 0x5f3f0000) {    /* x > 2**8000 */
                        ax *= twom9001;
                        y *= twom9001;
                        t = two4500 * sqrtl(ax + sqrtl(ax * ax + y * y));
                } else if (iy <= 0x20bf0000) {  /* y < 2**-8000 */
                        ax *= two8999;
                        y *= two8999;
                        t = twom4500 * sqrtl(ax + sqrtl(ax * ax + y * y));
                } else
                        t = sqrtl(half * (ax + sqrtl(ax * ax + y * y)));

                if (hx >= 0) {
                        LD_RE(ans) = t;
                        LD_IM(ans) = ay / (t + t);
                } else {
                        LD_IM(ans) = t;
                        LD_RE(ans) = ay / (t + t);
                }
        } else {
                n = (iy - ix) >> 16;
#if defined(__x86)              /* 64 significant bits */
                if (n >= 35) {  /* } */
#else                           /* 113 significant bits  */
                if (n >= 60) {
#endif
                        if (n >= 120)
                                t = sqrtl(half * ay);
                        else if (iy >= 0x7ffe0000)
                                t = sqrtl(half * ay + half * ax);
                        else if (ix <= 0x00010000)
                                t = half * (sqrtl(two * (ax + ay)));
                        else
                                t = sqrtl(half * (ax + ay));
                } else if (iy >= 0x5f3f0000) {  /* y > 2**8000 */
                        ax *= twom9001;
                        y *= twom9001;
```

```
127                         t = two4500 * sqrtl(ax + sqrtl(ax * ax + y * y));
128                 } else if (ix <= 0x20bf0000) {
129                         ax *= two8999;
130                         y *= two8999;
131                         t = twom4500 * sqrtl(ax + sqrtl(ax * ax + y * y));
132                 } else
133                         t = sqrtl(half * (ax + sqrtl(ax * ax + y * y)));
134
135                 if (hx >= 0) {
136                         LD_RE(ans) = t;
137                         LD_IM(ans) = ay / (t + t);
138                 } else {
139                         LD_IM(ans) = t;
140                         LD_RE(ans) = ay / (t + t);
141                 }
142         }
143         if (hy < 0)
144                 LD_IM(ans) = -LD_IM(ans);
145         return (ans);
146 }
```

```
**********************************************************
    1558 Sat May 10 12:09:23 2014
new/usr/src/lib/libm/common/complex/ctan.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak ctan = __ctan

/* INDENT OFF */
/*
 * dcomplex ctan(dcomplex z);
 *
 * If z = x+iy, then since ctan(iz) = i*ctanh(z),  we have
 *
 * ctan(z)      = ctan((-1)*(-z)) = ctan(i*i*(-z))
 *              = i*ctanh(i*(-z)) = i*ctanh(i*(-x-yi))
 *              = i*ctanh(y-ix)
 *              = -Im(ctanh(y-ix))+i*Re(ctanh(y-ix))
 */
/* INDENT ON */

#include "libm.h"
#include "complex_wrapper.h"

dcomplex
ctan(dcomplex z) {
        double x, y;
        dcomplex ans, ct;

        x = D_RE(z);
        y = D_IM(z);
        D_RE(z) = y;
        D_IM(z) = -x;
        ct = ctanh(z);
        D_RE(ans) = -D_IM(ct);
        D_IM(ans) = D_RE(ct);
        return (ans);
}
```

```
**********************************************************
    1275 Sat May 10 12:09:23 2014
new/usr/src/lib/libm/common/complex/ctanf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak ctanf = __ctanf

#include "libm.h"
#include "complex_wrapper.h"

fcomplex
ctanf(fcomplex z) {
        float x, y;
        fcomplex ans, ct;

        x = F_RE(z);
        y = F_IM(z);
        F_RE(z) = y;
        F_IM(z) = -x;
        ct = ctanhf(z);
        F_RE(ans) = -F_IM(ct);
        F_IM(ans) = F_RE(ct);
        return (ans);
}
```

```
**********************************************************
    5411 Sat May 10 12:09:23 2014
new/usr/src/lib/libm/common/complex/ctanh.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak ctanh = __ctanh

/* INDENT OFF */
/*
 * dcomplex ctanh(dcomplex z);
 *
 *            tanh x  + i tan y      sinh 2x  +  i sin 2y
 * ctanh z = -------------------- = --------------------
 *           1 + i tanh(x)tan(y)       cosh 2x + cos 2y
 *
 * For |x| >= prec/2 (14,28,34,60 for single, double, double extended, quad),
 * we use
 *                          1   2x                                  2 sin 2y
 *    cosh 2x = sinh 2x = --- e    and hence  ctanh z = 1 + i -----------;
 *                          2                                        2x
 *                                                                  e
 *
 * otherwise, to avoid cancellation, for |x| < prec/2,
 *                             2x     2
 *                          (e   - 1)       2      2
 *    cosh 2x + cos 2y = 1 + ------------ + cos y - sin y
 *                                2x
 *                             2 e
 *
 *                       1    2x     2  -2x         2
 *                    = --- (e   - 1)  e     + 2 cos y
 *                       2
 * and
 *
 *                  [           2x      ]
 *              1   [  2x       e   - 1  ]
```



```
 *    sinh 2x = --- [ e  - 1 + --------- ]
 *               2  [              2x   ]
 *                  [             e     ]
 *                                    2x
 * Implementation notes:  let t = expm1(2x) = e   - 1, then
 *
 *                      1    [  t*t         2  ]              1    [      t  ]
 * cosh 2x + cos 2y = --- * [ ----- + 4 cos y ];  sinh 2x = --- * [ t + --- ]
 *                      2    [  t+1           ]              2    [     t+1 ]
 *
 * Hence,
 *
 *
 *                          t*t+2t                   [4(t+1)(cos y)]*(sin y)
 *    ctanh z = -------------------------- + i -------------------------
 *              t*t+[4(t+1)(cos y)](cos y)     t*t+[4(t+1)(cos y)](cos y)
 *
 * EXCEPTION (conform to ISO/IEC 9899:1999(E)):
 *      ctanh(0,0)=(0,0)
 *      ctanh(x,inf) = (NaN,NaN) for finite x
 *      ctanh(x,NaN) = (NaN,NaN) for finite x
 *      ctanh(inf,y) = 1+ i*0*sin(2y) for positive-signed finite y
 *      ctanh(inf,inf) = (1, +-0)
 *      ctanh(inf,NaN) = (1, +-0)
 *      ctanh(NaN,0) = (NaN,0)
 *      ctanh(NaN,y) = (NaN,NaN) for non-zero y
 *      ctanh(NaN,NaN) = (NaN,NaN)
 */
/* INDENT ON */

#include "libm.h"               /* exp/expm1/fabs/sin/tanh/sincos */
#include "complex_wrapper.h"

static const double four = 4.0, two = 2.0, one = 1.0, zero = 0.0;

dcomplex
ctanh(dcomplex z) {
        double t, r, v, u, x, y, S, C;
        int hx, ix, lx, hy, iy, ly;
        dcomplex ans;

        x = D_RE(z);
        y = D_IM(z);
        hx = HI_WORD(x);
        lx = LO_WORD(x);
        ix = hx & 0x7fffffff;
        hy = HI_WORD(y);
        ly = LO_WORD(y);
        iy = hy & 0x7fffffff;
        x = fabs(x);
        y = fabs(y);

        if ((iy | ly) == 0) {   /* ctanh(x,0) = (x,0) for x = 0 or NaN */
                D_RE(ans) = tanh(x);
                D_IM(ans) = zero;
        } else if (iy >= 0x7ff00000) {  /* y is inf or NaN */
                if (ix < 0x7ff00000)    /* catanh(finite x,inf/nan) is nan */
                        D_RE(ans) = D_IM(ans) = y - y;
                else if (((ix - 0x7ff00000) | lx) == 0) {       /* x is inf */
                        D_RE(ans) = one;
                        D_IM(ans) = zero;
                } else {
                        D_RE(ans) = x + y;
                        D_IM(ans) = y - y;
                }
        } else if (ix >= 0x403c0000) {
```

```
128                 /*
129                  * |x| > 28 = prec/2 (14,28,34,60)
130                  * ctanh z ~ 1 + i (sin2y)/(exp(2x))
131                  */
132                 D_RE(ans) = one;
133                 if (iy < 0x7fe00000)    /* t = sin(2y) */
134                         S = sin(y + y);
135                 else {
136                         (void) sincos(y, &S, &C);
137                         S = (S + S) * C;
138                 }
139                 if (ix >= 0x7fe00000) { /* |x| > max/2 */
140                         if (ix >= 0x7ff00000) { /* |x| is inf or NaN */
141                                 if (((ix - 0x7ff00000) | lx) != 0)
142                                         D_RE(ans) = D_IM(ans) = x + y;
143                                                                 /* x is NaN */
144                                 else
145                                         D_IM(ans) = zero * S;   /* x is inf */
146                         } else
147                                 D_IM(ans) = S * exp(-x);        /* underflow */
148                 } else
149                         D_IM(ans) = (S + S) * exp(-(x + x));
150                                                                 /* 2 sin 2y / exp(2x) */
151         } else {
152                 /* INDENT OFF */
153                 /*
154                  *                           t*t+2t
155                  *    ctanh z = -------------------------- +
156                  *                t*t+[4(t+1)(cos y)](cos y)
157                  *
158                  *                   [4(t+1)(cos y)]*(sin y)
159                  *              i -------------------------
160                  *                t*t+[4(t+1)(cos y)](cos y)
161                  */
162                 /* INDENT ON */
163                 (void) sincos(y, &S, &C);
164                 t = expm1(x + x);
165                 r = (four * C) * (t + one);
166                 u = t * t;
167                 v = one / (u + r * C);
168                 D_RE(ans) = (u + two * t) * v;
169                 D_IM(ans) = (r * S) * v;
170         }
171         if (hx < 0)
172                 D_RE(ans) = -D_RE(ans);
173         if (hy < 0)
174                 D_IM(ans) = -D_IM(ans);
175         return (ans);
176 }
```

```
**********************************************************
    3091 Sat May 10 12:09:23 2014
new/usr/src/lib/libm/common/complex/ctanhf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#pragma weak ctanhf = __ctanhf

#include "libm.h"               /* expf/expm1f/fabsf/sincosf/sinf/tanhf */
#include "complex_wrapper.h"

/* INDENT OFF */
static const float four = 4.0F, two = 2.0F, one = 1.0F, zero = 0.0F;
/* INDENT ON */

fcomplex
ctanhf(fcomplex z) {
        float r, u, v, t, x, y, S, C;
        int hx, ix, hy, iy;
        fcomplex ans;

        x = F_RE(z);
        y = F_IM(z);
        hx = THE_WORD(x);
        ix = hx & 0x7fffffff;
        hy = THE_WORD(y);
        iy = hy & 0x7fffffff;
        x = fabsf(x);
        y = fabsf(y);

        if (iy == 0) {          /* ctanh(x,0) = (x,0) for x = 0 or NaN */
                F_RE(ans) = tanhf(x);
                F_IM(ans) = zero;
        } else if (iy >= 0x7f800000) {  /* y is inf or NaN */
                if (ix < 0x7f800000)    /* catanh(finite x,inf/nan) is nan */
                        F_RE(ans) = F_IM(ans) = y - y;
                else if (ix == 0x7f800000) {    /* x is inf */
                        F_IM(ans) = zero;
```



```
                } else {
                        F_RE(ans) = x + y;
                        F_IM(ans) = y - y;
                }
        } else if (ix >= 0x41600000) {
                /*
                 * |x| > 14 = prec/2 (14,28,34,60)
                 * ctanh z ~ 1 + i (sin2y)/(exp(2x))
                 */
                F_RE(ans) = one;
                if (iy < 0x7f000000)    /* t = sin(2y) */
                        S = sinf(y + y);
                else {
                        (void) sincosf(y, &S, &C);
                        S = (S + S) * C;
                }
                if (ix >= 0x7f000000) { /* |x| > max/2 */
                        if (ix >= 0x7f800000) { /* |x| is inf or NaN */
                                if (ix > 0x7f800000)    /* x is NaN */
                                        F_RE(ans) = F_IM(ans) = x + y;
                                else
                                        F_IM(ans) = zero * S;   /* x is inf */
                        } else
                                F_IM(ans) = S * expf(-x);       /* underflow */
                } else
                        F_IM(ans) = (S + S) * expf(-(x + x));
                                                        /* 2 sin 2y / exp(2x) */
        } else {
                /* INDENT OFF */
                /*
                 *                          t*t+2t
                 *    ctanh z = --------------------------
                 *               t*t+[4(t+1)(cos y)](cos y)
                 *
                 *                  [4(t+1)(cos y)]*(sin y)
                 *              i --------------------------
                 *                t*t+[4(t+1)(cos y)](cos y)
                 */
                /* INDENT ON */
                (void) sincosf(y, &S, &C);
                t = expm1f(x + x);
                r = (four * C) * (t + one);
                u = t * t;
                v = one / (u + r * C);
                F_RE(ans) = (u + two * t) * v;
                F_IM(ans) = (r * S) * v;
        }
        if (hx < 0)
                F_RE(ans) = -F_RE(ans);
        if (hy < 0)
                F_IM(ans) = -F_IM(ans);
        return (ans);
}
```

```
**********************************************************
    3183 Sat May 10 12:09:24 2014
new/usr/src/lib/libm/common/complex/ctanhl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak ctanhl = __ctanhl

#include "libm.h"       /* expl/expm1l/fabsl/isinfl/isnanl/sincosl/sinl/tanhl */
#include "complex_wrapper.h"
#include "longdouble.h"

/* INDENT OFF */
static const long double four = 4.0L, two = 2.0L, one = 1.0L, zero = 0.0L;
/* INDENT ON */

ldcomplex
ctanhl(ldcomplex z) {
        long double r, u, v, t, x, y, S, C;
        int hx, ix, hy, iy;
        ldcomplex ans;

        x = LD_RE(z);
        y = LD_IM(z);
        hx = HI_XWORD(x);
        ix = hx & 0x7fffffff;
        hy = HI_XWORD(y);
        iy = hy & 0x7fffffff;
        x = fabsl(x);
        y = fabsl(y);

        if (y == zero) {        /* ctanh(x,0) = (x,0) for x = 0 or NaN */
                LD_RE(ans) = tanhl(x);
                LD_IM(ans) = zero;
        } else if (iy >= 0x7fff0000) {  /* y is inf or NaN */
                if (ix < 0x7fff0000)    /* catanh(finite x,inf/nan) is nan */
                        LD_RE(ans) = LD_IM(ans) = y - y;
                else if (isinfl(x)) {   /* x is inf */
```



```
                        LD_RE(ans) = one;
                        LD_IM(ans) = zero;
                } else {
                        LD_RE(ans) = x + y;
                        LD_IM(ans) = y - y;
                }
        } else if (ix >= 0x4004e000) {
                /* INDENT OFF */
                /*
                 * |x| > 60 = prec/2 (14,28,34,60)
                 * ctanh z ~ 1 + i (sin2y)/(exp(2x))
                 */
                /* INDENT ON */
                LD_RE(ans) = one;
                if (iy < 0x7ffe0000)    /* t = sin(2y) */
                        S = sinl(y + y);
                else {
                        (void) sincosl(y, &S, &C);
                        S = (S + S) * C;
                }
                if (ix >= 0x7ffe0000) { /* |x| > max/2 */
                        if (ix >= 0x7fff0000) { /* |x| is inf or NaN */
                                if (isnanl(x))  /* x is NaN */
                                        LD_RE(ans) = LD_IM(ans) = x + y;
                                else
                                        LD_IM(ans) = zero * S;  /* x is inf */
                        } else
                                LD_IM(ans) = S * expl(-x);      /* underflow */
                } else
                        LD_IM(ans) = (S + S) * expl(-(x + x));
                                                        /* 2 sin 2y / exp(2x) */
        } else {
                /* INDENT OFF */
                /*
                 *                          t*t+2t
                 *    ctanh z = --------------------------
                 *               t*t+[4(t+1)(cos y)](cos y)
                 *
                 *                  [4(t+1)(cos y)]*(sin y)
                 *              i -------------------------
                 *                t*t+[4(t+1)(cos y)](cos y)
                 */
                /* INDENT ON */
                sincosl(y, &S, &C);
                t = expm1l(x + x);
                r = (four * C) * (t + one);
                u = t * t;
                v = one / (u + r * C);
                LD_RE(ans) = (u + two * t) * v;
                LD_IM(ans) = (r * S) * v;
        }
        if (hx < 0)
                LD_RE(ans) = -LD_RE(ans);
        if (hy < 0)
                LD_IM(ans) = -LD_IM(ans);
        return (ans);
}
```

```
**********************************************************
    1292 Sat May 10 12:09:24 2014
new/usr/src/lib/libm/common/complex/ctanl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak ctanl = __ctanl

#include "libm.h"
#include "complex_wrapper.h"

ldcomplex
ctanl(ldcomplex z) {
        long double x, y;
        ldcomplex ans, ct;

        x = LD_RE(z);
        y = LD_IM(z);
        LD_RE(z) = y;
        LD_IM(z) = -x;
        ct = ctanhl(z);
        LD_RE(ans) = -LD_IM(ct);
        LD_IM(ans) = LD_RE(ct);
        return (ans);
}
```

```
**********************************************************
   18271 Sat May 10 12:09:24 2014
new/usr/src/lib/libm/common/complex/k_atan2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include "libm.h"               /* __k_atan2 */
#include "complex_wrapper.h"

/*
 * double __k_atan2(double y, double x, double *e)
 *
 * Compute atan2 with error terms.
 *
 * Important formula:
 *                  3      5
 *                 x      x
 * atan(x) = x - ----- + ----- - ...    (for x <= 1)
 *                 3      5
 *
 *          pi     1     1
 *        = --- - --- + --- - ...      (for x > 1)
 *                    3
 *           2     x    3x
 *
 * Arg(x + y i) = sign(y) * atan2(|y|, x)
 *              = sign(y) * atan(|y|/x)          (for x > 0)
 *                sign(y) * (PI - atan(|y|/|x|))  (for x < 0)
 * Thus if x >> y (IEEE double: EXP(x) - EXP(y) >= 60):
 *      1. (x > 0): atan2(y,x) ~ y/x
 *      2. (x < 0): atan2(y,x) ~ sign(y) (PI - |y/x|))
 * Otherwise if x << y:
 *      atan2(y,x) ~ sign(y)*PI/2 - x/y
 *
 * __k_atan2 call static functions mx_poly, mx_atan
 */

/*
 * (void) mx_poly (double *z, double *a, double *e, int n)
```



```
 * return
 *      e = a  + z*(a  + z*(a  + ... z*(a  + e)...))
 *           0       2       4           2n
 * Note:
 * 1.   e and coefficient ai are represented by two double numbers.
 *      For e, the first one contain the leading 24 bits rounded, and the
 *      second one contain the remaining 53 bits (total 77 bits accuracy).
 *      For ai, the first one contian the leading 53 bits rounded, and the
 *      second is the remaining 53 bits (total 106 bits accuracy).
 * 2.   z is an array of three doubles.
 *      z[0] :  the rounded value of Z (the intended value of z)
 *      z[1] :  the leading 24 bits of Z rounded
 *      z[2] :  the remaining 53 bits of Z
 *              Note that z[0] = z[1]+z[2] rounded.
 *
 */

static void
mx_poly(const double *z, const double *a, double *e, int n) {
        double r, s, t, p_h, p_l, z_h, z_l, p;
        int i;

        n = n + n;
        p = e[0] + a[n];
        p_l = a[n + 1];
        p_h = (double) ((float) p);
        p   = a[n - 2] + z[0] * p;
        z_h = z[1]; z_l = z[2];
        p_l += e[0] - (p_h - a[n]);

        for (i = n - 2; i >= 2; i -= 2) {
        /* compute p = ai + z * p */
                t   = z_h * p_h;
                s   = z[0] * p_l + p_h * z_l;
                p_h = (double) ((float) p);
                s  += a[i + 1];
                r   = t - (p_h - a[i]);
                p   = a[i - 2] + z[0] * p;
                p_l = r + s;
        }
        e[0] = (double)((float) p);
        t   = z_h * p_h;
        s   = z[0] * p_l + p_h * z_l;
        r   = t - (e[0] - a[0]);
        e[1] = r + s;
}

/*
 * Table of constants for atan from 0.125 to 8
 *      0.125 -- 0x3fc00000  --- (increment at bit 16)
 *               0x3fc10000
 *               0x3fc20000
 *      ...      ...
 *               0x401f0000
 *      8.000 -- 0x40200000      (total: 97)
 * By K.C. Ng, March 9, 1989
 */

static const double TBL_atan_hi[] = {
1.24354994546761438 2e-01, 1.32039761614638762 0e-01, 1.39708874289163620 4e-01,
1.47361481088651630 2e-01, 1.54996741923940972 7e-01, 1.62613828597948567 6e-01,
1.70211925285474408 0e-01, 1.77790228992676047 1e-01, 1.85347949995694760 7e-01,
1.92884312257974643 9e-01, 2.00398553825878511 5e-01, 2.07889927202262986 3e-01,
2.15357699677380476 e-01, 2.22801153759394521 3e-01, 2.30219587276843717 9e-01,
2.37612313865471241 9e-01, 2.44978663126864143 5e-01, 2.59629629408257511 8e-01,
2.74167451119658789 3e-01, 2.88587361894077409 9e-01, 3.02884868374971416 6e-01,
```

```
3.170557532091470287e-01, 3.310960767041321029e-01, 3.450021772071051318e-01,
3.587706702705721895e-01, 3.723984466767542023e-01, 3.858826693980737521e-01,
3.992207695752525431e-01, 4.124104415973872673e-01, 4.254496373700422662e-01,
4.383365598579578304e-01, 4.510696559885234436e-01, 4.636476090008060935e-01,
4.883339510564055352e-01, 5.123894603107377321e-01, 5.358112379604637043e-01,
5.585993153435624414e-01, 5.807563535676704136e-01, 6.022873461349641522e-01,
6.231993299340659043e-01, 6.435011087932843710e-01, 6.632029927060932861e-01,
6.823165548747480713e-01, 7.008544078844501923e-01, 7.188299996216245269e-01,
7.362574289814280970e-01, 7.531512809621944138e-01, 7.695264804056582975e-01,
7.853981633974482790e-01, 8.156919233162234217e-01, 8.441539861131710509e-01,
8.709034570756529758e-01, 8.960553845713439269e-01, 9.197196053504168578e-01,
9.420000403794636101e-01, 9.629943306809362058e-01, 9.827937232473290541e-01,
1.001483135694234639e+00, 1.019141344266349725e+00, 1.035841253008800145e+00,
1.051650212548373764e+00, 1.066630365315743623e+00, 1.080839000541168327e+00,
1.094328907321189925e+00, 1.107148717794090409e+00, 1.130953743979160375e+00,
1.152571997215667610e+00, 1.172273881128476303e+00, 1.190289949682531656e+00,
1.206817370285252489e+00, 1.222025323210989667e+00, 1.236059489478081863e+00,
1.249045772398254428e+00, 1.261093382252440387e+00, 1.272297395208717319e+00,
1.282740879744270757e+00, 1.292496667789785336e+00, 1.301628834009196156e+00,
1.310193935047555547e+00, 1.318242051016837113e+00, 1.325817663668032553e+00,
1.339705659589999565e+00, 1.352127380920954636e+00, 1.363300100359693845e+00,
1.373400766945015894e+00, 1.382574821490125894e+00, 1.390942827002418447e+00,
1.398605512271957618e+00, 1.405647649380269870e+00, 1.412141064608495311e+00,
1.418146998399631542e+00, 1.423717971406494032e+00, 1.428899272190732761e+00,
1.433730152484709031e+00, 1.438244794498222623e+00, 1.442473099109101931e+00,
1.446441332248135092e+00,
};

static const double TBL_atan_lo[] = {
-3.125324142453938311e-18, -1.276925400709959526e-17, 2.479758919089733066e-17,
5.409599147666297957e-18, 9.585415594114323829e-18, 7.784470643106252464e-18,
-3.541164079802125137e-18, 2.372599351477449041e-17, 4.180692268843078977e-18,
2.034098543938166622e-17, 3.139954287184449286e-18, 7.333160666520898500e-18,
4.738160130078732886e-19, -5.498822172446843173e-18, 1.231340452914270316e-17,
1.058231431371112987e-17, 1.069875561873445139e-17, 1.923875492461530410e-17,
8.261353575163771936e-18, -1.428369957377257085e-17, -1.101082790300136900e-17,
-1.893928924292642146e-17, -7.952610375793798701e-18, -2.293880475557830393e-17,
3.088733564861919217e-17, 1.961231150484565340e-17, 2.378822732491940868e-17,
2.246598105617042065e-17, 3.963462895355093301e-17, 2.331553074189288466e-17,
-2.494277030626540909e-17, 3.280735600183735558e-17, 2.269877745296168709e-17,
-1.137323618932958456e-17, -2.546278147285580353e-17, -4.063795683482557497e-18,
-5.455630548591626394e-18, -1.441464378193066908e-17, 2.950430737228402307e-17,
2.672403885140095079e-17, 1.583478505144428617e-17, -3.076054864429649001e-17,
6.943223671560007740e-18, -1.987626234335816123e-17, -2.147838844445698302e-17,
3.473937648299456719e-17, -2.425693465918206812e-17, -3.704991905602721293e-17,
3.061616997868383018e-17, -1.071456562778743077e-17, -4.841337011934916763e-17,
-2.269823590747287052e-17, 2.923876285774304890e-17, -4.057439412852767923e-17,
5.460837485846687627e-17, -3.986660595210752445e-18, 1.390331103123099845e-17,
9.438308023545392000e-17, 1.000401886936679889e-17, 3.194313981784503706e-17,
-9.650564731467513515e-17, -5.956589637160374564e-17, -1.567632251135907253e-17,
-5.490676155022364226e-18, 9.404471373566379412e-17, 7.123833804538446299e-17,
-9.283188754266129476e-18, -6.830804768926660334e-17, -1.236918499824626670e-17,
8.745413734780278834e-17, -6.319394031144676258e-17, -8.824429373951136321e-17,
-2.599011860304134377e-17, 2.147674250751150961e-17, 1.093246171526936217e-16,
-3.307710355769516504e-17, -3.561490438648230100e-17, -9.843712133488842595e-17,
-2.324061182591627982e-17, -8.922630138234492386e-17, -9.573807110557223276e-17,
-8.263883782511013632e-17, 8.721870922223967507e-17, -6.457134743238754385e-17,
-4.396204466767636187e-17, -2.493019910264565554e-17, -1.105119435430315713e-16,
9.211323971545051565e-17,
};

/*
 * mx_atan(x,err)
```



```
 * Table look-up algorithm
 * By K.C. Ng, March 9, 1989
 *
 * Algorithm.
 *
 * The algorithm is based on atan(x)=atan(y)+atan((x-y)/(1+x*y)).
 * We use poly1(x) to approximate atan(x) for x in [0,1/8] with
 * error (relative)
 *      |(atan(x)-poly1(x))/x|<= 2^-83.41
 *
 * and use poly2(x) to approximate atan(x) for x in [0,1/65] with
 * error
 *      |atan(x)-poly2(x)|<= 2^-86.8
 *
 * Here poly1 and poly2 are odd polynomial with the following form:
 *              x + x^3*(a1+x^2*(a2+...))
 *
 * (0). Purge off Inf and NaN and 0
 * (1). Reduce x to positive by atan(x) = -atan(-x).
 * (2). For x <= 1/8, use
 *      (2.1) if x < 2^(-prec/2), atan(x) =  x  with inexact flag raised
 *      (2.2) Otherwise
 *              atan(x) = poly1(x)
 * (3). For x >= 8 then (prec = 78)
 *      (3.1) if x >= 2^prec,     atan(x) = atan(inf) - pio2lo
 *      (3.2) if x >= 2^(prec/3), atan(x) = atan(inf) - 1/x
 *      (3.3) if x >  65,         atan(x) = atan(inf) - poly2(1/x)
 *      (3.4) Otherwise,          atan(x) = atan(inf) - poly1(1/x)
 *
 * (4). Now x is in (0.125, 8)
 *      Find y that match x to 4.5 bit after binary (easy).
 *      If iy is the high word of y, then
 *              single : j = (iy - 0x3e000000) >> 19
 *              double : j = (iy - 0x3fc00000) >> 16
 *              quad   : j = (iy - 0x3ffc0000) >> 12
 *
 *      Let s = (x-y)/(1+x*y). Then
 *      atan(x) = atan(y) + poly1(s)
 *              = _TBL_atan_hi[j] + (_TBL_atan_lo[j] + poly2(s) )
 *
 *      Note. |s| <= 1.5384615385e-02 = 1/65. Maxium occurs at x = 1.03125
 *
 */

#define P1 p[2]
#define P4 p[8]
#define P5 p[9]
#define P6 p[10]
#define P7 p[11]
#define P8 p[12]
#define P9 p[13]
static const double p[] = {
        1.0,
        0.0,
        -3.33333333333333314830e-01,    /* p1   = BFD55555 55555555 */
        -1.85030852238476921863e-17,    /* p1_l = BC755525 9783A49C */
        2.00000000000000011102e-01,     /* p2   = 3FC99999 9999999A */
        -1.27263196576150347368e-17,    /* p2_l = BC6D584B 0D874007 */
        -1.42857142857141405923e-01,    /* p3   = BFC24924 9249245E */
        -1.34258204847170493327e-17,    /* p3_l = BC6EF534 A112500D */
        1.11111111110486909803e-01,     /* p4   = 3FBC71C7 1C71176A */
        -9.09090907557387889470e-02,    /* p5   = BFB745D1 73B47A7D */
        7.69230541541713053189e-02,     /* p6   = 3FB3B13A B1E68DE6 */
        -6.66645815401964159097e-02,    /* p7   = BFB110EE 1584446A */
        5.87081768778560317279e-02,     /* p8   = 3FAE0EFF 87657733 */
        -4.90818147456113240690e-02,    /* p9   = BFA92140 6A524B5C */
```

```
260 };
261 #define Q1 q[2]
262 #define Q3 q[6]
263 #define Q4 q[7]
264 #define Q5 q[8]
265 static const double q[] = {
266         1.0,
267         0.0,
268         -3.3333333333333314830e-01,    /* q1   = BFD55555 55555555 */
269         -1.8502294157127863873e-17,    /* q1_l = BC7554E9 D20EFA66 */
270         1.9999999999999927836e-01,     /* q2   = 3FC99999 99999997 */
271         -1.2878256440743883339e-17,    /* q2_l = BC6DB1FB 17217417 */
272         -1.4285714285549228064e-01,    /* q3   = BFC24924 92483C46 */
273         1.1111109713018335609e-01,     /* q4   = 3FBC71C6 E06595CC */
274         -9.0855330356910929401e-02,    /* q5   = BFB7424B 808CDA76 */
275 };
276 static const double
277 one = 1.0,
278 pio2hi = 1.57079632679489658e+00,
279 pio2lo = 6.1232339957367658e-17;

281 static double
282 mx_atan(double x, double *err) {
283         double y, z, r, s, t, w, s_h, s_l, x_h, x_l, zz[3], ee[2], z_h,
284                z_l, r_h, r_l, u, v;
285         int ix, iy, sign, j;

287         ix = ((int *) &x)[HIWORD];
288         sign = ix & 0x80000000;
289         ix ^= sign;

291         /* for |x| < 1/8 */
292         if (ix < 0x3fc00000) {
293                 if (ix < 0x3f300000) {  /* when |x| < 2**-12 */
294                         if (ix < 0x3d800000) {  /* if |x| < 2**-39 */
295                                 *err = (double) ((int) x);
296                                 return (x);
297                         }
298                         z = x * x;
299                         t = x * z * (q[2] + z * (q[4] + z * q[6]));
300                         r = x + t;
301                         *err = t - (r - x);
302                         return (r);
303                 }
304                 z = x * x;

306                 /* use double precision at p4 and on */
307                 ee[0] = z *
308                         (P4 + z *
309                         (P5 + z * (P6 + z * (P7 + z * (P8 + z * P9)))));

311                 x_h = (double) ((float) x);
312                 z_h = (double) ((float) z);
313                 x_l = x - x_h;
314                 z_l = (x_h * x_h - z_h);
315                 zz[0] = z;
316                 zz[1] = z_h;
317                 zz[2] = z_l + x_l * (x + x_h);

319                 /*
320                  * compute (1+z*(p1+z*(p2+z*(p3+e)))) by call
321                  * mx_poly
322                  */

324                 mx_poly(zz, p, ee, 3);
```



```
326                 /* finally x*(1+z*(p1+...)) */
327                 r = x_h * ee[0];
328                 t = x * ee[1] + x_l * ee[0];
329                 s = t + r;
330                 *err = t - (s - r);
331                 return (s);
332         }
333         /* for |x| >= 8.0 */
334         if (ix >= 0x40200000) { /* x >=  8 */
335                 x = fabs(x);
336                 if (ix >= 0x42600000) { /* x >=  2**39 */
337                         if (ix >= 0x44c00000) { /* x >=  2**77 */
338                                 y = -pio2lo;
339                         } else
340                                 y = one / x - pio2lo;
341                         if (sign == 0) {
342                                 t = pio2hi - y;
343                                 *err = -(y - (pio2hi - t));
344                         } else {
345                                 t = y - pio2hi;
346                                 *err = y - (pio2hi + t);
347                         }
348                         return (t);
349                 } else {
350                         /* compute r = 1/x */
351                         r = one / x;
352                         z = r * r;
353                         if (ix < 0x40504000) {  /* 8 <  x <  65 */

355                                 /* use double precision at p4 and on */
356                                 ee[0] = z *
357                                         (P4 + z *
358                                         (P5 + z *
359                                         (P6 + z * (P7 + z * (P8 + z * P9)))));
360                                 x_h = (double) ((float) x);
361                                 r_h = (double) ((float) r);
362                                 z_h = (double) ((float) z);
363                                 r_l = r * ((x_h - x) * r_h - (x_h * r_h - one));
364                                 z_l = (r_h * r_h - z_h);
365                                 zz[0] = z;
366                                 zz[1] = z_h;
367                                 zz[2] = z_l + r_l * (r + r_h);
368                                 /*
369                                  * compute (1+z*(p1+z*(p2+z*(p3+e)))) by call
370                                  * mx_poly
371                                  */
372                                 mx_poly(zz, p, ee, 3);
373                         } else { /* x < 65 < 2**39 */
374                                 /* use double precision at q3 and on */
375                                 ee[0] = z * (Q3 + z * (Q4 + z * Q5));
376                                 x_h = (double) ((float) x);
377                                 r_h = (double) ((float) r);
378                                 z_h = (double) ((float) z);
379                                 r_l = r * ((x_h - x) * r_h - (x_h * r_h - one));
380                                 z_l = (r_h * r_h - z_h);
381                                 zz[0] = z;
382                                 zz[1] = z_h;
383                                 zz[2] = z_l + r_l * (r + r_h);
384                                 /*
385                                  * compute (1+z*(q1+z*(q2+e))) by call
386                                  * mx_poly
387                                  */
388                                 mx_poly(zz, q, ee, 2);
389                         }
390                         /* pio2 - r*(1+...) */
391                         v = r_h * ee[0];
```

```
392                         t = pio2lo - (r * ee[1] + r_l * ee[0]);
393                         if (sign == 0) {
394                                 s = pio2hi - v;
395                                 t -= (v - (pio2hi - s));
396                         } else {
397                                 s = v - pio2hi;
398                                 t = -(t - (v - (s + pio2hi)));
399                         }
400                         w = s + t;
401                         *err = t - (w - s);
402                         return (w);
403                 }
404         }
405         /* now x is between 1/8 and 8 */
406         ((int *) &x)[HIWORD] = ix;
407         iy = (ix + 0x00008000) & 0x7fff0000;
408         ((int *) &y)[HIWORD] = iy;
409         ((int *) &y)[LOWORD] = 0;
410         j = (iy - 0x3fc00000) >> 16;

412         w = (x - y);
413         v = 1 / (one + x * y);
414         s = w * v;
415         z = s * s;
416         /* use double precision at q3 and on */
417         ee[0] = z * (Q3 + z * (Q4 + z * Q5));
418         s_h = (double) ((float) s);
419         z_h = (double) ((float) z);
420         x_h = (double) ((float) x);
421         t = (double) ((float) (one + x * y));
422         r = -((x_h - x) * y - (x_h * y - (t - one)));
423         s_l = -v * (s_h * r - (w - s_h * t));
424         z_l = (s_h * s_h - z_h);
425         zz[0] = z;
426         zz[1] = z_h;
427         zz[2] = z_l + s_l * (s + s_h);
428         /* compute (1+z*(q1+z*(q2+e))) by call mx_poly */
429         mx_poly(zz, q, ee, 2);
430         v = s_h * ee[0];
431         t = TBL_atan_lo[j] + (s * ee[1] + s_l * ee[0]);
432         u = TBL_atan_hi[j];
433         s = u + v;
434         t += (v - (s - u));
435         w = s + t;
436         *err = t - (w - s);
437         if (sign != 0) {
438                 w = -w;
439                 *err = -*err;
440         }
441         return (w);
442 }

444 static const double
445         twom768 = 6.441148769597133308e-232,    /* 2^-768 */
446         two768  = 1.552518092300708935e+231,    /* 2^768 */
447         pi = 3.14159265358979311599796346854,
448         pi_lo = 1.224646799147353177e-16,
449         pio2 = 1.570796326794896558e+00,
450         pio2_lo = 6.123233995736765886e-17,
451         pio4 = 0.78539816339744827899949,
452         pio4_lo = 3.061616997868382943e-17,
453         pi3o4 = 2.35619449019234483699 8,
454         pi3o4_lo = 9.184850993605148829195e-17;

456 double
457 __k_atan2(double y, double x, double *w) {
```



```
458         double t, xh, th, t1, t2, w1, w2;
459         int ix, iy, hx, hy, lx, ly;

461         hy = ((int *) &y)[HIWORD];
462         ly = ((int *) &y)[LOWORD];
463         iy = hy & ~0x80000000;

465         hx = ((int *) &x)[HIWORD];
466         lx = ((int *) &x)[LOWORD];
467         ix = hx & ~0x80000000;

469         *w = 0.0;
470         if (ix >= 0x7ff00000 || iy >= 0x7ff00000) {     /* ignore inexact */
471                 if (isnan(x) || isnan(y))
472                         return (x * y);
473                 else if (iy < 0x7ff00000) {
474                         if (hx >= 0) {  /* ATAN2(+-finite, +inf) is +-0 */
475                                 *w *= y;
476                                 return (*w);
477                         } else {        /* ATAN2(+-finite, -inf) is +-pi */
478                                 *w = copysign(pi_lo, y);
479                                 return (copysign(pi, y));
480                         }
481                 } else if (ix < 0x7ff00000) {
482                                 /* ATAN2(+-inf, finite) is +-pi/2 */
483                         *w = (hy >= 0)? pio2_lo : -pio2_lo;
484                         return ((hy >= 0)? pio2 : -pio2);
485                 } else if (hx > 0) {    /* ATAN2(+-INF,+INF) = +-pi/4 */
486                         *w = (hy >= 0)? pio4_lo : -pio4_lo;
487                         return ((hy >= 0)? pio4 : -pio4);
488                 } else {                /* ATAN2(+-INF,-INF) = +-3pi/4 */
489                         *w = (hy >= 0)? pi3o4_lo : -pi3o4_lo;
490                         return ((hy >= 0)? pi3o4 : -pi3o4);
491                 }
492         } else if ((ix | lx) == 0 || (iy | ly) == 0) {
493                 if ((iy | ly) == 0) {
494                         if (hx >= 0) /* ATAN2(+-0, +(0 <= x <= inf)) is +-0 */
495                                 return (y);
496                         else {  /* ATAN2(+-0, -(0 <= x <= inf)) is +-pi */
497                                 *w = (hy >= 0)? pi_lo : -pi_lo;
498                                 return ((hy >= 0)? pi : -pi);
499                         }
500                 } else { /* ATAN2(+-(anything but 0 and NaN), 0) is +-pi/2 */
501                         *w = (hy >= 0)? pio2_lo : -pio2_lo;
502                         return ((hy >= 0)? pio2 : -pio2);
503                 }
504         } else if (iy - ix > 0x06400000) { /* |x/y| < 2 ** -100 */
505                 *w = (hy >= 0)? pio2_lo : -pio2_lo;
506                 return ((hy >= 0)? pio2 : -pio2);
507         } else if (ix - iy > 0x06400000) { /* |y/x| < 2 ** -100 */
508                 if (hx < 0) {
509                         *w = (hy >= 0)? pi_lo : -pi_lo;
510                         return ((hy >= 0)? pi : -pi);
511                 } else {
512                         t = y / x;
513                         th = t;
514                         ((int *) &th)[LOWORD] &= 0xf8000000;
515                         xh = x;
516                         ((int *) &xh)[LOWORD] &= 0xf8000000;
517                         t1 = (x - xh) * t + xh * (t - th);
518                         t2 = y - xh * th;
519                         *w = (t2 - t1) / x;
520                         return (t);
521                 }
522         } else {
523                 if (ix >= 0x5f300000) {
```

```
524                         x *= twom768;
525                         y *= twom768;
526                 } else if (ix < 0x23d00000) {
527                         x *= two768;
528                         y *= two768;
529                 }
530                 y = fabs(y);
531                 x = fabs(x);
532                 t = y / x;
533                 th = t;
534                 ((int *) &th)[LOWORD] &= 0xf8000000;
535                 xh = x;
536                 ((int *) &xh)[LOWORD] &= 0xf8000000;
537                 t1 = (x - xh) * t + xh * (t - th);
538                 t2 = y - xh * th;
539                 w1 = mx_atan(t, &w2);
540                 w2 += (t2 - t1) / (x + y * t);
541                 if (hx < 0) {
542                         t1 = pi - w1;
543                         t2 = pi_t1;
544                         w2 = (pi_lo - w2) - (w1 - t2);
545                         w1 = t1;
546                 }
547                 *w = (hy >= 0)? w2 : -w2;
548                 return ((hy >= 0)? w1 : -w1);
549         }
550 }
```

```
**********************************************************
   32109 Sat May 10 12:09:24 2014
new/usr/src/lib/libm/common/complex/k_atan2l.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
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 */

#include "libm.h"               /* __k_atan2l */
#include "complex_wrapper.h"

#if defined(__sparc)
#define HALF(x)  ((int *) &x)[3] = 0; ((int *) &x)[2] &= 0xfe000000
#elif defined(__x86)
#define HALF(x)  ((int *) &x)[0] = 0
#endif

/*
 * long double __k_atan2l(long double y, long double x, long double *e)
 *
 * Compute atan2l with error terms.
 *
 * Important formula:
 *                  3       5
 *                 x       x
 * atan(x) = x - ----- + ----- - ...    (for x <= 1)
 *                 3       5
 *
 *          pi     1     1
 *        = --- - --- + --- - ...      (for x > 1)
 *                  3
 *           2     x    3x
 *
 * Arg(x + y i) = sign(y) * atan2(|y|, x)
 *              = sign(y) * atan(|y|/x)          (for x > 0)
 *                sign(y) * (PI - atan(|y|/|x|))  (for x < 0)
 * Thus if x >> y (IEEE double: EXP(x) - EXP(y) >= 60):
 *      1. (x > 0): atan2(y,x) ~ y/x
 *      2. (x < 0): atan2(y,x) ~ sign(y) (PI - |y/x|))
 * Otherwise if x << y:
 *      atan2(y,x) ~ sign(y)*PI/2 - x/y
```



```
 *
 * __k_atan2l call static functions mx_polyl, mx_atanl
 */


/*
 * (void) mx_polyl (long double *z, long double *a, long double *e, int n)
 * return
 *      e = a  + z*(a  + z*(a  + ... z*(a  + e)...))
 *           0       2       4           2n
 * Note:
 * 1.   e and coefficient ai are represented by two long double numbers.
 *      For e, the first one contain the leading 53 bits (30 for x86 exteneded)
 *      and the second one contain the remaining 113 bits (64 for x86 extended).
 *      For ai, the first one contian the leading 53 bits (or 30 for x86)
 *      rounded, and the second is the remaining 113 bits (or 64 for x86).
 * 2.   z is an array of three doubles.
 *      z[0] :  the rounded value of Z (the intended value of z)
 *      z[1] :  the leading 32 (or 56) bits of Z rounded
 *      z[2] :  the remaining 113 (or 64) bits of Z
 *              Note that z[0] = z[1]+z[2] rounded.
 *
 */

static void
mx_polyl(const long double *z, const long double *a, long double *e, int n) {
        long double r, s, t, p_h, p_l, z_h, z_l, p, w;
        int i;
        n = n + n;
        p = e[0] + a[n];
        p_l = a[n + 1];
        w = p; HALF(w);
        p_h = w;
        p   = a[n - 2] + z[0] * p;
        z_h = z[1]; z_l = z[2];
        p_l += e[0] - (p_h - a[n]);

        for (i = n - 2; i >= 2; i -= 2) {

        /* compute p = ai + z * p */
                t = z_h * p_h;
                s = z[0] * p_l + p_h * z_l;
                w = p;  HALF(w);
                p_h = w;
                s  += a[i + 1];
                r   = t - (p_h - a[i]);
                p   = a[i - 2] + z[0] * p;
                p_l = r + s;
        }
        w = p; HALF(w);
        e[0] = w;
        t   = z_h * p_h;
        s   = z[0] * p_l + p_h * z_l;
        r   = t - (e[0] - a[0]);
        e[1] = r + s;
}

/*
 * Table of constants for atan from 0.125 to 8
 *      0.125 -- 0x3ffc0000  --- (increment at bit 12)
 *               0x3ffc1000
 *               0x3ffc2000
 *      ...     ...
 *               0x4001f000
 *      8.000 -- 0x40020000      (total: 97)
 */
```

```
129 static const long double TBL_atan_hil[] = {
130 #if defined(__sparc)
131 1.24354994546761435031354849163871024165 68e-01L,
132 1.32039761614638749274684406526569532262 50e-01L,
133 1.39708874289163645183367776739095056816 07e-01L,
134 1.47361481088651635609802760396845518210 66e-01L,
135 1.54996741923940982303714374933492191331 71e-01L,
136 1.62613828597948575373641563761557800620 19e-01L,
137 1.70211925285474404490496607099761713695 43e-01L,
138 1.77790228992676070796624799215824688994 56e-01L,
139 1.85347949956947648860259612285446466726 1e-01L,
140 1.92884312257974664197058710690227303498 78e-01L,
141 2.00398553825878514653945785034378384461 53e-01L,
142 2.07889927202262993605334983102994324756 29e-01L,
143 2.15357699697738048024459627166489641657 45e-01L,
144 2.22801153759394515771032122140432555250 24e-01L,
145 2.30219587276843730240170959679802990655 51e-01L,
146 2.37612313865471252473883634325637779198 92e-01L,
147 2.44978663126864154172082481211275806419 59e-01L,
148 2.59629629408257531029946443183971905601 06e-01L,
149 2.74167451119658797599371898342175785924 44e-01L,
150 2.88587361894077395623611419958218345043 32e-01L,
151 3.02884868374971405560556094505558218122 77e-01L,
152 3.17055753209147009809015576674467329758 52e-01L,
153 3.31096076704132094944338787756944554212 59e-01L,
154 3.45002177207105108867681286900051684082 90e-01L,
155 3.58770670270572220395920063926460522153 63e-01L,
156 3.72398446676754221923655038283701826413 6e-01L,
157 3.85882669398073775897695484607231396381 86e-01L,
158 3.99220769575252565614716696158864764911 04e-01L,
159 4.12410441597387306899791289667126942609 20e-01L,
160 4.25449637370042289542263605180792330138 17e-01L,
161 4.38336559857957805445616049214771308958 82e-01L,
162 4.51069655988523476375639257282193440737 98e-01L,
163 4.63647609000806116214256231461214397133 44e-01L,
164 4.88333951056405523867164960747064844596 44e-01L,
165 5.12389460310737706666601020584259238055 58e-01L,
166 5.35811237960463700269085068707691446984 71e-01L,
167 5.58599315343562435971508216401661228758 73e-01L,
168 5.80756353567670399203274475001500823751 22e-01L,
169 6.02287346134964181682122694204232919224 59e-01L,
170 6.23199329934065930992475349060374593677 93e-01L,
171 6.43501108793284386802809228717322604472 65e-01L,
172 6.63202992706093255363254310238275834172 26e-01L,
173 6.82316554874748078256429981711152987847 29e-01L,
174 7.00854407884450172457951281786751273186 23e-01L,
175 7.18829999621624505417014151525904698910 43e-01L,
176 7.36257428981428131742835271089146624792 74e-01L,
177 7.53151280962194389524739370269028886005 75e-01L,
178 7.69526480405658260406820035985654017265 98e-01L,
179 7.85398163397448309615660845819875669369 77e-01L,
180 8.15691923316223411021460383745645826722 84e-01L,
181 8.44153986113171002517844148271647467386 32e-01L,
182 8.70903457075652953140173112597814072916 50e-01L,
183 8.96055384571343956174800718029937795466 02e-01L,
184 9.19719605350416817228603454821089409693 11e-01L,
185 9.42000040379463664737937170534593621158 91e-01L,
186 9.62994330680936201815195835997099896772 98e-01L,
187 9.82793723247329067985710611014666037625 72e-01L,
188 1.00148313569423473291832959530143748963 43e+00L,
189 1.01914134426634973463834291702306362123 54e+00L,
190 1.03584125300880017658469447032544407354 76e+00L,
191 1.05165021254837366745986731208629990269 20e+00L,
192 1.06663036531574356307917634742027990860 15e+00L,
193 1.08083900054116831088715672921719978590 03e+00L,
```



```
194 1.09432890732118991989278831461023527630 33e+00L,
195 1.10714871779409050301706546017853704975 43e+00L,
196 1.13095374397916044647093351553632775600 26e+00L,
197 1.15257199721566751804014986261275146728 34e+00L,
198 1.17227388112847638660059494413370460068 65e+00L,
199 1.19028994968253173292773377482931828033 84e+00L,
200 1.20681737028525253039551158005655766256 82e+00L,
201 1.22202532321098963704174174392257041202 94e+00L,
202 1.23605948947808194190945197110907861462 10e+00L,
203 1.24904577239825442582991707728109004835 50e+00L,
204 1.26109338225244041931394088124733576401 24e+00L,
205 1.27229739520871734129619374982248057464 63e+00L,
206 1.28274087974427074736288525113649551640 72e+00L,
207 1.29249666778978526790309142140708167235 28e+00L,
208 1.30162883400919614380478585036668550244 53e+00L,
209 1.31019393504755563425643768917190534375 37e+00L,
210 1.31824205101683704985933020232713630404 27e+00L,
211 1.32581766366803246505923921042847568861 64e+00L,
212 1.33970565959899953932830375258955578502 43e+00L,
213 1.35212738092095465718914794138981275987 74e+00L,
214 1.36330010035969395428929852782509915602 69e+00L,
215 1.37340076694501586086127192644496104604 836e+00L,
216 1.38257482149012585805996741776856851639 55e+00L,
217 1.39094282700241834864276869438364323954 86e+00L,
218 1.39860551227195759501267008161142827278 58e+00L,
219 1.40564764938026978095219340199580806644 06e+00L,
220 1.41214106460849521536761367185848908528 20e+00L,
221 1.41814699839963145940386030397009886326 07e+00L,
222 1.42371797140649411890181904661072971089 05e+00L,
223 1.42889927219073269641847007453719840013 89e+00L,
224 1.43373015248470898664047190966988738802 64e+00L,
225 1.43824479449822259796140424793548160396 69e+00L,
226 1.44247309910910182002529205993772918103 52e+00L,
227 1.44644133224813518419996684247588038661 09e+00L,
228 #elif defined(__x86)
229 1.24354994535678997635841369628 9e-01L,  1.32039761578198522329330444335 9e-01L,
230 1.39708874281495809555053710937 5e-01L,  1.47361481038387864828109741201 9e-01L,
231 1.54996741912327706813812255859 4e-01L,  1.62613828550092875957489013671 9e-01L,
232 1.70211925229523330926895141601 6e-01L,  1.77790228975936770439147949218 8e-01L,
233 1.85347949695822596549987792969 e-01L,  1.92884312244132161140441894531 2e-01L,
234 2.00398553803097456693649291992 2e-01L,  2.07889927201904356479644775390 6e-01L,
235 2.15357699664309620857238769531 2e-01L,  2.22801153722684830427169799804 7e-01L,
236 2.30219587276224046945571899414 1e-01L,  2.37612313823774456977844238281 2e-01L,
237 2.44978663104120641946792602539 1e-01L,  2.59629629319533705711364746093 8e-01L,
238 2.74167451076209545135498046875 0e-01L,  2.88587361807003617286682128906 2e-01L,
239 3.02884868361546897888183593750 e-01L,  3.17055753199383616447487304688 e-01L,
240 3.31096076639369130134582951562 e-01L,  3.45002177171409130096435546875 0e-01L,
241 3.58770670252852141857147216796 9e-01L,  3.72398446663282811641693115234 4e-01L,
242 3.88582669361308217048645019531 2e-01L,  3.99220769526436924934387207031 2e-01L,
243 4.12410441553220152854919433593 8e-01L,  4.25449637346900099546051025390 6e-01L,
244 4.63647608994506299456970214844 e-01L,  4.88333950983360409736633007812 e-01L,
245 5.12389460112899541854858398437 5e-01L,  5.35811237758025527000427246093 8e-01L,
246 5.58599315118044614791870117187 5e-01L,  5.80756353447213768959045410156 2e-01L,
247 6.02287346031516790390014648437 5e-01L,  6.23199329711496829986572265625 0e-01L,
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249 6.82316554710268974304199218750 0e-01L,  7.00854407856240868568420410156 2e-01L,
250 7.18829994450062513351440429688 e-01L,  7.36257428769022226336181640625 e-01L,
251 7.53151280805468559265136718750 0e-01L,  7.69526480231434106826782226562 5e-01L,
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255 9.42000040318816900253295898437 5e-01L,  9.62994330562651157379150390625 0e-01L,
256 9.82793723233044174914550781250 e-01L,  1.00148313539102673530578613281 2e+00L,
257 1.01914134388789534568786621093 8e+00L,  1.03584125265479087829589843750 0e+00L,
258 1.05165021214634180068969726562 5e+00L,  1.06663036486133933067321777343 8e+00L,
259 1.08083900054116831088715672921719978590 03e+00L,
```

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1.42889927187934517860412597656 2e+00L,  1.43373015243560075759887695312 5e+00L,
1.43824479449540376663208007812 5e+00L,  1.44247309910133481025695800781 2e+00L,
1.44644133187830448150634765625 0e+00L,
#endif
};
static const long double TBL_atan_lol[] = {
#if defined(__sparc)
1.40748691976280638023172028204143100395 56e-36L,
-4.95969615947399255557304394379996752955 05e-36L,
8.95277456251946488739312134463618494727 88e-36L,
1.18804374232078957181807658435449655894 27e-35L,
-2.78102781120451453784253751282343653814 48e-37L,
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-4.21695614005481987328703848018496398638 29e-36L,
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-9.95157454051267235544523672981286051863 05e-36L,
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-5.09608468199455143678470639236625071367 21e-36L,
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7.99772028257934352894348136008904942561 12e-36L,
-8.05778407733621390548484923406273096453 05e-35L,
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-3.92126267767860743839161884989558286349 47e-35L,
-7.83403973963778672558644945685940883786 48e-35L,
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-2.31654194515821533263839447562209004543 30e-35L,
-1.84283125815253194093993020370321111384 3e-35L,
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5.59510735636014654981992094784 8e-11L,  1.67393003574768499970746962376 9e-11L,
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2.27810579602964930421908805549 7e-11L,  3.58637125690207712369330282319 1e-13L,
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```

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393 3.676555884905046507598141175404e-11L,  4.881564068032948912761478588710e-11L,
394 4.416715404487185607337693704681e-11L,  2.314128999621257979016734983553e-11L,
395 5.380138283056477968352133002913e-11L,  4.393022562414389595406841771063e-11L,
396 6.299816718559209976839402028537e-12L,  7.304511413053165996581483735843e-11L,
397 1.978381648117426221467592544212e-10L,  2.024381732686578226139414070989e-10L,
398 2.255178211796380992141612703464e-10L,  1.204566302442290648452508620986e-10L,
399 1.034473912921080457667329099995e-10L,  2.225691010059030834353745950874e-10L,
400 4.817137162794350606107263804151e-11L,  6.565755971506095086327587326326e-11L,
401 1.644791039522307629611529931429e-10L,  2.820930388953087163050126809014e-11L,
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403 1.567258302596026515190288816001e-10L,  1.742241535800378094231540188685e-10L,
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415 1.746932950084818923507049088298e-11L,  2.837781909176306820465786987027e-10L,
416 3.859312847318946163435901230778e-10L,  4.601335192895268187473357720101e-10L,
417 2.811262558622337888849804940684e-10L,  4.060360843532416964489955306249e-10L,
418 8.058369357752989796958168458531e-11L,  3.725546414244147566166855921414e-10L,
419 1.040286509953292907344053122733e-10L,  3.094968093808145773271362531155e-10L,
420 4.454811192340438979284756311844e-10L,  5.676678748199027602705574110388e-11L,
421 2.518376833121948163898128509842e-10L,  3.907837370041422778250991189943e-10L,
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424 4.161925466840049254333079881002e-10L,  4.265713490956410156084891599630e-10L,
425 2.437693664320585461575989523716e-10L,  4.466519138542116247357297503086e-10L,
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427 2.818831329324169810481585538618e-12L,  7.767009768334052125229252512543e-12L,
428 3.698307026936191862258804165254e-10L,
429 #endif
430 };

431 /*
432  * mx_atanl(x, err)
433  * Table look-up algorithm
434  * By K.C. Ng, March 9, 1989
435  *
436  * Algorithm.
437  *
438  * The algorithm is based on atan(x)=atan(y)+atan((x-y)/(1+x*y)).
439  * We use poly1(x) to approximate atan(x) for x in [0,1/8] with
440  * error (relative)
441  *      |(atan(x)-poly1(x))/x|<= 2^-140
442  *
443  * and use poly2(x) to approximate atan(x) for x in [0,1/65] with
444  * error
445  *      |atan(x)-poly2(x)|<= 2^-143.7
446  *
447  * Here poly1 and poly2 are odd polynomial with the following form:
448  *              x + x^3*(a1+x^2*(a2+...))
449  *
450  * (0). Purge off Inf and NaN and 0
451  * (1). Reduce x to positive by atan(x) = -atan(-x).
452  * (2). For x <= 1/8, use
453  *      (2.1) if x < 2^(-prec/2), atan(x) =  x  with inexact flag raised
454  *      (2.2) Otherwise
455  *              atan(x) = poly1(x)
456  * (3). For x >= 8 then (prec = 78)
457  *
```



```
458  *      (3.1) if x >= 2^prec,     atan(x) = atan(inf) - pio2_lo
459  *      (3.2) if x >= 2^(prec/3), atan(x) = atan(inf) - 1/x
460  *      (3.3) if x >  65,         atan(x) = atan(inf) - poly2(1/x)
461  *      (3.4) Otherwise,          atan(x) = atan(inf) - poly1(1/x)
462  *
463  * (4). Now x is in (0.125, 8)
464  *      Find y that match x to 4.5 bit after binary (easy).
465  *      If iy is the high word of y, then
466  *              single : j = (iy - 0x3e000000) >> 19
467  *              double : j = (iy - 0x3fc00000) >> 16
468  *              quad   : j = (iy - 0x3ffc0000) >> 12
469  *
470  *      Let s = (x-y)/(1+x*y). Then
471  *      atan(x) = atan(y) + poly1(s)
472  *              = _TBL_atan_hi[j] + (_TBL_atan_lo[j] + poly2(s) )
473  *
474  *      Note. |s| <= 1.5384615385e-02 = 1/65. Maxium occurs at x = 1.03125
475  *
476  */

477 /*
478  * p[0] - p[16] for atan(x) =
479  *              x + x^3*(p1+x^2*(p2+...))
480  */
481 static const long double pe[] = {
482         1.0L,
483         0.0L,
484 #if defined(__sparc)
485         -0.33333333333333332870740406406184774823L,
486         -4.62592926927148558508441072595508240609e-18L,
487         0.19999999999999999972244424384371086489 4L,
488         2.77555756156289124602047010782090464486e-18L,
489         -0.14285714285714285615158658515611023176L,
490         -9.91270557700756738621231719241800559409e-19L,
491 #elif defined(__x86)
492         -0.33333333325572311878204345703125L,
493         -7.76102145512898763020833333192787755766644373e-11L,
494         0.19999999995343387126922607421875L,
495         4.65661287307739257812498949613909375938538636e-11L,
496         -0.14285714284051209688186645507812 5L,
497         -1.66307602609906877787419703858463013035681375e-11L,
498 #endif
499 };

500 static const long double p[] = { /* p[0] - p[16] */
501         1.0L,
502         -3.33333333333333333333333333333333333319278775586e-0001L,
503         1.99999999999999999999999999999989496139093760 1e-0001L,
504         -1.42857142857142857142857142856866970385846301312e-0001L,
505         1.11111111111111111111111107428990944159544277 38e-0001L,
506         -9.09090909090909090908797270701554923195142180 6e-0002L,
507         7.69230769230769230767699003016385628597359717046e-0002L,
508         -6.66666666666666661138427634952912280252265752 59e-0002L,
509         5.88235294117646915706902204947653640091126695962e-0002L,
510         -5.26315789473657016886225044679594035524579379810e-0002L,
511         4.76190476186633969331771169790375592681525481267e-0002L,
512         -4.34782608290146274616081389793141896576997370161e-0002L,
513         3.99999968161267722260103962788865225205057218988e-0002L,
514         -3.70368536844778256320786172745225703228683638328e-0002L,
515         3.44752320396524479494062858284036892703898522150e-0002L,
516         -3.20491216046653214683721787768133605912334280 81e-0002L,
517         2.67632651033434456758550618122802167256870856514e-0002L,
518 };

519 /* q[0] - q[9] */
520 static const long double qe[] = {
```

```
524         1.0L,
525         0.0L,
526 #if defined(__sparc)
527         -0.33333333333333333287074040640618477482348680496215820312 5L,
528         -4.62592926927148558506934546547120731253186871463421763 0e-18L,
529         0.19999999999999999972244424384371086489409208297729492187 5L,
530         2.77555756156288642682605539129568136219772203591346675 60e-18L,
531 #elif defined(__x86)
532         -0.33333333325572311878204345703125L,
533         -7.76102145512898763020833330421351509278 93e-11L,
534         0.19999999995343387126922607421875L,
535         4.65661287307739257812450757669762210686305 8e-11L,
536 #endif
537 };

539 static const long double q[] = {        /* q[0] - q[9] */
540         -3.33333333333333333333333333333333333330421351509 4e-0001L,
541         1.99999999999999999999999999999999950757669762210 77e-0001L,
542         -1.42857142857142857142857142570379604317921113079e-0001L,
543         1.11111111111111111111029238619009791279782140 77e-0001L,
544         -9.09090909090909089586854075816999506863320031460e-0002L,
545         7.69230769230756334929213246003824644696974730368e-0002L,
546         -6.66666665891924339744020135089121381681335798 56e-0002L,
547         5.88235013696778007696800252045588307023299350858e-0002L,
548         -5.25754959898164576495303840687699583228444695685e-0002L,
549 };

551 static const long double
552 two8700  = 9.14033843895506765900208849270 1e+2618L, /* 2^8700 */
553 twom8700 = 1.09405139282164366805143659376 0e-2619L, /* 2^-8700 */
554 one   = 1.0L,
555 zero  = 0.0L,
556 pi    = 3.14159265358979323846264338327950288419716939937 51L,
557 pio2  = 1.57079632679489661923132169163975144209858469968755L,
558 pio4  = 0.78539816339744830961566084581987572104929234984377 6L,
559 pi3o4 = 2.35619449019234492884698253745962716314787704953132 9L,
560 #if defined(__sparc)
561 pi_lo    = 8.67181013012378102479704402604335196876232e-35L,
562 pio2_lo  = 4.33590506506189051239852201302167598438116e-35L,
563 pio4_lo  = 2.16795253253094525619926100651083799219058e-35L,
564 pi3o4_lo = 6.50385759759283576859778301953251397657174e-35L;
565 #elif defined(__x86)
566 pi_lo    = -5.01655761266833202355732708e-20L,
567 pio2_lo  = -2.50827880633416601177866354e-20L,
568 pio4_lo  = -1.25413940316708300588933177e-20L,
569 pi3o4_lo = -9.18342907192877118770525931e-20L;
570 #endif

572 static long double
573 mx_atanl(long double x, long double *err) {
574         long double y, z, r, s, t, w, s_h, s_l, x_h, x_l, zz[3], ee[2], z_h,
575                 z_l, r_h, r_l, u, v;
576         int ix, iy, hx, i, j;
577         float fx;

579         hx = HI_XWORD(x);
580         ix = hx & (~0x80000000);

582         /* for |x| < 1/8 */
583         if (ix < 0x3ffc0000) {
584                 if (ix < 0x3ff30000) {  /* when |x| < 2**-12 */
585                         if (ix < 0x3fc60000) {  /* if |x| < 2**-prec/2 */
586                                 *err = (long double) ((int) x);
587                                 return (x);
588                         }
589                         z = x * x;
```



```
590                         t = q[8];
591                         for (i = 7; i >= 0; i--) t = q[i] + z * t;
592                         t *= x * z;
593                         r = x + t;
594                         *err = t - (r - x);
595                         return (r);
596                 }
597                 z = x * x;

599                 /* use long double precision at p4 and on */
600                 t = p[16];
601                 for (i = 15; i >= 4; i--) t = p[i] + z * t;
602                 ee[0] = z * t;

604                 x_h = x;  HALF(x_h);
605                 z_h = z;  HALF(z_h);
606                 x_l = x - x_h;
607                 z_l = (x_h * x_h - z_h);
608                 zz[0] = z;
609                 zz[1] = z_h;
610                 zz[2] = z_l + x_l * (x + x_h);

612                 /* compute (1+z*(p1+z*(p2+z*(p3+e)))) */

614                 mx_polyl(zz, pe, ee, 3);

616                 /* finally x*(1+z*(p1+...)) */
617                 r = x_h * ee[0];
618                 t = x * ee[1] + x_l * ee[0];
619                 s = t + r;
620                 *err = t - (s - r);
621                 return (s);
622         }
623         /* for |x| >= 8.0 */
624         if (ix >= 0x40020000) { /* x >=  8 */
625                 x = fabsl(x);
626                 if (ix >= 0x402e0000) { /* x >=  2**47 */
627                         if (ix >= 0x408b0000) { /* x >=  2**140 */
628                                 y = -pio2_lo;
629                         } else
630                                 y = one / x - pio2_lo;
631                         if (hx >= 0) {
632                                 t = pio2 - y;
633                                 *err = -(y - (pio2 - t));
634                         } else {
635                                 t = y - pio2;
636                                 *err = y - (pio2 + t);
637                         }
638                         return (t);
639                 } else {
640                         /* compute r = 1/x */
641                         r = one / x;
642                         z = r * r;
643                         x_h = x; HALF(x_h);
644                         r_h = r; HALF(r_h);
645                         z_h = z; HALF(z_h);
646                         r_l = r * ((x_h - x) * r_h - (x_h * r_h - one));
647                         z_l = (r_h * r_h - z_h);
648                         zz[0] = z;
649                         zz[1] = z_h;
650                         zz[2] = z_l + r_l * (r + r_h);
651                         if (ix < 0x40050400) {  /* 8 <  x <  65 */
652                                 /* use double precision at p4 and on */
653                                 t = p[16];
654                                 for (i = 15; i >= 4; i--) t = p[i] + z * t;
655                                 ee[0] = z * t;
```

```
656                             /* compute (1+z*(p1+z*(p2+z*(p3+e)))) */
657                             mx_polyl(zz, pe, ee, 3);
658                     } else { /* x < 65 < 2**47 */
659                             /* use long double at q3 and on */
660                             t = q[8];
661                             for (i = 7; i >= 2; i--) t = q[i] + z * t;
662                             ee[0] = z * t;
663                             /* compute (1+z*(q1+z*(q2+e))) */
664                             mx_polyl(zz, qe, ee, 2);
665                     }
666                     /* pio2 - r*(1+...) */
667                     v = r_h * ee[0];
668                     t = pio2_lo - (r * ee[1] + r_l * ee[0]);
669                     if (hx >= 0) {
670                             s = pio2 - v;
671                             t -= (v - (pio2 - s));
672                     } else {
673                             s = v - pio2;
674                             t = -(t - (v - (s + pio2)));
675                     }
676                     w = s + t;
677                     *err = t - (w - s);
678                     return (w);
679             }
680         }
681         /* now x is between 1/8 and 8 */
682         iy = (ix + 0x00000800) & 0x7ffff000;
683         j = (iy - 0x3ffc0000) >> 12;
684         ((int *) &fx)[0] = 0x3e000000 + (j << 19);
685         y = (long double) fx;
686         x = fabsl(x);

688         w = (x - y);
689         v = 1.0L / (one + x * y);
690         s = w * v;
691         z = s * s;
692         /* use long double precision at q3 and on */
693         t = q[8];
694         for (i = 7; i >= 2; i--) t = q[i] + z * t;
695         ee[0] = z * t;
696         s_h = s; HALF(s_h);
697         z_h = z; HALF(z_h);
698         x_h = x; HALF(x_h);
699         t = one + x * y; HALF(t);
700         r = -((x_h - x) * y - (x_h * y - (t - one)));
701         s_l = -v * (s_h * r - (w - s_h * t));
702         z_l = (s_h * s_h - z_h);
703         zz[0] = z;
704         zz[1] = z_h;
705         zz[2] = z_l + s_l * (s + s_h);
706         /* compute (1+z*(q1+z*(q2+e))) by call mx_poly */
707         mx_polyl(zz, qe, ee, 2);
708         v = s_h * ee[0];
709         t = TBL_atan_lol[j] + (s * ee[1] + s_l * ee[0]);
710         u = TBL_atan_hil[j];
711         s = u + v;
712         t += (v - (s - u));
713         w = s + t;
714         *err = t - (w - s);
715         if (hx < 0) {
716                 w = -w;
717                 *err = -*err;
718         }
719         return (w);
720 }
```



```
722 long double
723 __k_atan2l(long double y, long double x, long double *w) {
724         long double t, xh, th, t1, t2, w1, w2;
725         int ix, iy, hx, hy;

727         hy = HI_XWORD(y);
728         hx = HI_XWORD(x);
729         iy = hy & ~0x80000000;
730         ix = hx & ~0x80000000;

732         *w = 0.0;
733         if (ix >= 0x7fff0000 || iy >= 0x7fff0000) {     /* ignore inexact */
734                 if (isnanl(x) || isnanl(y))
735                         return (x * y);
736                 else if (iy < 0x7fff0000) {
737                         if (hx >= 0) {  /* ATAN2(+-finite, +inf) is +-0 */
738                                 *w *= y;
739                                 return (*w);
740                         } else {        /* ATAN2(+-finite, -inf) is +-pi */
741                                 *w = copysignl(pi_lo, y);
742                                 return (copysignl(pi, y));
743                         }
744                 } else if (ix < 0x7fff0000) {
745                                         /* ATAN2(+-inf, finite) is +-pi/2 */
746                         *w = (hy >= 0)? pio2_lo : -pio2_lo;
747                         return ((hy >= 0)? pio2 : -pio2);
748                 } else if (hx > 0) {    /* ATAN2(+-INF,+INF) = +-pi/4 */
749                         *w = (hy >= 0)? pio4_lo : -pio4_lo;
750                         return ((hy >= 0)? pio4 : -pio4);
751                 } else {                /* ATAN2(+-INF,-INF) = +-3pi/4 */
752                         *w = (hy >= 0)? pi3o4_lo : -pi3o4_lo;
753                         return ((hy >= 0)? pi3o4 : -pi3o4);
754                 }
755         } else if (x == zero || y == zero) {
756                 if (y == zero) {
757                         if (hx >= 0) /* ATAN2(+-0, +(0 <= x <= inf)) is +-0 */
758                                 return (y);
759                         else {  /* ATAN2(+-0, -(0 <= x <= inf)) is +-pi */
760                                 *w = (hy >= 0)? pi_lo : -pi_lo;
761                                 return ((hy >= 0)? pi : -pi);
762                         }
763                 } else { /* ATAN2(+-(anything but 0 and NaN), 0) is +-pi/2 */
764                         *w = (hy >= 0)? pio2_lo : -pio2_lo;
765                         return ((hy >= 0)? pio2 : -pio2);
766                 }
767         } else if (iy - ix > 0x00640000) { /* |x/y| < 2 ** -100 */
768                 *w = (hy >= 0)? pio2_lo : -pio2_lo;
769                 return ((hy >= 0)? pio2 : -pio2);
770         } else if (ix - iy > 0x00640000) { /* |y/x| < 2 ** -100 */
771                 if (hx < 0) {
772                         *w = (hy >= 0)? pi_lo : -pi_lo;
773                         return ((hy >= 0)? pi : -pi);
774                 } else {
775                         t = y / x;
776                         th = t; HALF(th);
777                         xh = x; HALF(xh);
778                         t1 = (x - xh) * t + xh * (t - th);
779                         t2 = y - xh * th;
780                         *w = (t2 - t1) / x;
781                         return (t);
782                 }
783         } else {
784                 if (ix >= 0x5fff3000) {
785                         x *= twom8700;
786                         y *= twom8700;
787                 } else if (ix < 0x203d0000) {
```

```
788                         x *= two8700;
789                         y *= two8700;
790                 }
791                 y = fabsl(y);
792                 x = fabsl(x);
793                 t = y / x;
794                 th = t; HALF(th);
795                 xh = x; HALF(xh);
796                 t1 = (x - xh) * t + xh * (t - th);
797                 t2 = y - xh * th;
798                 w1 = mx_atanl(t, &w2);
799                 w2 += (t2 - t1) / (x + y * t);
800                 if (hx < 0) {
801                         t1 = pi - w1;
802                         t2 = pi - t1;
803                         w2 = (pi_lo - w2) - (w1 - t2);
804                         w1 = t1;
805                 }
806                 *w = (hy >= 0)? w2 : -w2;
807                 return ((hy >= 0)? w1 : -w1);
808         }
809 }
```

```
**********************************************************
    5524 Sat May 10 12:09:24 2014
new/usr/src/lib/libm/common/complex/k_cexp.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/* INDENT OFF */
/*
 * double __k_cexp(double x, int *n);
 * Returns the exponential of x in the form of 2**n * y, y=__k_cexp(x,&n).
 *
 * Method
 *   1. Argument reduction:
 *      Reduce x to an r so that |r| <= 0.5*ln2 ~ 0.34658.
 *      Given x, find r and integer k such that
 *
 *               x = k*ln2 + r,  |r| <= 0.5*ln2.
 *
 *      Here r will be represented as r = hi-lo for better
 *      accuracy.
 *
 *   2. Approximation of exp(r) by a special rational function on
 *      the interval [0,0.34658]:
 *      Write
 *          R(r**2) = r*(exp(r)+1)/(exp(r)-1) = 2 + r*r/6 - r**4/360 + ...
 *      We use a special Remez algorithm on [0,0.34658] to generate
 *      a polynomial of degree 5 to approximate R. The maximum error
 *      of this polynomial approximation is bounded by 2**-59. In
 *      other words,
 *          R(z) ~ 2.0 + P1*z + P2*z**2 + P3*z**3 + P4*z**4 + P5*z**5
 *      (where z=r*r, and the values of P1 to P5 are listed below)
 *      and
 *          |                    5          |     -59
 *          | 2.0+P1*z+...+P5*z   -  R(z) | <= 2
 *          |                               |
 *      The computation of exp(r) thus becomes
 *                             2*r
```



```
 *              exp(r) = 1 + -------
 *                             R - r
 *                                 r*R1(r)
 *                       = 1 + r + ----------- (for better accuracy)
 *                                 2 - R1(r)
 *      where
 *                                  2       4            10
 *              R1(r) = r - (P1*r  + P2*r  + ... + P5*r   ).
 *
 *   3. Return n = k and __k_cexp = exp(r).
 *
 * Special cases:
 *      exp(INF) is INF, exp(NaN) is NaN;
 *      exp(-INF) is 0, and
 *      for finite argument, only exp(0)=1 is exact.
 *
 * Range and Accuracy:
 *      When |x| is really big, say |x| > 50000, the accuracy
 *      is not important because the ultimate result will over or under
 *      flow. So we will simply replace n = 50000 and r = 0.0. For
 *      moderate size x, according to an error analysis, the error is
 *      always less than 1 ulp (unit in the last place).
 *
 * Constants:
 * The hexadecimal values are the intended ones for the following
 * constants. The decimal values may be used, provided that the
 * compiler will convert from decimal to binary accurately enough
 * to produce the hexadecimal values shown.
 */
/* INDENT ON */

#include "libm.h"               /* __k_cexp */
#include "complex_wrapper.h"    /* HI_WORD/LO_WORD */

/* INDENT OFF */
static const double
one = 1.0,
two128 = 3.40282366920938463463e+38,
halF[2] = {
        0.5, -0.5,
},
ln2HI[2] = {
        6.93147180369123816490e-01,     /* 0x3fe62e42, 0xfee00000 */
        -6.93147180369123816490e-01,    /* 0xbfe62e42, 0xfee00000 */
},
ln2LO[2] = {
        1.90821492927058770002e-10,     /* 0x3dea39ef, 0x35793c76 */
        -1.90821492927058770002e-10,    /* 0xbdea39ef, 0x35793c76 */
},
invln2 = 1.44269504088896338700e+00,    /* 0x3ff71547, 0x652b82fe */
P1 = 1.66666666666666019037e-01,        /* 0x3FC55555, 0x5555553E */
P2 = -2.77777777770155933842e-03,       /* 0xBF66C16C, 0x16BEBD93 */
P3 = 6.61375632143793436117e-05,        /* 0x3F11566A, 0xAF25DE2C */
P4 = -1.65339022054652515390e-06,       /* 0xBEBBBD41, 0xC5D26BF1 */
P5 = 4.13813679705723846039e-08;        /* 0x3E663769, 0x72BEA4D0 */
/* INDENT ON */

double
__k_cexp(double x, int *n) {
        double hi = 0.0L, lo = 0.0L, c, t;
        int k, xsb;
        unsigned hx, lx;

        hx = HI_WORD(x);        /* high word of x */
        lx = LO_WORD(x);        /* low word of x */
        xsb = (hx >> 31) & 1;   /* sign bit of x */
```

```
127         hx &= 0x7fffffff;       /* high word of |x| */

129         /* filter out non-finite argument */
130         if (hx >= 0x40e86a00) { /* if |x| > 50000 */
131                 if (hx >= 0x7ff00000) {
132                         *n = 1;
133                         if (((hx & 0xfffff) | lx) != 0)
134                                 return (x + x); /* NaN */
135                         else
136                                 return ((xsb == 0) ? x : 0.0);
137                                                         /* exp(+-inf)={inf,0} */
138                 }
139                 *n = (xsb == 0) ? 50000 : -50000;
140                 return (one + ln2LO[1] * ln2LO[1]);     /* generate inexact */
141         }

143         *n = 0;
144         /* argument reduction */
145         if (hx > 0x3fd62e42) {  /* if  |x| > 0.5 ln2 */
146                 if (hx < 0x3FF0A2B2) {  /* and |x| < 1.5 ln2 */
147                         hi = x - ln2HI[xsb];
148                         lo = ln2LO[xsb];
149                         k = 1 - xsb - xsb;
150                 } else {
151                         k = (int) (invln2 * x + halF[xsb]);
152                         t = k;
153                         hi = x - t * ln2HI[0];
154                                         /* t*ln2HI is exact for t<2**20 */
155                         lo = t * ln2LO[0];
156                 }
157                 x = hi - lo;
158                 *n = k;
159         } else if (hx < 0x3e300000) {   /* when |x|<2**-28 */
160                 return (one + x);
161         } else
162                 k = 0;

164         /* x is now in primary range */
165         t = x * x;
166         c = x - t * (P1 + t * (P2 + t * (P3 + t * (P4 + t * P5))));
167         if (k == 0)
168                 return (one - ((x * c) / (c - 2.0) - x));
169         else {
170                 t = one - ((lo - (x * c) / (2.0 - c)) - hi);
171                 if (k > 128) {
172                         t *= two128;
173                         *n = k - 128;
174                 } else if (k > 0) {
175                         HI_WORD(t) += (k << 20);
176                         *n = 0;
177                 }
178                 return (t);
179         }
180 }
```

```
**********************************************************
   10291 Sat May 10 12:09:24 2014
new/usr/src/lib/libm/common/complex/k_cexpl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/* INDENT OFF */
/*
 * long double __k_cexpl(long double x, int *n);
 * Returns the exponential of x in the form of 2**n * y, y=__k_cexpl(x,&n).
 *
 *      1. Argument Reduction: given the input x, find r and integer k
 *         and j such that
 *                    x = (32k+j)*ln2 + r,  |r| <= (1/64)*ln2 .
 *
 *      2. expl(x) = 2^k * (2^(j/32) + 2^(j/32)*expm1(r))
 *         Note:
 *         a. expm1(r) = (2r)/(2-R), R = r - r^2*(t1 + t2*r^2)
 *         b. 2^(j/32) is represented as
 *                       exp2_32_hi[j]+exp2_32_lo[j]
 *         where
 *              exp2_32_hi[j] = 2^(j/32) rounded
 *              exp2_32_lo[j] = 2^(j/32) - exp2_32_hi[j].
 *
 * Special cases:
 *      expl(INF) is INF, expl(NaN) is NaN;
 *      expl(-INF)=  0;
 *      for finite argument, only expl(0)=1 is exact.
 *
 * Accuracy:
 *      according to an error analysis, the error is always less than
 *      an ulp (unit in the last place).
 *
 * Misc. info.
 *      When |x| is really big, say |x| > 1000000, the accuracy
 *      is not important because the ultimate result will over or under
 *      flow. So we will simply replace n = 1000000 and r = 0.0. For
```



```
 *      moderate size x, according to an error analysis, the error is
 *      always less than 1 ulp (unit in the last place).
 *
 * Constants:
 * Only decimal values are given. We assume that the compiler will convert
 * from decimal to binary accurately enough to produce the correct
 * hexadecimal values.
 */
/* INDENT ON */

#include "libm.h"               /* __k_cexpl */
#include "complex_wrapper.h"    /* HI_XWORD */

/* INDENT OFF */
/* ln2/32 = 0.021660849392498290919288503795568017752359379198757976691271 3 */
#if defined(__x86)
static const long double
                        /* 43 significant bits, 21 trailing zeros */
ln2_32hi = 2.16608493924965728183451574295759201049804687 5e-2L,
ln2_32lo = 1.71810094334636599209764737891044875797669127 13e-15L;
static const long double exp2_32_hi[] = {       /* exp2_32[j] = 2^(j/32) */
        1.00000000000000000000000000e+00L,
        1.02189714865411667 82081522e+00L,
        1.04427378242741384 02382006e+00L,
        1.06714040067682361 81297224e+00L,
        1.09050773266525765 91003302e+00L,
        1.11438674259589253 62894369e+00L,
        1.13878863475669165 36971221e+00L,
        1.16372485877757751 37938619e+00L,
        1.18920711500272106 66875674e+00L,
        1.21524735998046887 80476325e+00L,
        1.24185781207348404 85256747e+00L,
        1.26905095719173322 24885722e+00L,
        1.29683955465100966 59215822e+00L,
        1.32523664315974129 45939118e+00L,
        1.35425554693689272 82668852e+00L,
        1.38390988196383195 48151403e+00L,
        1.41421356237309504 87637881e+00L,
        1.44518080697704662 00253470e+00L,
        1.47682614593949931 13155431e+00L,
        1.50916442759342273 97133885e+00L,
        1.54221082540794082 35859630e+00L,
        1.57598084510788648 64006862e+00L,
        1.61049033194925430 80837174e+00L,
        1.64575547815396484 45110730e+00L,
        1.68179283050742908 60378350e+00L,
        1.71861929812247791 56032914e+00L,
        1.75625216037329948 31094730e+00L,
        1.79470907500310718 64148413e+00L,
        1.83400808640934246 33989166e+00L,
        1.87416763411029990 13002103e+00L,
        1.91520656139714729 38202589e+00L,
        1.95714412417540026 89657438e+00L,
};
static const long double exp2_32_lo[] = {
        0.00000000000000000000000000e+00L,
        2.63279656671808825 69382524e-20L,
        8.37658635218951911 29661899e-20L,
        3.97987057774545042 49209575e-20L,
        1.06680465966515586 40993042e-19L,
        1.93760098472853604 48117114e-20L,
        6.70818194561129537 51277576e-21L,
        1.97116805026291864 62729727e-20L,
        2.99325844384495236 89104569e-20L,
        6.88877541530391094 11061914e-20L,
        6.80027187412253789 42847820e-20L,
```

```
        6.5846917376975403439742349e-20L,
        1.2171958727511372194876001e-20L,
        3.5625253228704087115438260e-20L,
        3.1129551559077560956309179e-20L,
        5.7519192396164779846216492e-20L,
        3.7900651177865141593101239e-20L,
        1.1659262405698741798080115e-20L,
        7.1364385105284695967172478e-20L,
        5.2631003710812203588788949e-20L,
        2.6328853788732632868460580e-20L,
        5.4583950085438242788190141e-20L,
        9.5803254376938269960718656e-20L,
        7.6837733983874245823512279e-21L,
        2.4415965910835093824202087e-20L,
        2.6052966871016580981769728e-20L,
        2.6876456344632553875309579e-21L,
        1.2861930155613700201703279e-20L,
        8.8166633394037485606572294e-20L,
        2.9788615389580190940837037e-20L,
        5.2352341619805098677422139e-20L,
        5.2578463064010463732242363e-20L,
};
#else   /* sparc */
static const long double
                        /* 0x3FF962E4 2FEFA39E F35793C7 00000000 */
ln2_32hi = 2.16608493924982909192884985859245151568 8e-2L,
ln2_32lo = 5.20964350259547565278265415750118673177 9e-27L;
static const long double exp2_32_hi[] = {       /* exp2_32[j] = 2^(j/32) */
        1.0000000000000000000000000000000000000000e+0000L,
        1.0218971486541166782344801347832994397 82e+0000L,
        1.0442737824274138403219664787399290087 85e+0000L,
        1.0671404006768236181695211209928091626 07e+0000L,
        1.0905077326652576592070106557607079789 93e+0000L,
        1.1143867425958925363088129569196030678 00e+0000L,
        1.1387886347566916537038302838415112547 20e+0000L,
        1.1637248587775775138135735990921853123 43e+0000L,
        1.1892071150027210667174999705604759152 93e+0000L,
        1.2152473599804688781165202513387984576 24e+0000L,
        1.2418578120734840485936774687265956055 11e+0000L,
        1.2690509571917332225544190810323380047 15e+0000L,
        1.2968395546510096659337541177924511598 35e+0000L,
        1.3252366431597412946295370954987216741 13e+0000L,
        1.3542555469368927282980147401407028043 43e+0000L,
        1.3839098819638319548726595272651928180 02e+0000L,
        1.4142135623730950488016887242096980785 70e+0000L,
        1.4451808069770466200370062414716709056 78e+0000L,
        1.4768261459394993113869074803740499239 24e+0000L,
        1.5091644275934227397660195510331935314 20e+0000L,
        1.5422108254079408236122918620907348413 07e+0000L,
        1.5759808451078864864552701601819050089 06e+0000L,
        1.6104903319492543081795206673574005834 59e+0000L,
        1.6457554781539648445187567247258224456 67e+0000L,
        1.6817928305074290860622509524664297900 80e+0000L,
        1.7186192981224779156293443764563125045 16e+0000L,
        1.7562521603732994831121606193753132212 94e+0000L,
        1.7947090750031071864277032421277818143 54e+0000L,
        1.8340080864093424634870831895882888560 77e+0000L,
        1.8741676341102999013299989499544465344 39e+0000L,
        1.9152065613971472938726112702958308878 50e+0000L,
        1.9571441241754002690183222516268714911 90e+0000L,
};

static const long double exp2_32_lo[] = {
        +0.0000000000000000000000000000000000000000e+0000L,
        +1.8050678742033095474557333305457378646 51e-0035L,
        -9.3745202922804274219575674197308321438 43e-0035L,
```



```
        -1.5969684472927587707129096302314999712 33e-0035L,
        +9.1124934101250229785116861016724866621 19e-0035L,
        -6.5042282069785482872303747752593887109 85e-0035L,
        -8.1484688445258511373256917674881553236 05e-0035L,
        -5.0662145767218003133723307451429033509 63e-0035L,
        -1.3598309746888169737498756382459191189 24e-0035L,
        +9.4974276355631964703077105664332465971 09e-0035L,
        -3.2831705231769986016150659653339152619 32e-0036L,
        -5.0172357093871904102901865304584289508 62e-0035L,
        -2.3914747976891091716228343016026401392 58e-0035L,
        -8.3505713576339088152988907379440838530 80e-0036L,
        +7.0367568890732650424217371906718764407 29e-0035L,
        -5.1824848530646464575368930185669561898 17e-0035L,
        +9.4222425486218320656921167363940648797 58e-0035L,
        -3.9675008253988623091673061302164182811 03e-0035L,
        +7.1435289915633006145232736150927672435 21e-0035L,
        +1.1598712528679851242465178341004443277 47e-0035L,
        +4.6969334783581154953097392132018744666 85e-0035L,
        -3.3865131759950047107992419849998191651 97e-0035L,
        -8.5873187742982470688686559351038744535 22e-0035L,
        -9.6059515487493505031854993622460690888 35e-0035L,
        +9.6097339321280127845075586971417858136 55e-0035L,
        +6.3783979214400284392447614497808485459 57e-0035L,
        +7.7924307856958642494564611251692777011 77e-0035L,
        +7.3613377675884565241319308366339321950 88e-0035L,
        -6.4729951479133472300352145756121705252 66e-0035L,
        +8.5874744179536986942787980622952296242 07e-0035L,
        +2.3718154228251748356916512283026909779 51e-0035L,
        -3.0268916820961187730045973734219003142 56e-0037L,
};
#endif

static const long double
        one = 1.0L,
        two = 2.0L,
        ln2_64 = 1.0830424696249145459644251897784008985 68e-2L,
        invln2_32 = 4.6166241308446829035517589792060548396 5e+1L;

/* rational approximation coeffs for [-(ln2)/64,(ln2)/64] */
static const long double
        t1 =  1.6666666666666666666666666666608763873 7e-1L,
        t2 = -2.7777777777777777777777078120931734787 56e-3L,
        t3 =  6.6137566137566134820742803269328742212 02424e-5L,
        t4 = -1.6534391533921399541696098227422358511 20e-6L,
        t5 =  4.1753148517695397513878521166109737960 53e-8L;
/* INDENT ON */

long double
__k_cexpl(long double x, int *n) {
        int hx, ix, j, k;
        long double t, r;

        *n = 0;
        hx = HI_XWORD(x);
        ix = hx & 0x7fffffff;
        if (hx >= 0x7fff0000)
                return (x + x); /* NaN of +inf */
        if (((unsigned) hx) >= 0xffff0000)
                return (-one / x);      /* NaN or -inf */
        if (ix < 0x3fc30000)
                return (one + x);       /* |x|<2^-60 */
        if (hx > 0) {
                if (hx > 0x401086a0) {  /* x > 200000 */
                        *n = 200000;
                        return (one);
                }
```

```
259                 k = (int) (invln2_32 * (x + ln2_64));
260         } else {
261                 if (ix > 0x401086a0) {  /* x < -200000 */
262                         *n = -200000;
263                         return (one);
264                 }
265                 k = (int) (invln2_32 * (x - ln2_64));
266         }
267         j = k & 0x1f;
268         *n = k >> 5;
269         t = (long double) k;
270         x = (x - t * ln2_32hi) - t * ln2_32lo;
271         t = x * x;
272         r = (x - t * (t1 + t * (t2 + t * (t3 + t * (t4 + t * t5))))) - two;
273         x = exp2_32_hi[j] - ((exp2_32_hi[j] * (x + x)) / r - exp2_32_lo[j]);
274         k >>= 5;
275         if (k > 240) {
276                 XFSCALE(x, 240);
277                 *n -= 240;
278         } else if (k > 0) {
279                 XFSCALE(x, k);
280                 *n = 0;
281         }
282         return (x);
283 }
```

```
**********************************************************
   15329 Sat May 10 12:09:24 2014
new/usr/src/lib/libm/common/complex/k_clog_r.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

#include "libm.h"               /* __k_clog_r */
#include "complex_wrapper.h"

/* INDENT OFF */
/*
 * double __k_clog_r(double x, double y, double *e);
 *
 * Compute real part of complex natural logarithm of x+iy in extra precision
 *
 * __k_clog_r returns log(hypot(x, y)) with a correction term e.
 *
 * Accuracy: 70 bits
 *
 * Method.
 * Let Z = x*x + y*y.  Z can be normalized as Z = 2^N * z,  1 <= z < 2.
 * We further break down z into 1 + zk + zh + zt, where
 *      zk = K*(2^-7) matches z to 7.5 significant bits, 0 <= K <= 2^(-7)-1
 *      zh = (z-zk) rounded to 24 bits
 *      zt = (z-zk-zh) rounded.
 *
 *          z - (1+zk)        (zh+zt)
 * Let s = ------------ = ---------------, then
 *          z + (1+zk)     2(1+zk)+zh+zt
 *                                                    z
 * log(Z) = N*log2 + log(z) = N*log2 + log(1+zk) + log(------)
 *                                                   1+zk
 *                                  1+s
 *         = N*log2 + log(1+zk) + log(---)
 *                                  1-s
 *                                   1     3    1     5
 *       = N*log2 + log(1+zk) + 2s + -- (2s)  + -- (2s)  + ...
 *                                   12         80
```



```
 *
 * Note 1. For IEEE double precision,  a seven degree odd polynomial
 *              2s + P1*(2s)^3 + P2*(2s)^5 + P3*(2s)^7
 *         is generated by a special remez algorithm to
 *         approx log((1+s)/(1-s)) accurte to 72 bits.
 * Note 2. 2s can be computed accurately as s2h+s2t by
 *         r = 2/((zh+zt)+2(1+zk))
 *         s2 = r*(zh+zt)
 *         s2h = s2 rounded to float;  v = 0.5*s2h;
 *         s2t = r*((((zh-s2h*(1+zk))-v*zh)+zt)-v*zt)
 */
/* INDENT ON */

static const double
zero  = 0.0,
half  = 0.5,
two   = 2.0,
two120 = 1.32922799578491587290e+36,  /* 2^120 */
ln2_h  = 6.93147180369123816490e-01,  /* 3fe62e42 fee00000 */
ln2_t  = 1.90821492927058770002e-10,  /* 3dea39ef 35793c76 */
P1 =  .08333333333333335155410871737798620222476526219125,
P2 =  .01249999999819227552330700574633767185896464873834375,
P3 =  .00223219384586456566054715599875125162347022842872656 25;

/*
* T[2k, 2k+1] = log(1+k*2^-7) for k = 0, ..., 2^7 - 1,
* with T[2k] * 2^40 is an int
*/

static const double TBL_log1k[] = {
0.00000000000000000000e+00,  0.00000000000000000000e+00,
7.78214044203195953742e-03,  2.29894100462035112076e-14,
1.55041865355087793432e-02,  4.56474807636434698847e-13,
2.31670592811497044750e-02,  3.84673753843363762372e-13,
3.07716586667083902285e-02,  4.52981425779092882775e-14,
3.83188643018002039753e-02,  3.36395218465265063278e-13,
4.58095360309016541578e-02,  3.92549008891706208826e-13,
5.32445145181554835290e-02,  6.56799336898521766515e-13,
6.06246218158048577607e-02,  6.29984819938331143924e-13,
6.79506619080711971037e-02,  4.36552908562952819 46e-13,
7.52234212368421140127e-02,  7.45411685916941618656e-13,
8.24436692109884461388e-02,  8.61451293608781447223e-14,
8.96121586893059429713e-02,  3.81189648692113819551e-13,
9.67296264579999842681e-02,  5.51128027471986918274e-13,
1.03796793680885457434e-01,  7.58107392301637643358e-13,
1.10814366339582193177e-01,  7.07921017612766061755e-13,
1.17783035655520507134e-01,  8.62947404296943765415e-13,
1.24703478500123310369e-01,  8.33925494898414856118e-13,
1.31576357788617315236e-01,  1.01957352237084734958e-13,
1.38402322858382831328e-01,  7.36304357708705134617e-13,
1.45182009843665582594e-01,  8.32314688404647202319e-13,
1.51916042025732167531e-01,  1.09807540998552379211e-13,
1.58605030175749561749e-01,  8.89022343972466269900e-13,
1.65249572894936136436e-01,  3.71026439894104998399e-13,
1.71850256926518341061e-01,  1.40881279371111350341e-13,
1.78407657472234859597e-01,  5.83437522462346671423e-13,
1.84922338493379356805e-01,  6.32635858668445232946e-13,
1.91394852999110298697e-01,  5.19155912393432989209e-13,
1.97825743329303804785e-01,  6.16075577558872326221e-13,
2.04215541428311553318e-01,  3.79338185766902218086e-13,
2.10564769106895255391e-01,  4.54382278998146218219e-13,
2.16873938300523150247e-01,  9.12093724991498410553e-14,
2.23143551314024080057e-01,  1.85675709597960106615e-13,
2.29374101064422575291e-01,  4.23254700234549300166e-13,
2.35566071311950508971e-01,  8.16400106820959292914e-13,
2.41719936886511277407e-01,  6.33890736899755317832e-13,
```

```
128 2.4783616390413953922 7e-01,  4.4171755371315546656 6e-13,
129 2.5391520998073247028 5e-01,  2.3097385217586939489 2e-13,
130 2.5995752443668607156 7e-01,  2.3999540484211735346 5e-13,
131 2.6596354849698400357 7e-01,  1.5393776174455407568 1e-13,
132 2.7193371548310096841 3e-01,  5.4079041861455149741 1e-13,
133 2.7786845100308710243 6e-01,  3.6920375082080088702 7e-13,
134 2.8376817312982893781 7e-01,  8.1566052953629127578 2e-13,
135 2.8963329258294834289 7e-01,  9.4333981895126903084 6e-14,
136 2.9546421289342106320 0e-01,  4.1481318704258567983 0e-13,
137 3.0126133057729020947 6e-01,  8.7157153697083510373 9e-13,
138 3.0702503529482783051 2e-01,  8.4031563047924245575 8e-14,
139 3.1275571000333002302 8e-01,  5.6686535829007390092 2e-13,
140 3.1845373111809749389 1e-01,  4.3712191957429144427 8e-13,
141 3.2411946865340723888 9e-01,  8.0473720118516277451 5e-13,
142 3.2975328637166967382 7e-01,  7.9830798787733502411 2e-13,
143 3.3535554192076233448 5e-01,  3.7549577257259855717 4e-13,
144 3.4092658697045408189 3e-01,  1.3912841212197565935 8e-13,
145 3.4646767346100823488 6e-01,  1.0775743037572640454 6e-13,
146 3.5197642315688426606 4e-01,  2.9391859187648000773 0e-13,
147 3.5745588892132218461 5e-01,  4.8158961117232053948 9e-13,
148 3.6290549368914071237 7e-01,  2.2774076114039556198 6e-13,
149 3.6832556115859915735 2e-01,  1.0849569622967912150 6e-13,
150 3.7371640979290532413 9e-01,  6.7875668231587061658 2e-13,
151 3.7907835293481184635 3e-01,  1.5761203773969435028 7e-13,
152 3.8441169891029858263 2e-01,  3.3457102695440823738 0e-14,
153 3.8971675113953097024 9e-01,  4.9424312113856702491 1e-13,
154 3.9499380824054242111 7e-01,  3.2655698896907145695 6e-13,
155 4.0024316412655025487 8e-01,  4.6245205166840379283 3e-13,
156 4.0546510810781910549 8e-01,  3.4527647952039770874 4e-13,
157 4.1065992498442938085 6e-01,  8.3900507785183073413 9e-13,
158 4.1582789514359319582 6e-01,  1.1776978751369214188 9e-13,
159 4.2096929464332788484 2e-01,  8.0175128715683245807 9e-13,
160 4.2608439531068142969 2e-01,  2.1863343292159103190 6e-13,
161 4.3117346481813001446 4e-01,  2.4132639491333131489 4e-13,
162 4.3623676677452749572 7e-01,  3.9057462209830702226 5e-13,
163 4.4127456080423144158 0e-01,  6.4378790973732068968 4e-13,
164 4.4628710262804816011 3e-01,  3.7135141919592021322 9e-13,
165 4.5127464413872075965 6e-01,  7.3782548841210396805 8e-13,
166 4.5623743348096468253 1e-01,  6.2291185019378470474 8e-13,
167 4.6117571512149879708 9e-01,  6.7136927913846011451 3e-13,
168 4.6608972992453345796 1e-01,  6.5766597685800614752 8e-14,
169 4.7097971521816361928 4e-01,  6.2739326331111559842 4e-13,
170 4.7584590486985689494 8e-01,  1.0701931762114254920 9e-13,
171 4.8068852934557071421 3e-01,  1.8119346366441111472 9e-13,
172 4.8550781578160240314 9e-01,  9.8404652782326269550 1e-14,
173 4.9030398804461583495 1e-01,  5.7800319894540276937 6e-13,
174 4.9507726679712504847 0e-01,  7.2646612821251152829 5e-13,
175 4.9982786955570190912 1e-01,  7.4742070020547871229 3e-13,
176 5.0455601075191225390 9e-01,  4.8303314949553202230 0e-13,
177 5.0926190178961405763 4e-01,  1.9388917004910708894 3e-13,
178 5.1394575110134610440 6e-01,  8.8821239518571854472 0e-13,
179 5.1860776420744514325 6e-01,  6.0048889664054576120 1e-13,
180 5.2324814376424910733 5e-01,  2.9872918204441328673 1e-13,
181 5.2786708962048578541 7e-01,  3.5659969663347829809 2e-13,
182 5.3246479886911401990 8e-01,  3.5782396591276383762 1e-13,
183 5.3704146589643642073 5e-01,  4.4723383175748246894 6e-13,
184 5.4159728243212157394 7e-01,  6.2279762917225152564 9e-13,
185 5.4613243759740726091 0e-01,  7.2838947272065736298 7e-13,
186 5.5064711795239418279 4e-01,  2.6809646615211672363 6e-13,
187 5.5514150753970170626 4e-01,  7.9988645131233547947 0e-13,
188 5.5961578793539956677 7e-01,  2.3119493838005377632 0e-14,
189 5.6407013828447816195 0e-01,  3.2480412171993574072 9e-13,
190 5.6850473535178025485 9e-01,  8.8845721926148331771 6e-13,
191 5.7291975356110924622 0e-01,  6.7626287231705415466 7e-13,
192 5.7731365034337446559 6e-01,  4.8615775889150903384 2e-13,
193 5.8169173963415232719 9e-01,  4.7015532207554981178 0e-13,
```



```
194 5.8604904500316479243 3e-01,  4.1341647073835564335 7e-13,
195 5.9038744660210795700 6e-01,  6.8417636415914665909 5e-14,
196 5.9470710774621693417 4e-01,  4.7585534004430637633 3e-13,
197 5.9900818964524660259 5e-01,  8.3679678674757693814 5e-13,
198 6.0329085143803240498 5e-01,  5.1857355306341828604 2e-14,
199 6.0755525022432266268 9e-01,  2.1913281229340091773 1e-13,
200 6.1180154110570583725 3e-01,  2.8706627640861676833 1e-13,
201 6.1602987721471436088 9e-01,  7.9965875851854397745 1e-13,
202 6.2024040975120442453 8e-01,  6.5310431377633653417 7e-13,
203 6.2443328801145980833 1e-01,  4.3369271155582052973 3e-13,
204 6.2860865942184318555 5e-01,  5.3095218911835779011 5e-13,
205 6.3276666957062843721 4e-01,  4.0939233218678665639 2e-13,
206 6.3690746223619498778 1e-01,  8.7424383914858288855 7e-13,
207 6.4103117942067910917 1e-01,  2.5218188456842881423 1e-13,
208 6.4513796137271128827 7e-01,  8.7341338816870267024 6e-13,
209 6.4922794662470550974 8e-01,  4.0430914253011920980 5e-13,
210 6.5330127201195864472 5e-01,  7.8699403323355322579 7e-13,
211 6.5735807270812074421 0e-01,  2.3928593215343764513 5e-13,
212 6.6139848224520392250 3e-01,  1.6108575753932458515 6e-13,
213 6.6542263254450517706 6e-01,  5.8527188436251511269 7e-13,
214 6.6943065394207224017 0e-01,  5.5702712879388029460 0e-13,
215 6.7342267521144094644 1e-01,  7.2577385816637653180 4e-13,
216 6.7739882359092007391 2e-01,  8.8606898134949155668 4e-13,
217 6.8135922480723820626 7e-01,  6.6486268071468700626 4e-13,
218 6.8530400309828110039 2e-01,  6.3831615170646517165 7e-13,
219 6.8923328123855753801 8e-01,  2.5144230728376074661 1e-13,
220 };

222 /*
223  * Compute N*log2 + log(1+zk+zh+zt) in extra precision
224  */
225 static double k_log_NKz(int N, int K, double zh, double *zt)
226 {
227         double y, r, w, s2, s2h, s2t, t, zk, v, P;

229         ((int *)&zk)[HIWORD] = 0x3ff00000 + (K << 13);
230         ((int *)&zk)[LOWORD] = 0;
231         t  = zh + (*zt);
232         r = two / (t + two * zk);
233         s2h = s2 = r * t;
234         ((int *)&s2h)[LOWORD] &= 0xe0000000;
235         v = half * s2h;
236         w = s2 * s2;
237         s2t = r * ((((zh - s2h * zk) - v * zh) + (*zt)) - v * (*zt));
238         P = s2t + (w * s2) * ((P1 + w * P2) + (w * w) * P3);
239         P += N * ln2_t + TBL_log1k[K + K + 1];
240         t = N*ln2_h + TBL_log1k[K+K];
241         y = t + (P + s2h);
242         P -= ((y - t) - s2h);
243         *zt = P;
244         return (y);
245 }

247 double
248 __k_clog_r(double x, double y, double *er)
249 {
250         double t1, t2, t3, t4, tk, z, wh, w, zh, zk;
251         int n, k, ix, iy, iz, nx, ny, nz, i, j;
252         unsigned lx, ly;

254         ix = (((int *)&x)[HIWORD]) & ~0x80000000;
255         lx = ((unsigned *)&x)[LOWORD];
256         iy = (((int *)&y)[HIWORD]) & ~0x80000000;
257         ly = ((unsigned *)&y)[LOWORD];
258         y = fabs(y); x = fabs(x);
259         if (ix < iy || (ix == iy && lx < ly)) {         /* force x >= y */
```

```
260                 tk = x;  x = y;   y = tk;
261                 n = ix, ix = iy; iy = n;
262                 n = lx, lx = ly; ly = n;
263         }
264         *er = zero;
265         nx = ix >> 20; ny = iy >> 20;
266         if (nx >= 0x7ff) {      /* x or y is Inf or NaN */
267                 if (ISINF(ix, lx))
268                         return (x);
269                 else if (ISINF(iy, ly))
270                         return (y);
271                 else
272                         return (x+y);
273         }
274 /*
275  * for tiny y (double y < 2^-35, extended y < 2^-46, quad y < 2^-70):
276  *      log(sqrt(1+y^2)) = (y^2)/2 - (y^4)/8 + ... ~= (y^2)/2
277  */
278         if ((((ix - 0x3ff00000) | lx) == 0) && ny < (0x3ff - 35))  {
279                 t2 = y * y;
280                 if (ny >= 565) {        /* compute er = tail of t2 */
281                         ((int *)&wh)[HIWORD] =  iy;
282                         ((unsigned *)&wh)[LOWORD] = ly & 0xf8000000;
283                         *er = half * ((y - wh) * (y + wh) - (t2 - wh * wh));
284                 }
285                 return (half * t2);
286         }
287 /*
288  * x or y is subnormal or zero
289  */
290         if (nx == 0) {
291                 if ((ix | lx) == 0)
292                         return (-1.0 / x);
293                 else {
294                         x *= two120;
295                         y *= two120;
296                         ix = ((int *)&x)[HIWORD];
297                         lx = ((unsigned *)&x)[LOWORD];
298                         iy = ((int *)&y)[HIWORD];
299                         ly = ((unsigned *)&y)[LOWORD];
300                         nx = (ix >> 20) - 120;
301                         ny = (iy >> 20) - 120;
302                         /* guard subnormal flush to 0 */
303                         if ((ix | lx) == 0)
304                                 return (-1.0 / x);
305                 }
306         } else if (ny == 0) {   /* y subnormal, scale it */
307                 y *= two120;
308                 iy = ((int *)&y)[HIWORD];
309                 ly = ((unsigned *)&y)[LOWORD];
310                 ny = (iy >> 20) - 120;
311         }
312         n = nx - ny;
313 /*
314  * return log(x) when y is zero or x >> y so that
315  * log(x) ~ log(sqrt(x*x+y*y)) to 27 extra bits
316  * (n > 62 for double, 78 for i386 extended, 122 for quad)
317  */
318         if (n > 62 || (iy | ly) == 0) {
319                 i = (0x000fffff & ix) | 0x3ff00000;     /* normalize x */
320                 ((int *)&x)[HIWORD] = i;
321                 i += 0x1000;
322                 ((int *)&zk)[HIWORD] = i & 0xffffe000;
323                 ((int *)&zk)[LOWORD] = 0;  /* zk matches 7.5 bits of x */
324                 z = x - zk;
325                 zh = (double)((float)z);
```



```
326                 i >>= 13;
327                 k = i & 0x7f;   /* index of zk */
328                 n = nx - 0x3ff;
329                 *er = z - zh;
330                 if (i >> 17) {  /* if zk = 2.0, adjust scaling */
331                         n += 1;
332                         zh *= 0.5;  *er *= 0.5;
333                 }
334                 w = k_log_NKz(n, k, zh, er);
335         } else {
336 /*
337  * compute z = x*x + y*y
338  */
339                 ix = (ix & 0xfffff) | 0x3ff00000;
340                 iy = (iy & 0xfffff) | (0x3ff00000 - (n << 20));
341                 ((int *)&x)[HIWORD] = ix; ((int *)&y)[HIWORD] = iy;
342                 t1 = x * x; t2 = y * y;
343                 j = ((lx >> 26) + 1) >> 1;
344                 ((int *)&wh)[HIWORD] = ix + (j >> 5);
345                 ((unsigned *)&wh)[LOWORD] = (j << 27);
346                 z = t1+t2;
347 /*
348  * higher precision simulation x*x = t1 + t3, y*y = t2 + t4
349  */
350                 tk = wh - x;
351                 t3 = tk * tk - (two * wh * tk - (wh * wh - t1));
352                 j = ((ly >> 26) + 1) >> 1;
353                 ((int *)&wh)[HIWORD] = iy + (j >> 5);
354                 ((unsigned *)&wh)[LOWORD] = (j << 27);
355                 tk = wh - y;
356                 t4 = tk * tk - (two * wh * tk - (wh * wh - t2));
357 /*
358  * find zk matches z to 7.5 bits
359  */
360                 nx -= 0x3ff;
361                 iz = ((int *)&z)[HIWORD] + 0x1000;
362                 k = (iz >> 13) & 0x7f;
363                 nz = (iz >> 20) - 0x3ff;
364                 ((int *)&zk)[HIWORD] = iz & 0xffffe000;
365                 ((int *)&zk)[LOWORD] = 0;
366 /*
367  * order t1,t2,t3,t4 according to their size
368  */
369                 if (t2 >= fabs(t3)) {
370                         if (fabs(t3) < fabs(t4)) {
371                                 wh = t3;  t3 = t4; t4 = wh;
372                         }
373                 } else {
374                         wh = t2; t2 = t3; t3 = wh;
375                 }
376 /*
377  * higher precision simulation: x * x + y * y = t1 + t2 + t3 + t4
378  * = zk (7 bits) + zh (24 bits) + *er (tail) and call k_log_NKz
379  */
380                 tk = t1 - zk;
381                 zh = ((tk + t2) + t3) + t4;
382                 ((int *)&zh)[LOWORD] &= 0xe0000000;
383                 w = fabs(zh);
384                 if (w >= fabs(t2))
385                         *er = (((tk - zh) + t2) + t3) + t4;
386                 else {
387                         if (n == 0) {
388                                 wh = half * zk;
389                                 wh = (t1 - wh) - (wh - t2);
390                         } else
391                                 wh = tk + t2;
```

```
392                         if (w >= fabs(t3))
393                                 *er = ((wh - zh) + t3) + t4;
394                         else {
395                                 z = t3;
396                                 t3 += t4;
397                                 t4 -= t3 - z;
398                                 if (w >= fabs(t3))
399                                         *er = ((wh - zh) + t3) + t4;
400                                 else
401                                         *er = ((wh + t3) - zh) + t4;
402                         }
403                 }
404                 if (nz == 3) {zh *= 0.125; *er *= 0.125; }
405                 if (nz == 2) {zh *= 0.25; *er *= 0.25; }
406                 if (nz == 1) {zh *= half; *er *= half; }
407                 nz += nx + nx;
408                 w = half * k_log_NKz(nz, k, zh, er);
409                 *er *= half;
410         }
411         return (w);
412 }
```

```
**********************************************************
   22566 Sat May 10 12:09:24 2014
new/usr/src/lib/libm/common/complex/k_clog_rl.c
14071:dece9aafe99a - fix build problems on sparc
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include "libm.h"               /* __k_clog_rl */
#include "complex_wrapper.h"
#include "longdouble.h"

/* INDENT OFF */
/*
 * long double __k_clog_rl(long double x, long double y, long double *e);
 *
 * Compute real part of complex natural logarithm of x+iy in extra precision
 *
 * __k_clog_rl returns log(hypot(x, y)) with a correction term e.
 *
 * Accuracy: quad 140 bits, intel extended 91 bits.
 *
 * Method.
 * Assume X > Y >= 0 . Let X = 2**nx * x, Y = 2**nx * y, where 1 <= x < 2.
 * Let Z = X*X + Y*Y.  Then Z = 2**(nx+nx) * z, where z = x*x + y*y.
 * Note that z < 8.
 * Let Z = x*x + y*y.  Z can be normalized as Z = 2**N * z,  1 <= z < 2.
 * We further break down z into 1 + zk + zh + zt, where
 *      zk = K*(2**-7) matches z to 7.5 significant bits, 0 <= K <= 2**(-7)-1
 *      zh = (z-zk) rounded to half of the current significant bits
 *      zt = (z-zk-zh) rounded.
 *
 *         z - (1+zk)           (zh+zt)
 * Let s = ------------ = ---------------, then
 *         z + (1+zk)     2(1+zk)+zh+zt
 *                                                    z
 * log(Z) = N*log2 + log(z) = N*log2 + log(1+zk) + log(------)
 *                                                   1+zk
 *                                      1+s
```



```
 *        = N * log2 + log(1 +zk) + log(---)
 *                                      1-s
 *
 *                                           3             5
 *        = N*log2 + log(1+zk) +  2s +  1/12(2s)    +   1/80(2s)  + ...
 *
 *
 * Note 1. For IEEE double precision,  a fifteen degree odd polynomial
 *              2s + P1*(2s)^3 + P2*(2s)^5 + P3*(2s)^7 + ... + P7*(2s)^15
 *        is generated by a special remez algorithm to
 *        approx log((1+s)/(1-s)) accurte to 145 bits.
 * Note 2. 2s can be computed accurately as s2h+s2t by
 *        r = 2/((zh+zt)+2(1+zk))
 *        s2 = r*(zh+zt)
 *        s2h = s2 rounded to double;  v = 0.5*s2h;
 *        s2t = r*((((zh-s2h*(1+zk))-v*zh)+zt)-v*zt)
 */
/* INDENT ON */

static const long double
zero  = 0.0L,
half  = 0.5L,
two   = 2.0L,
two240 = 1.766847064778384329583297500742918515827483 9e+72L, /* 2^240 */

/* first 48 bits of ln2 */
ln2_h  = 0.693147180559943620892227045260369777679443359375L,
ln2_t  = 1.688525005076197806790396056774985255254120 68e-15L,
P1 = .0833333333333333333333333333333333333341023785768375L,
P2 = .0124999999999999999999999999999967908540207576615937 5L,
P3 = .0022321428571428571428571433100920476212844905646718 75L,
P4 = .0004340277777777777777474678131926487241315695651210 9375L,
P5 = .0000887784090909101756336594019277185263940665468935546875L,
P6 = .0000187800480555896398953609278346283712683547784465332031 25L,
P7 = .0000040692278543289829213667360034588380310871536354064941 40625L;

/*
 * T[2k, 2k+1] = log(1+k*2**-7) for k = 0, ..., 2**7 - 1,
 * with T[2k] * 2^48 is an int
 */

static const long double TBL_log1k[] = {
0.0000000000000000000000000000000000000000e+00L,
0.0000000000000000000000000000000000000000e+00L,
7.7821404420532758194894995540380477905273e-03L,
1.6731279734005070987158875984584325351222e-15L,
1.5504186535963526694104075431823730468750e-02L,
1.7274567499706106231054091184928671990316e-15L,
2.3167059281533397552266251295804977416992e-02L,
9.8067653290966648493916241687661877474892e-16L,
3.0771658666751022792595904320478439331055e-02L,
2.6655784323032762937247606420524589813624e-15L,
3.8318864302134159061097307130694389343262e-02L,
2.4401326580179931029010027013316092332340e-15L,
4.5809536031292452662455616518855094909668e-02L,
1.7505042236510958082472042641283104263139e-15L,
5.3244514518809182845870964229106903076172e-02L,
3.1000199992295574218738634002122149891138e-15L,
6.0624621816433688081815489567816257476807e-02L,
1.1544987906424726040058093958345197512800e-15L,
6.7950661908504628172522643581032752990723e-02L,
3.1212220426341915966610439115772728417386e-15L,
7.5223421237584631171557703055441379547119e-02L,
2.8945270476369282210350897509258766743153e-15L,
8.2443669211073711267090402543544769287109e-02L,
8.8000106966612476303662698634483335676886e-16L,
```

```
126 8.96121586896860833348910091444848996795654e-02L,
127 1.04928506046023399953198953111517407992226e-15L,
128 9.67296264585506548883131472393870353695873e-02L,
129 4.57407257909248076401645167072446208706662e-16L,
130 1.03796793681642185447344672866165637969970e-01L,
131 1.37937871713089780905033660501742398222054e-15L,
132 1.10814366340289183199274702928960323333374e-01L,
133 9.30995531466394251604764733623800860369190e-16L,
134 1.17783035656380263844766886904835700988770e-01L,
135 3.19069402722256568600407971118131466908900e-15L,
136 1.24703478500954645369347417727112770080570e-01L,
137 2.59049405909765375049841104692141938900520e-15L,
138 1.31576357788716791219485457986593246459960e-01L,
139 2.48136923067070288991599179110121005672190e-15L,
140 1.38402322859118243059128872118890285491940e-01L,
141 8.92626197001482758901901215717089720003800e-16L,
142 1.45182009844496917594369733706116676330570e-01L,
143 9.79687565330034447647192010509116364800250e-16L,
144 1.51916042025838748941168887540698051452640e-01L,
145 3.22613063453735618645987494711192130180106e-15L,
146 1.58605030176637740169098833575844764709470e-01L,
147 8.43924272341049996810536219803948279987350e-16L,
148 1.65249572895305618658312596380710601806640e-01L,
149 1.54421729885289652971192259482705797461010e-15L,
150 1.71850256926656896894201054237782955169680e-01L,
151 2.32544589789181736430976570098948311327390e-15L,
152 1.78407657472817504640261176973581314086910e-01L,
153 7.92479139064537360654267769125209420368960e-16L,
154 1.84922338494011739840061636641621589660640e-01L,
155 2.52823841956017628031345146246107741260200e-16L,
156 1.91394852999628994894010247662663459777830e-01L,
157 4.59715288559898645413669207312977292692280e-16L,
158 1.97825743329918424251445685513317584991460e-01L,
159 1.45611112638568364388408380275265671915270e-15L,
160 2.04215541428688140968006337061524391174320e-01L,
161 2.75053581404913471488103942628409193770090e-15L,
162 2.10564769107346450027762330137193202972410e-01L,
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6.89233281238806227975146612152457237243650e-01L,
2.75234976772566214666598914164040536238320e-15L,
};

/*
 * Compute N*log2 + log(1+zk+zh+zt) in extra precision
 */
static long double k_log_NKzl(int N, int K, long double zh, long double *zt)
{
        long double y, r, w, s2, s2h, s2t, t, zk, v, P;
        double dzk;

#if !defined(__x86)
        unsigned lx, ly;
        int j;
#endif

        ((int *)&dzk)[HIWORD] = 0x3ff00000 + (K << 13);
        ((int *)&dzk)[LOWORD] = 0;
        t  = zh + (*zt);
        zk = (long double) dzk;
        r = two / (t + two * zk);
        s2h = s2 = r * t;
/* split s2 into correctly rounded half */

#if defined(__x86)
                ((unsigned *)&s2h)[0] = 0;      /* 32 bits chopped */
#else

                lx = ((unsigned *)&s2h)[2];     /* 56 bits rounded */
                j  = ((lx >> 24) + 1) >> 1;
                ((unsigned *)&s2h)[2] = (j << 25);
                lx = ((unsigned *)&s2h)[1];
                ly = lx + (j >> 7);
```

```
390                 ((unsigned *)&s2h)[1] = ly;
391                 ((unsigned *)&s2h)[0] += (ly == 0 && lx != 0);
392                 ((unsigned *)&s2h)[3] = 0;
393 #endif

395         v = half * s2h;
396         w = s2 * s2;
397         s2t = r * ((((zh - s2h * zk) - v * zh) + (*zt)) - v * (*zt));
398         P = s2t + (w * s2) * ((P1 + w * P2) + (w * w) * ((P3 + w * P4)
399                 + (w * w) * (P5 + w * P6 + (w * w) * P7)));
400         P += N * ln2_t + TBL_log1k[K + K + 1];
401         t = N*ln2_h + TBL_log1k[K+K];
402         y = t + (P + s2h);
403         P -= ((y - t) - s2h);
404         *zt = P;
405         return (y);
406 }

408 long double
409 __k_clog_rl(long double x, long double y, long double *er)
410 {
411         long double t1, t2, t3, t4, tk, z, wh, w, zh, zk;
412         int n, k, ix, iy, iz, nx, ny, nz, i;
413         double dk;

415 #if !defined(__x86)
416         int j;
417         unsigned lx, ly;
418 #endif

420         ix = HI_XWORD(x) & ~0x80000000;
421         iy = HI_XWORD(y) & ~0x80000000;
422         y = fabsl(y); x = fabsl(x);
423         if (ix < iy || (ix < 0x7fff0000 && ix == iy && x < y)) {
424                 /* force x >= y */
425                 tk = x;  x = y;   y = tk;
426                 n = ix, ix = iy; iy = n;
427         }
428         *er = zero;
429         nx = ix >> 16; ny = iy >> 16;
430         if (nx >= 0x7fff) {     /* x or y is Inf or NaN */
431                 if (isinfl(x))
432                         return (x);
433                 else if (isinfl(y))
434                         return (y);
435                 else
436                         return (x+y);
437         }
438 /*
439  * for tiny y:(double y < 2^-35, extended y < 2^-46, quad y < 2^-70)
440  *
441  *      log(sqrt(1 + y**2)) =  y**2 / 2 - y**4 / 8 + ...  =  y**2 / 2
442  */
443 #if defined(__x86)
444         if (x == 1.0L && ny < (0x3fff - 46)) {
445 #else
446         if (x == 1.0L && ny < (0x3fff - 70)) {
447 #endif

449                 t2 = y * y;
450                 if (ny >= 8305) {       /* compute er = tail of t2 */
451                         dk = (double) y;

453 #if defined(__x86)
454                         ((unsigned *)&dk)[LOWORD] &= 0xfffe0000;
455 #endif
```



```
457                         wh = (long double) dk;
458                         *er = half * ((y - wh) * (y + wh) - (t2 - wh * wh));
459                 }
460                 return (half * t2);
461         }
462 /*
463  * x or y is subnormal or zero
464  */
465         if (nx == 0) {
466                 if (x == 0.0L)
467                         return (-1.0L / x);
468                 else {
469                         x *= two240;
470                         y *= two240;
471                         ix = HI_XWORD(x);
472                         iy = HI_XWORD(y);
473                         nx = (ix >> 16) - 240;
474                         ny = (iy >> 16) - 240;
475                         /* guard subnormal flush to 0 */
476                         if (x == 0.0L)
477                                 return (-1.0L / x);
478                 }
479         } else if (ny == 0) {   /* y subnormal, scale it */
480                 y *= two240;
481                 iy = HI_XWORD(y);
482                 ny = (iy >> 16) - 240;
483         }
484         n = nx - ny;
485 /*
486  * When y is zero or when x >> y, i.e.,  n > 62, 78, 122 for DBLE,
487  * EXTENDED, QUAD respectively,
488  * log(x) = log(sqrt(x * x + y * y)) to 27 extra bits.
489  */

491 #if defined(__x86)
492         if (n > 78 || y == 0.0L) {
493 #else
494         if (n > 122 || y == 0.0L) {
495 #endif

497                 XFSCALE(x, (0x3fff - (ix >> 16)));
498                 i = ((ix & 0xffff) + 0x100) >> 9;  /* 7.5 bits of x */
499                 zk = 1.0L + ((long double) i) * 0.0078125L;
500                 z = x - zk;
501                 dk = (double)z;

503 #if defined(__x86)
504                 ((unsigned *)&dk)[LOWORD] &= 0xfffe0000;
505 #endif

507                 zh = (long double)dk;
508                 k = i & 0x7f;   /* index of zk */
509                 n = nx - 0x3fff;
510                 *er = z - zh;
511                 if (i == 0x80) {        /* if zk = 2.0, adjust scaling */
512                         n += 1;
513                         zh *= 0.5L;  *er *= 0.5L;
514                 }
515                 w = k_log_NKzl(n, k, zh, er);
516         } else {
517 /*
518  * compute z = x*x + y*y
519  */
520                 XFSCALE(x, (0x3fff - (ix >> 16)));
521                 XFSCALE(y, (0x3fff - n - (iy >> 16)));
```

```
522                 ix = (ix & 0xffff) | 0x3fff0000;
523                 iy = (iy & 0xffff) | (0x3fff0000 - (n << 16));
524                 nx -= 0x3fff;
525                 t1 = x * x; t2 = y * y;
526                 wh = x;

528 /* split x into correctly rounded half */
529 #if defined(__x86)
530                 ((unsigned *)&wh)[0] = 0;       /* 32 bits chopped */
531 #else
532                 lx = ((unsigned *)&wh)[2];      /* 56 rounded */
533                 j  = ((lx >> 24) + 1) >> 1;
534                 ((unsigned *)&wh)[2] = (j << 25);
535                 lx = ((unsigned *)&wh)[1];
536                 ly = lx + (j >> 7);
537                 ((unsigned *)&wh)[1] = ly;
538                 ((unsigned *)&wh)[0] += (ly == 0 && lx != 0);
539                 ((unsigned *)&wh)[3] = 0;
540 #endif

542                 z = t1+t2;
543 /*
544  * higher precision simulation x*x = t1 + t3, y*y = t2 + t4
545  */
546                 tk = wh - x;
547                 t3 = tk * tk - (two * wh * tk - (wh * wh - t1));
548                 wh = y;

550 /* split y into correctly rounded half */
551 #if defined(__x86)
552                 ((unsigned *)&wh)[0] = 0;       /* 32 bits chopped */
553 #else
554                 ly = ((unsigned *)&wh)[2];      /* 56 bits rounded */
555                 j  = ((ly >> 24) + 1) >> 1;
556                 ((unsigned *)&wh)[2] = (j << 25);
557                 lx = ((unsigned *)&wh)[1];
558                 ly = lx + (j >> 7);
559                 ((unsigned *)&wh)[1] = ly;
560                 ((unsigned *)&wh)[0] += (ly == 0 && lx != 0);
561                 ((unsigned *)&wh)[3] = 0;
562 #endif

564                 tk = wh - y;
565                 t4 = tk * tk - (two * wh * tk - (wh * wh - t2));
566 /*
567  * find zk matches z to 7.5 bits
568  */
569                 iz = HI_XWORD(z);
570                 k = ((iz & 0xffff) + 0x100) >> 9;  /* 7.5 bits of x */
571                 nz = (iz >> 16) - 0x3fff + (k >> 7);
572                 k &= 0x7f;
573                 zk = 1.0L + ((long double) k) * 0.0078125L;
574                 if (nz == 1) zk += zk;
575                 else if (nz == 2) zk *= 4.0L;
576                 else if (nz == 3) zk *= 8.0L;
577 /*
578  * order t1, t2, t3, t4 according to their size
579  */
580                 if (t2 >= fabsl(t3)) {
581                         if (fabsl(t3) < fabsl(t4)) {
582                                 wh = t3;  t3 = t4; t4 = wh;
583                         }
584                 } else {
585                         wh = t2; t2 = t3; t3 = wh;
586                 }
587 /*
```



```
588  * higher precision simulation: x * x + y * y = t1 + t2 + t3 + t4
589  * = zk(7 bits) + zh(24 bits) + *er(tail) and call k_log_NKz
590  */
591                 tk = t1 - zk;
592                 zh = ((tk + t2) + t3) + t4;

594 /* split zh into correctly rounded half */
595 #if defined(__x86)
596                 ((unsigned *)&zh)[0] = 0;
597 #else
598                 ly = ((unsigned *)&zh)[2];
599                 j  = ((ly >> 24) + 1) >> 1;
600                 ((unsigned *)&zh)[2] = (j << 25);
601                 lx = ((unsigned *)&zh)[1];
602                 ly = lx + (j >> 7);
603                 ((unsigned *)&zh)[1] = ly;
604                 ((unsigned *)&zh)[0] += (ly == 0 && lx != 0);
605                 ((unsigned *)&zh)[3] = 0;
606 #endif

608                 w = fabsl(zh);
609                 if (w >= fabsl(t2))
610 {
611                         *er = (((tk - zh) + t2) + t3) + t4;
612 }

614                 else {

616                         if (n == 0) {
617                                 wh = half * zk;
618                                 wh = (t1 - wh) - (wh - t2);
619                         } else
620                                 wh = tk + t2;
621                         if (w >= fabsl(t3))
622                                 *er = ((wh - zh) + t3) + t4;
623                         else {
624                                 z = t3;
625                                 t3 += t4;
626                                 t4 -= t3 - z;
627                                 if (w >= fabsl(t3))
628                                         *er = ((wh - zh) + t3) + t4;
629                                 else
630                                         *er = ((wh + t3) - zh) + t4;
631                         }
632                 }
633                 if (nz == 3) {
634                         zh *= 0.125L; *er *= 0.125L;
635                 } else if (nz == 2) {
636                         zh *= 0.25L; *er *= 0.25L;
637                 } else if (nz == 1) {
638                         zh *= half; *er *= half;
639                 }
640                 nz += nx + nx;
641                 w = half * k_log_NKzl(nz, k, zh, er);
642                 *er *= half;
643         }
644         return (w);
645 }
```

****
1407 Sat May 10 12:09:25 2014
new/usr/src/lib/libm/common/llib-lm
patch01 - 693 import Sun Devpro Math Library
****

```
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/* LINTLIBRARY */
/* PROTOLIB1 */

#undef  __PRAGMA_REDEFINE_EXTNAME
#include <math.h>
#if defined(_STDC_C99)
#undef isnan
extern int isnan(double);
extern int isnand(double);      /* LSARC/2003/670 */
typedef union _h_val {
        unsigned long _i[2];
        double _d;
} _h_val;
extern const _h_val __huge_val;
#endif
#include <fenv.h>
#include <complex.h>
#undef  clog
extern double complex clog(double complex);
```

```
**********************************************************
    5329 Sat May 10 12:09:25 2014
new/usr/src/lib/libm/common/m9x/__fenv_amd64.il
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/
        .inline __fenv_getcwsw,1
        fstsw   (%rdi)
        fstcw   2(%rdi)
        .end

        .inline __fenv_setcwsw,1
        movw    (%rdi),%dx
        movw    2(%rdi),%cx
        subq    $32,%rsp
        fstenv  (%rsp)
        movw    %cx,(%rsp)
        movw    %dx,4(%rsp)
        fldenv  (%rsp)
        fwait
        addq    $32,%rsp
        .end

        .inline __fenv_getmxcsr,1
        stmxcsr (%rdi)
        .end

        .inline __fenv_setmxcsr,1
        ldmxcsr (%rdi)
        .end

        .inline f2xm1,1
        fldt    (%rsp)
        f2xm1
        .end

        .inline fyl2x,2
        fldt    (%rsp)
        fldt    16(%rsp)
        fyl2x
        .end
```



```
        .inline fptan,1
        fldt    (%rsp)
        fptan
        fstpt   (%rsp)
        .end

        .inline fpatan,2
        fldt    (%rsp)
        fldt    16(%rsp)
        fpatan
        .end

        .inline fxtract,1
        fldt    (%rsp)
        fxtract
        .end

        .inline fprem1,2
        fldt    (%rsp)
        fldt    16(%rsp)
        fprem1
        fstp    %st(1)
        .end

        .inline fprem,2
        fldt    (%rsp)
        fldt    16(%rsp)
        fprem
        fstp    %st(1)
        .end

        .inline fyl2xp1,2
        fldt    (%rsp)
        fldt    16(%rsp)
        fyl2xp1
        .end

        .inline fsqrt,1
        fldt    (%rsp)
        fsqrt
        .end

        .inline fsincos,1
        fldt    (%rsp)
        fsincos
        .end

        .inline frndint,1
        fldt    (%rsp)
        frndint
        .end

        .inline fscale,2
        fldt    (%rsp)
        fldt    16(%rsp)
        fscale
        fstp    %st(1)
        .end

        .inline fsin,1
        fldt    (%rsp)
        fsin
        .end

        .inline fcos,1
        fldt    (%rsp)
```

```
128         fcos
129         .end

131         .inline sse_cmpeqss,3
132         movss   (%rdi),%xmm0
133         cmpeqss (%rsi),%xmm0
134         movss   %xmm0,(%rdx)
135         .end

137         .inline sse_cmpltss,3
138         movss   (%rdi),%xmm0
139         cmpltss (%rsi),%xmm0
140         movss   %xmm0,(%rdx)
141         .end

143         .inline sse_cmpless,3
144         movss   (%rdi),%xmm0
145         cmpless (%rsi),%xmm0
146         movss   %xmm0,(%rdx)
147         .end

149         .inline sse_cmpunordss,3
150         movss   (%rdi),%xmm0
151         cmpunordss      (%rsi),%xmm0
152         movss   %xmm0,(%rdx)
153         .end

155         .inline sse_minss,3
156         movss   (%rdi),%xmm0
157         minss   (%rsi),%xmm0
158         movss   %xmm0,(%rdx)
159         .end

161         .inline sse_maxss,3
162         movss   (%rdi),%xmm0
163         maxss   (%rsi),%xmm0
164         movss   %xmm0,(%rdx)
165         .end

167         .inline sse_addss,3
168         movss   (%rdi),%xmm0
169         addss   (%rsi),%xmm0
170         movss   %xmm0,(%rdx)
171         .end

173         .inline sse_subss,3
174         movss   (%rdi),%xmm0
175         subss   (%rsi),%xmm0
176         movss   %xmm0,(%rdx)
177         .end

179         .inline sse_mulss,3
180         movss   (%rdi),%xmm0
181         mulss   (%rsi),%xmm0
182         movss   %xmm0,(%rdx)
183         .end

185         .inline sse_divss,3
186         movss   (%rdi),%xmm0
187         divss   (%rsi),%xmm0
188         movss   %xmm0,(%rdx)
189         .end

191         .inline sse_sqrtss,2
192         sqrtss  (%rdi),%xmm0
193         movss   %xmm0,(%rsi)
```



```
194         .end

196         .inline sse_ucomiss,2
197         movss   (%rdi),%xmm0
198         ucomiss (%rsi),%xmm0
199         .end

201         .inline sse_comiss,2
202         movss   (%rdi),%xmm0
203         comiss  (%rsi),%xmm0
204         .end

206         .inline sse_cvtss2sd,2
207         cvtss2sd        (%rdi),%xmm0
208         movsd   %xmm0,(%rsi)
209         .end

211         .inline sse_cvtsi2ss,2
212         cvtsi2ss        (%rdi),%xmm0
213         movss   %xmm0,(%rsi)
214         .end

216         .inline sse_cvttss2si,2
217         cvttss2si       (%rdi),%ecx
218         movl    %ecx,(%rsi)
219         .end

221         .inline sse_cvtss2si,2
222         cvtss2si        (%rdi),%ecx
223         movl    %ecx,(%rsi)
224         .end

226         .inline sse_cvtsi2ssq,2
227         cvtsi2ssq       (%rdi),%xmm0
228         movss   %xmm0,(%rsi)
229         .end

231         .inline sse_cvttss2siq,2
232         cvttss2siq      (%rdi),%rcx
233         movq    %rcx,(%rsi)
234         .end

236         .inline sse_cvtss2siq,2
237         cvtss2siq       (%rdi),%rcx
238         movq    %rcx,(%rsi)
239         .end

241         .inline sse_cmpeqsd,3
242         movsd   (%rdi),%xmm0
243         cmpeqsd (%rsi),%xmm0
244         movsd   %xmm0,(%rdx)
245         .end

247         .inline sse_cmpltsd,3
248         movsd   (%rdi),%xmm0
249         cmpltsd (%rsi),%xmm0
250         movsd   %xmm0,(%rdx)
251         .end

253         .inline sse_cmplesd,3
254         movsd   (%rdi),%xmm0
255         cmplesd (%rsi),%xmm0
256         movsd   %xmm0,(%rdx)
257         .end

259         .inline sse_cmpunordsd,3
```

```
260         movsd   (%rdi),%xmm0
261         cmpunordsd      (%rsi),%xmm0
262         movsd   %xmm0,(%rdx)
263         .end

265         .inline sse_minsd,3
266         movsd   (%rdi),%xmm0
267         minsd   (%rsi),%xmm0
268         movsd   %xmm0,(%rdx)
269         .end

271         .inline sse_maxsd,3
272         movsd   (%rdi),%xmm0
273         maxsd   (%rsi),%xmm0
274         movsd   %xmm0,(%rdx)
275         .end

277         .inline sse_addsd,3
278         movsd   (%rdi),%xmm0
279         addsd   (%rsi),%xmm0
280         movsd   %xmm0,(%rdx)
281         .end

283         .inline sse_subsd,3
284         movsd   (%rdi),%xmm0
285         subsd   (%rsi),%xmm0
286         movsd   %xmm0,(%rdx)
287         .end

289         .inline sse_mulsd,3
290         movsd   (%rdi),%xmm0
291         mulsd   (%rsi),%xmm0
292         movsd   %xmm0,(%rdx)
293         .end

295         .inline sse_divsd,3
296         movsd   (%rdi),%xmm0
297         divsd   (%rsi),%xmm0
298         movsd   %xmm0,(%rdx)
299         .end

301         .inline sse_sqrtsd,2
302         sqrtsd  (%rdi),%xmm0
303         movsd   %xmm0,(%rsi)
304         .end

306         .inline sse_ucomisd,2
307         movsd   (%rdi),%xmm0
308         ucomisd (%rsi),%xmm0
309         .end

311         .inline sse_comisd,2
312         movsd   (%rdi),%xmm0
313         comisd  (%rsi),%xmm0
314         .end

316         .inline sse_cvtsd2ss,2
317         cvtsd2ss        (%rdi),%xmm0
318         movss   %xmm0,(%rsi)
319         .end

321         .inline sse_cvtsi2sd,2
322         cvtsi2sd        (%rdi),%xmm0
323         movsd   %xmm0,(%rsi)
324         .end
```



```
326         .inline sse_cvttsd2si,2
327         cvttsd2si       (%rdi),%ecx
328         movl    %ecx,(%rsi)
329         .end

331         .inline sse_cvtsd2si,2
332         cvtsd2si        (%rdi),%ecx
333         movl    %ecx,(%rsi)
334         .end

336         .inline sse_cvtsi2sdq,2
337         cvtsi2sdq       (%rdi),%xmm0
338         movsd   %xmm0,(%rsi)
339         .end

341         .inline sse_cvttsd2siq,2
342         cvttsd2siq      (%rdi),%rcx
343         movq    %rcx,(%rsi)
344         .end

346         .inline sse_cvtsd2siq,2
347         cvtsd2siq       (%rdi),%rcx
348         movq    %rcx,(%rsi)
349         .end
```

```
**********************************************************
    6591 Sat May 10 12:09:25 2014
new/usr/src/lib/libm/common/m9x/__fenv_i386.il
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/
        .inline __fenv_getcwsw,1
        movl    (%esp),%eax
        fstsw   (%eax)
        fstcw   2(%eax)
        .end

        .inline __fenv_setcwsw,1
        movl    (%esp),%eax
        movw    (%eax),%dx
        movw    2(%eax),%cx
        subl    $28,%esp
        fstenv  (%esp)
        movw    %cx,(%esp)
        movw    %dx,4(%esp)
        fldenv  (%esp)
        fwait
        addl    $28,%esp
        .end

        .inline __fenv_getmxcsr,1
        movl    (%esp),%eax
        stmxcsr (%eax)
        .end

        .inline __fenv_setmxcsr,1
        movl    (%esp),%eax
        ldmxcsr (%eax)
        .end

        .inline f2xm1,1
        fldt    (%esp)
        f2xm1
        .end

        .inline fyl2x,2
        fldt    (%esp)
```



```
        fldt    12(%esp)
        fyl2x
        .end

        .inline fptan,1
        fldt    (%esp)
        fptan
        fstpt   (%esp)
        .end

        .inline fpatan,2
        fldt    (%esp)
        fldt    12(%esp)
        fpatan
        .end

        .inline fxtract,1
        fldt    (%esp)
        fxtract
        .end

        .inline fprem1,2
        fldt    (%esp)
        fldt    12(%esp)
        fprem1
        fstp    %st(1)
        .end

        .inline fprem,2
        fldt    (%esp)
        fldt    12(%esp)
        fprem
        fstp    %st(1)
        .end

        .inline fyl2xp1,2
        fldt    (%esp)
        fldt    12(%esp)
        fyl2xp1
        .end

        .inline fsqrt,1
        fldt    (%esp)
        fsqrt
        .end

        .inline fsincos,1
        fldt    (%esp)
        fsincos
        .end

        .inline frndint,1
        fldt    (%esp)
        frndint
        .end

        .inline fscale,2
        fldt    (%esp)
        fldt    12(%esp)
        fscale
        fstp    %st(1)
        .end

        .inline fsin,1
        fldt    (%esp)
        fsin
```

```
128         .end

130         .inline fcos,1
131         fldt    (%esp)
132         fcos
133         .end

135         .inline sse_cmpeqss,3
136         movl    (%esp),%eax
137         movl    4(%esp),%edx
138         movl    8(%esp),%ecx
139         movss   (%eax),%xmm0
140         cmpeqss (%edx),%xmm0
141         movss   %xmm0,(%ecx)
142         .end

144         .inline sse_cmpltss,3
145         movl    (%esp),%eax
146         movl    4(%esp),%edx
147         movl    8(%esp),%ecx
148         movss   (%eax),%xmm0
149         cmpltss (%edx),%xmm0
150         movss   %xmm0,(%ecx)
151         .end

153         .inline sse_cmpless,3
154         movl    (%esp),%eax
155         movl    4(%esp),%edx
156         movl    8(%esp),%ecx
157         movss   (%eax),%xmm0
158         cmpless (%edx),%xmm0
159         movss   %xmm0,(%ecx)
160         .end

162         .inline sse_cmpunordss,3
163         movl    (%esp),%eax
164         movl    4(%esp),%edx
165         movl    8(%esp),%ecx
166         movss   (%eax),%xmm0
167         cmpunordss      (%edx),%xmm0
168         movss   %xmm0,(%ecx)
169         .end

171         .inline sse_minss,3
172         movl    (%esp),%eax
173         movl    4(%esp),%edx
174         movl    8(%esp),%ecx
175         movss   (%eax),%xmm0
176         minss   (%edx),%xmm0
177         movss   %xmm0,(%ecx)
178         .end

180         .inline sse_maxss,3
181         movl    (%esp),%eax
182         movl    4(%esp),%edx
183         movl    8(%esp),%ecx
184         movss   (%eax),%xmm0
185         maxss   (%edx),%xmm0
186         movss   %xmm0,(%ecx)
187         .end

189         .inline sse_addss,3
190         movl    (%esp),%eax
191         movl    4(%esp),%edx
192         movl    8(%esp),%ecx
193         movss   (%eax),%xmm0
```



```
194         addss   (%edx),%xmm0
195         movss   %xmm0,(%ecx)
196         .end

198         .inline sse_subss,3
199         movl    (%esp),%eax
200         movl    4(%esp),%edx
201         movl    8(%esp),%ecx
202         movss   (%eax),%xmm0
203         subss   (%edx),%xmm0
204         movss   %xmm0,(%ecx)
205         .end

207         .inline sse_mulss,3
208         movl    (%esp),%eax
209         movl    4(%esp),%edx
210         movl    8(%esp),%ecx
211         movss   (%eax),%xmm0
212         mulss   (%edx),%xmm0
213         movss   %xmm0,(%ecx)
214         .end

216         .inline sse_divss,3
217         movl    (%esp),%eax
218         movl    4(%esp),%edx
219         movl    8(%esp),%ecx
220         movss   (%eax),%xmm0
221         divss   (%edx),%xmm0
222         movss   %xmm0,(%ecx)
223         .end

225         .inline sse_sqrtss,2
226         movl    (%esp),%eax
227         movl    4(%esp),%edx
228         sqrtss  (%eax),%xmm0
229         movss   %xmm0,(%edx)
230         .end

232         .inline sse_ucomiss,2
233         movl    (%esp),%eax
234         movl    4(%esp),%edx
235         movss   (%eax),%xmm0
236         ucomiss (%edx),%xmm0
237         .end

239         .inline sse_comiss,2
240         movl    (%esp),%eax
241         movl    4(%esp),%edx
242         movss   (%eax),%xmm0
243         comiss  (%edx),%xmm0
244         .end

246         .inline sse_cvtss2sd,2
247         movl    (%esp),%eax
248         movl    4(%esp),%edx
249         cvtss2sd        (%eax),%xmm0
250         movsd   %xmm0,(%edx)
251         .end

253         .inline sse_cvtsi2ss,2
254         movl    (%esp),%eax
255         movl    4(%esp),%edx
256         cvtsi2ss        (%eax),%xmm0
257         movss   %xmm0,(%edx)
258         .end
```

```
260         .inline sse_cvttss2si,2
261         movl    (%esp),%eax
262         movl    4(%esp),%edx
263         cvttss2si       (%eax),%ecx
264         movl    %ecx,(%edx)
265         .end

267         .inline sse_cvtss2si,2
268         movl    (%esp),%eax
269         movl    4(%esp),%edx
270         cvtss2si        (%eax),%ecx
271         movl    %ecx,(%edx)
272         .end

274         .inline sse_cmpeqsd,3
275         movl    (%esp),%eax
276         movl    4(%esp),%edx
277         movl    8(%esp),%ecx
278         movsd   (%eax),%xmm0
279         cmpeqsd (%edx),%xmm0
280         movsd   %xmm0,(%ecx)
281         .end

283         .inline sse_cmpltsd,3
284         movl    (%esp),%eax
285         movl    4(%esp),%edx
286         movl    8(%esp),%ecx
287         movsd   (%eax),%xmm0
288         cmpltsd (%edx),%xmm0
289         movsd   %xmm0,(%ecx)
290         .end

292         .inline sse_cmplesd,3
293         movl    (%esp),%eax
294         movl    4(%esp),%edx
295         movl    8(%esp),%ecx
296         movsd   (%eax),%xmm0
297         cmplesd (%edx),%xmm0
298         movsd   %xmm0,(%ecx)
299         .end

301         .inline sse_cmpunordsd,3
302         movl    (%esp),%eax
303         movl    4(%esp),%edx
304         movl    8(%esp),%ecx
305         movsd   (%eax),%xmm0
306         cmpunordsd      (%edx),%xmm0
307         movsd   %xmm0,(%ecx)
308         .end

310         .inline sse_minsd,3
311         movl    (%esp),%eax
312         movl    4(%esp),%edx
313         movl    8(%esp),%ecx
314         movsd   (%eax),%xmm0
315         minsd   (%edx),%xmm0
316         movsd   %xmm0,(%ecx)
317         .end

319         .inline sse_maxsd,3
320         movl    (%esp),%eax
321         movl    4(%esp),%edx
322         movl    8(%esp),%ecx
323         movsd   (%eax),%xmm0
324         maxsd   (%edx),%xmm0
325         movsd   %xmm0,(%ecx)
```



```
326         .end

328         .inline sse_addsd,3
329         movl    (%esp),%eax
330         movl    4(%esp),%edx
331         movl    8(%esp),%ecx
332         movsd   (%eax),%xmm0
333         addsd   (%edx),%xmm0
334         movsd   %xmm0,(%ecx)
335         .end

337         .inline sse_subsd,3
338         movl    (%esp),%eax
339         movl    4(%esp),%edx
340         movl    8(%esp),%ecx
341         movsd   (%eax),%xmm0
342         subsd   (%edx),%xmm0
343         movsd   %xmm0,(%ecx)
344         .end

346         .inline sse_mulsd,3
347         movl    (%esp),%eax
348         movl    4(%esp),%edx
349         movl    8(%esp),%ecx
350         movsd   (%eax),%xmm0
351         mulsd   (%edx),%xmm0
352         movsd   %xmm0,(%ecx)
353         .end

355         .inline sse_divsd,3
356         movl    (%esp),%eax
357         movl    4(%esp),%edx
358         movl    8(%esp),%ecx
359         movsd   (%eax),%xmm0
360         divsd   (%edx),%xmm0
361         movsd   %xmm0,(%ecx)
362         .end

364         .inline sse_sqrtsd,2
365         movl    (%esp),%eax
366         movl    4(%esp),%edx
367         sqrtsd  (%eax),%xmm0
368         movsd   %xmm0,(%edx)
369         .end

371         .inline sse_ucomisd,2
372         movl    (%esp),%eax
373         movl    4(%esp),%edx
374         movsd   (%eax),%xmm0
375         ucomisd (%edx),%xmm0
376         .end

378         .inline sse_comisd,2
379         movl    (%esp),%eax
380         movl    4(%esp),%edx
381         movsd   (%eax),%xmm0
382         comisd  (%edx),%xmm0
383         .end

385         .inline sse_cvtsd2ss,2
386         movl    (%esp),%eax
387         movl    4(%esp),%edx
388         cvtsd2ss        (%eax),%xmm0
389         movss   %xmm0,(%edx)
390         .end
```

```
392         .inline sse_cvtsi2sd,2
393         movl    (%esp),%eax
394         movl    4(%esp),%edx
395         cvtsi2sd        (%eax),%xmm0
396         movsd   %xmm0,(%edx)
397         .end

399         .inline sse_cvttsd2si,2
400         movl    (%esp),%eax
401         movl    4(%esp),%edx
402         cvttsd2si       (%eax),%ecx
403         movl    %ecx,(%edx)
404         .end

406         .inline sse_cvtsd2si,2
407         movl    (%esp),%eax
408         movl    4(%esp),%edx
409         cvtsd2si        (%eax),%ecx
410         movl    %ecx,(%edx)
411         .end
```

****
1154 Sat May 10 12:09:25 2014
new/usr/src/lib/libm/common/m9x/__fenv_sparc.il
patch01 - 693 import Sun Devpro Math Library
****

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  25 !
  26 !
  27         .inline __fenv_getfsr,1
  28         st      %fsr,[%o0]
  29         .end

  31         .inline __fenv_setfsr,1
  32         ld      [%o0],%fsr
  33         .end

  35         .inline __fenv_getfsr32,1
  36         st      %fsr,[%o0]
  37         .end

  39         .inline __fenv_setfsr32,1
  40         ld      [%o0],%fsr
  41         .end
```

****
1157 Sat May 10 12:09:25 2014
new/usr/src/lib/libm/common/m9x/__fenv_sparcv9.il
patch01 - 693 import Sun Devpro Math Library
****

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  25 !
  26 !
  27         .inline __fenv_getfsr,1
  28         stx     %fsr,[%o0]
  29         .end

  31         .inline __fenv_setfsr,1
  32         ldx     [%o0],%fsr
  33         .end

  35         .inline __fenv_getfsr32,1
  36         st      %fsr,[%o0]
  37         .end

  39         .inline __fenv_setfsr32,1
  40         ld      [%o0],%fsr
  41         .end
```

```
**********************************************************
   21518 Sat May 10 12:09:25 2014
new/usr/src/lib/libm/common/m9x/__fex_hdlr.c
patch06 - libm: fixed compilation issues after updates
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
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 */

#include "fenv_synonyms.h"
#undef lint
#include <signal.h>
#include <siginfo.h>
#include <ucontext.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <thread.h>
#include <math.h>
#if defined(__SUNPRO_C)
#include <sunmath.h>
#endif
#include <fenv.h>
#include "fex_handler.h"
#include "fenv_inlines.h"

#if defined(__sparc) && !defined(__sparcv9)
#include <sys/procfs.h>
#endif

/* 2.x signal.h doesn't declare sigemptyset or sigismember
   if they're #defined (see sys/signal.h) */
extern int sigemptyset(sigset_t *);
extern int sigismember(const sigset_t *, int);

/* external globals */
void (*__mt_fex_sync)() = NULL; /* for synchronization with libmtsk */
#pragma weak __mt_fex_sync
```



```
#ifdef LIBM_MT_FEX_SYNC
void (*__libm_mt_fex_sync)() = NULL; /* new, improved version of above */
#pragma weak __libm_mt_fex_sync
#endif

/* private variables */
static fex_handler_t main_handlers;
static int handlers_initialized = 0;
static thread_key_t handlers_key;
static mutex_t handlers_key_lock = DEFAULTMUTEX;

static struct sigaction oact = { 0, SIG_DFL };
static mutex_t hdlr_lock = DEFAULTMUTEX;
static int hdlr_installed = 0;

/* private const data */
static const int te_bit[FEX_NUM_EXC] = {
        1 << fp_trap_inexact,
        1 << fp_trap_division,
        1 << fp_trap_underflow,
        1 << fp_trap_overflow,
        1 << fp_trap_invalid,
        1 << fp_trap_invalid,
        1 << fp_trap_invalid,
        1 << fp_trap_invalid,
        1 << fp_trap_invalid,
        1 << fp_trap_invalid,
        1 << fp_trap_invalid,
        1 << fp_trap_invalid
};

/*
*  Return the traps to be enabled given the current handling modes
*  and flags
*/
static int
__fex_te_needed(struct fex_handler_data *thr_handlers, unsigned long fsr)
{
        int             i, ex, te;

        /* set traps for handling modes */
        te = 0;
        for (i = 0; i < FEX_NUM_EXC; i++)
                if (thr_handlers[i].__mode != FEX_NONSTOP)
                        te |= te_bit[i];

        /* add traps for retrospective diagnostics */
        if (fex_get_log()) {
                ex = (int)__fenv_get_ex(fsr);
                if (!(ex & FE_INEXACT))
                        te |= (1 << fp_trap_inexact);
                if (!(ex & FE_UNDERFLOW))
                        te |= (1 << fp_trap_underflow);
                if (!(ex & FE_OVERFLOW))
                        te |= (1 << fp_trap_overflow);
                if (!(ex & FE_DIVBYZERO))
                        te |= (1 << fp_trap_division);
                if (!(ex & FE_INVALID))
                        te |= (1 << fp_trap_invalid);
        }

        return te;
}

/*
*  The following function synchronizes with libmtsk (SPARC only, for now)
```

```
126 */
127 static void
128 __fex_sync_with_libmtsk(int begin, int master)
129 {
130         static fenv_t master_env;
131         static int env_initialized = 0;
132         static mutex_t env_lock = DEFAULTMUTEX;

134         if (begin) {
135                 mutex_lock(&env_lock);
136                 if (master) {
137                         (void) fegetenv(&master_env);
138                         env_initialized = 1;
139                 }
140                 else if (env_initialized)
141                         (void) fesetenv(&master_env);
142                 mutex_unlock(&env_lock);
143         }
144         else if (master && fex_get_log())
145                 __fex_update_te();
146 }

148 #ifdef LIBM_MT_FEX_SYNC
149 /*
150 *  The following function may be used for synchronization with any
151 *  internal project that manages multiple threads
152 */
153 enum __libm_mt_fex_sync_actions {
154         __libm_mt_fex_start_master = 0,
155         __libm_mt_fex_start_slave,
156         __libm_mt_fex_finish_master,
157         __libm_mt_fex_finish_slave
158 };

160 struct __libm_mt_fex_sync_data {
161         fenv_t  master_env;
162         int             initialized;
163         mutex_t lock;
164 };

166 static void
167 __fex_sync_with_threads(enum __libm_mt_fex_sync_actions action,
168         struct __libm_mt_fex_sync_data *thr_env)
169 {
170         switch (action) {
171         case __libm_mt_fex_start_master:
172                 mutex_lock(&thr_env->lock);
173                 (void) fegetenv(&thr_env->master_env);
174                 thr_env->initialized = 1;
175                 mutex_unlock(&thr_env->lock);
176                 break;

178         case __libm_mt_fex_start_slave:
179                 mutex_lock(&thr_env->lock);
180                 if (thr_env->initialized)
181                         (void) fesetenv(&thr_env->master_env);
182                 mutex_unlock(&thr_env->lock);
183                 break;

185         case __libm_mt_fex_finish_master:
186 #if defined(__x86)
187                 __fex_update_te();
188 #else
189                 if (fex_get_log())
190                         __fex_update_te();
191 #endif
```



```
192                 break;

194         case __libm_mt_fex_finish_slave:
195 #if defined(__x86)
196                 /* clear traps, making all accrued flags visible in status word
197                 {
198                         unsigned long   fsr;
199                         __fenv_getfsr(&fsr);
200                         __fenv_set_te(fsr, 0);
201                         __fenv_setfsr(&fsr);
202                 }
203 #endif
204                 break;
205         }
206 }
207 #endif

209 #if defined(__sparc)

211 /*
212 *  Code for setting or clearing interval mode on US-III and above.
213 *  This is embedded as data so we don't have to mark the library
214 *  as a v8plusb/v9b object.  (I could have just used one entry and
215 *  modified the second word to set the bits I want, but that would
216 *  have required another mutex.)
217 */
218 static const unsigned int siam[][2] = {
219         { 0x81c3e008, 0x81b01020 }, /* retl, siam 0 */
220         { 0x81c3e008, 0x81b01024 }, /* retl, siam 4 */
221         { 0x81c3e008, 0x81b01025 }, /* retl, siam 5 */
222         { 0x81c3e008, 0x81b01026 }, /* retl, siam 6 */
223         { 0x81c3e008, 0x81b01027 }  /* retl, siam 7 */
224 };

226 /*
227 *  If a handling mode is in effect, apply it; otherwise invoke the
228 *  saved handler
229 */
230 static void
231 __fex_hdlr(int sig, siginfo_t *sip, ucontext_t *uap)
232 {
233         struct fex_handler_data *thr_handlers;
234         struct sigaction        act;
235         void                    (*handler)(), (*siamp)();
236         int                     mode, i;
237         enum fex_exception      e;
238         fex_info_t              info;
239         unsigned long           fsr, tmpfsr, addr;
240         unsigned int            gsr;

242         /* determine which exception occurred */
243         switch (sip->si_code) {
244         case FPE_FLTDIV:
245                 e = fex_division;
246                 break;
247         case FPE_FLTOVF:
248                 e = fex_overflow;
249                 break;
250         case FPE_FLTUND:
251                 e = fex_underflow;
252                 break;
253         case FPE_FLTRES:
254                 e = fex_inexact;
255                 break;
256         case FPE_FLTINV:
257                 if ((int)(e = __fex_get_invalid_type(sip, uap)) < 0)
```

```
258                         goto not_ieee;
259                 break;
260         default:
261                 /* not an IEEE exception */
262                 goto not_ieee;
263         }

265         /* get the handling mode */
266         mode = FEX_NOHANDLER;
267         handler = oact.sa_handler; /* for log; just looking, no need to lock */
268         thr_handlers = __fex_get_thr_handlers();
269         if (thr_handlers && thr_handlers[(int)e].__mode != FEX_NOHANDLER) {
270                 mode = thr_handlers[(int)e].__mode;
271                 handler = thr_handlers[(int)e].__handler;
272         }

274         /* make an entry in the log of retro. diag. if need be */
275         i = ((int)uap->uc_mcontext.fpregs.fpu_fsr >> 5) & 0x1f;
276         __fex_mklog(uap, (char *)sip->si_addr, i, e, mode, (void *)handler);

278         /* handle the exception based on the mode */
279         if (mode == FEX_NOHANDLER)
280                 goto not_ieee;
281         else if (mode == FEX_ABORT)
282                 abort();
283         else if (mode == FEX_SIGNAL) {
284                 handler(sig, sip, uap);
285                 return;
286         }

288         /* custom or nonstop mode; disable traps and clear flags */
289         __fenv_getfsr(&fsr);
290         __fenv_set_te(fsr, 0);
291         __fenv_set_ex(fsr, 0);

293         /* if interval mode was set, clear it, then substitute the
294            interval rounding direction and clear ns mode in the fsr */
295 #ifdef __sparcv9
296         gsr = uap->uc_mcontext.asrs[3];
297 #else
298         gsr = 0;
299         if (uap->uc_mcontext.xrs.xrs_id == XRS_ID)
300                 gsr = (*(unsigned long long*)((prxregset_t*)uap->uc_mcontext.
301                     xrs.xrs_ptr)->pr_un.pr_v8p.pr_filler);
302 #endif
303         gsr = (gsr >> 25) & 7;
304         if (gsr & 4) {
305                 siamp = (void (*)()) siam[0];
306                 siamp();
307                 tmpfsr = fsr;
308                 fsr = (fsr & ~0xc0400000ul) | ((gsr & 3) << 30);
309         }
310         __fenv_setfsr(&fsr);

312         /* decode the operation */
313         __fex_get_op(sip, uap, &info);

315         /* if a custom mode handler is installed, invoke it */
316         if (mode == FEX_CUSTOM) {
317                 /* if we got here from feraiseexcept, pass dummy info */
318                 addr = (unsigned long)sip->si_addr;
319                 if (addr >= (unsigned long)feraiseexcept &&
320                     addr < (unsigned long)fetestexcept ) {
321                         info.op = fex_other;
322                         info.op1.type = info.op2.type = info.res.type =
323                             fex_nodata;
```



```
324                 }

326                 /* restore interval mode if it was set, and put the original
327                    rounding direction and ns mode back in the fsr */
328                 if (gsr & 4) {
329                         __fenv_setfsr(&tmpfsr);
330                         siamp = (void (*)()) siam[1 + (gsr & 3)];
331                         siamp();
332                 }

334                 handler(1 << (int)e, &info);

336                 /* restore modes in case the user's handler changed them */
337                 if (gsr & 4) {
338                         siamp = (void (*)()) siam[0];
339                         siamp();
340                 }
341                 __fenv_setfsr(&fsr);
342         }

344         /* stuff the result */
345         __fex_st_result(sip, uap, &info);

347         /* "or" in any exception flags and update traps */
348         fsr = uap->uc_mcontext.fpregs.fpu_fsr;
349         fsr |= ((info.flags & 0x1f) << 5);
350         i = __fex_te_needed(thr_handlers, fsr);
351         __fenv_set_te(fsr, i);
352         uap->uc_mcontext.fpregs.fpu_fsr = fsr;
353         return;

355 not_ieee:
356         /* revert to the saved handler (if any) */
357         mutex_lock(&hdlr_lock);
358         act = oact;
359         mutex_unlock(&hdlr_lock);
360         switch ((unsigned long)act.sa_handler) {
361         case (unsigned long)SIG_DFL:
362                 /* simulate trap with no handler installed */
363                 sigaction(SIGFPE, &act, NULL);
364                 kill(getpid(), SIGFPE);
365                 break;
366 #if !defined(__lint)
367         case (unsigned long)SIG_IGN:
368                 break;
369 #endif
370         default:
371                 act.sa_handler(sig, sip, uap);
372         }
373 }

375 #elif defined(__x86)

377 #if defined(__amd64)
378 #define test_sse_hw     1
379 #else
380 extern int _sse_hw;
381 #define test_sse_hw     _sse_hw
382 #endif

384 #if !defined(REG_PC)
385 #define REG_PC  EIP
386 #endif

388 /*
389 *  If a handling mode is in effect, apply it; otherwise invoke the
```

```
390 *  saved handler
391 */
392 static void
393 __fex_hdlr(int sig, siginfo_t *sip, ucontext_t *uap)
394 {
395         struct fex_handler_data *thr_handlers;
396         struct sigaction        act;
397         void                    (*handler)() = NULL, (*simd_handler[4])();
398         int                     mode, simd_mode[4], i, len, accrued, *ap;
399         unsigned int            cwsw, oldcwsw, mxcsr, oldmxcsr;
400         enum fex_exception      e, simd_e[4];
401         fex_info_t              info, simd_info[4];
402         unsigned long           addr;
403         siginfo_t               osip = *sip;
404         sseinst_t               inst;

406         /* check for an exception caused by an SSE instruction */
407         if (!(uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.status & 0x80)) {
408                 len = __fex_parse_sse(uap, &inst);
409                 if (len == 0)
410                         goto not_ieee;

412                 /* disable all traps and clear flags */
413                 __fenv_getcwsw(&oldcwsw);
414                 cwsw = (oldcwsw & ~0x3f) | 0x003f0000;
415                 __fenv_setcwsw(&cwsw);
416                 __fenv_getmxcsr(&oldmxcsr);
417                 mxcsr = (oldmxcsr & ~0x3f) | 0x1f80;
418                 __fenv_setmxcsr(&mxcsr);

420                 if ((int)inst.op & SIMD) {
421                         __fex_get_simd_op(uap, &inst, simd_e, simd_info);

423                         thr_handlers = __fex_get_thr_handlers();
424                         addr = (unsigned long)uap->uc_mcontext.gregs[REG_PC];
425                         accrued = uap->uc_mcontext.fpregs.fp_reg_set.
426                             fpchip_state.mxcsr;

428                         e = (enum fex_exception)-1;
429                         mode = FEX_NONSTOP;
430                         for (i = 0; i < 4; i++) {
431                                 if ((int)simd_e[i] < 0)
432                                         continue;

434                                 e = simd_e[i];
435                                 simd_mode[i] = FEX_NOHANDLER;
436                                 simd_handler[i] = oact.sa_handler;
437                                 if (thr_handlers &&
438                                     thr_handlers[(int)e].__mode !=
439                                     FEX_NOHANDLER) {
440                                         simd_mode[i] =
441                                             thr_handlers[(int)e].__mode;
442                                         simd_handler[i] =
443                                             thr_handlers[(int)e].__handler;
444                                 }
445                                 accrued &= ~te_bit[(int)e];
446                                 switch (simd_mode[i]) {
447                                 case FEX_ABORT:
448                                         mode = FEX_ABORT;
449                                         break;
450                                 case FEX_SIGNAL:
451                                         if (mode != FEX_ABORT)
452                                                 mode = FEX_SIGNAL;
453                                         handler = simd_handler[i];
454                                         break;
455                                 case FEX_NOHANDLER:
```



```
456                                         if (mode != FEX_ABORT && mode !=
457                                             FEX_SIGNAL)
458                                                 mode = FEX_NOHANDLER;
459                                         break;
460                                 }
461                         }
462                         if (e == (enum fex_exception)-1) {
463                                 __fenv_setcwsw(&oldcwsw);
464                                 __fenv_setmxcsr(&oldmxcsr);
465                                 goto not_ieee;
466                         }
467                         accrued |= uap->uc_mcontext.fpregs.fp_reg_set.
468                             fpchip_state.status;
469                         ap = __fex_accrued();
470                         accrued |= *ap;
471                         accrued &= 0x3d;

473                         for (i = 0; i < 4; i++) {
474                                 if ((int)simd_e[i] < 0)
475                                         continue;

477                                 __fex_mklog(uap, (char *)addr, accrued,
478                                     simd_e[i], simd_mode[i],
479                                     (void *)simd_handler[i]);
480                         }

482                         if (mode == FEX_NOHANDLER) {
483                                 __fenv_setcwsw(&oldcwsw);
484                                 __fenv_setmxcsr(&oldmxcsr);
485                                 goto not_ieee;
486                         } else if (mode == FEX_ABORT) {
487                                 abort();
488                         } else if (mode == FEX_SIGNAL) {
489                                 __fenv_setcwsw(&oldcwsw);
490                                 __fenv_setmxcsr(&oldmxcsr);
491                                 handler(sig, &osip, uap);
492                                 return;
493                         }

495                         *ap = 0;
496                         for (i = 0; i < 4; i++) {
497                                 if ((int)simd_e[i] < 0)
498                                         continue;

500                                 if (simd_mode[i] == FEX_CUSTOM) {
501                                         handler(1 << (int)simd_e[i],
502                                             &simd_info[i]);
503                                         __fenv_setcwsw(&cwsw);
504                                         __fenv_setmxcsr(&mxcsr);
505                                 }
506                         }

508                         __fex_st_simd_result(uap, &inst, simd_e, simd_info);
509                         for (i = 0; i < 4; i++) {
510                                 if ((int)simd_e[i] < 0)
511                                         continue;

513                                 accrued |= simd_info[i].flags;
514                         }

516                         if ((int)inst.op & INTREG) {
517                                 /* set MMX mode */
518 #if defined(__amd64)
519                                 uap->uc_mcontext.fpregs.fp_reg_set.
520                                     fpchip_state.sw &= ~0x3800;
521                                 uap->uc_mcontext.fpregs.fp_reg_set.
```

```
522                                 fpchip_state.fctw = 0;
523 #else
524                             uap->uc_mcontext.fpregs.fp_reg_set.
525                                 fpchip_state.state[1] &= ~0x3800;
526                             uap->uc_mcontext.fpregs.fp_reg_set.
527                                 fpchip_state.state[2] = 0;
528 #endif
529                         }
530                 } else {
531                         e = __fex_get_sse_op(uap, &inst, &info);
532                         if ((int)e < 0) {
533                                 __fenv_setcwsw(&oldcwsw);
534                                 __fenv_setmxcsr(&oldmxcsr);
535                                 goto not_ieee;
536                         }

538                         mode = FEX_NOHANDLER;
539                         handler = oact.sa_handler;
540                         thr_handlers = __fex_get_thr_handlers();
541                         if (thr_handlers && thr_handlers[(int)e].__mode !=
542                             FEX_NOHANDLER) {
543                                 mode = thr_handlers[(int)e].__mode;
544                                 handler = thr_handlers[(int)e].__handler;
545                         }

547                         addr = (unsigned long)uap->uc_mcontext.gregs[REG_PC];
548                         accrued = uap->uc_mcontext.fpregs.fp_reg_set.
549                             fpchip_state.mxcsr & ~te_bit[(int)e];
550                         accrued |= uap->uc_mcontext.fpregs.fp_reg_set.
551                             fpchip_state.status;
552                         ap = __fex_accrued();
553                         accrued |= *ap;
554                         accrued &= 0x3d;
555                         __fex_mklog(uap, (char *)addr, accrued, e, mode,
556                             (void *)handler);

558                         if (mode == FEX_NOHANDLER) {
559                                 __fenv_setcwsw(&oldcwsw);
560                                 __fenv_setmxcsr(&oldmxcsr);
561                                 goto not_ieee;
562                         } else if (mode == FEX_ABORT) {
563                                 abort();
564                         } else if (mode == FEX_SIGNAL) {
565                                 __fenv_setcwsw(&oldcwsw);
566                                 __fenv_setmxcsr(&oldmxcsr);
567                                 handler(sig, &osip, uap);
568                                 return;
569                         } else if (mode == FEX_CUSTOM) {
570                                 *ap = 0;
571                                 if (addr >= (unsigned long)feraiseexcept &&
572                                     addr < (unsigned long)fetestexcept ) {
573                                         info.op = fex_other;
574                                         info.op1.type = info.op2.type =
575                                             info.res.type = fex_nodata;
576                                 }
577                                 handler(1 << (int)e, &info);
578                                 __fenv_setcwsw(&cwsw);
579                                 __fenv_setmxcsr(&mxcsr);
580                         }

582                         __fex_st_sse_result(uap, &inst, e, &info);
583                         accrued |= info.flags;

585 #if defined(__amd64)
586                         /*
587                          * In 64-bit mode, the 32-bit convert-to-integer
```



```
588                          * instructions zero the upper 32 bits of the
589                          * destination.  (We do this here and not in
590                          * __fex_st_sse_result because __fex_st_sse_result
591                          * can be called from __fex_st_simd_result, too.)
592                          */
593                         if (inst.op == cvtss2si || inst.op == cvttss2si ||
594                             inst.op == cvtsd2si || inst.op == cvttsd2si)
595                                 inst.op1->i[1] = 0;
596 #endif
597                 }

599                 /* advance the pc past the SSE instruction */
600                 uap->uc_mcontext.gregs[REG_PC] += len;
601                 goto update_state;
602         }

604         /* determine which exception occurred */
605         __fex_get_x86_exc(sip, uap);
606         switch (sip->si_code) {
607         case FPE_FLTDIV:
608                 e = fex_division;
609                 break;
610         case FPE_FLTOVF:
611                 e = fex_overflow;
612                 break;
613         case FPE_FLTUND:
614                 e = fex_underflow;
615                 break;
616         case FPE_FLTRES:
617                 e = fex_inexact;
618                 break;
619         case FPE_FLTINV:
620                 if ((int)(e = __fex_get_invalid_type(sip, uap)) < 0)
621                         goto not_ieee;
622                 break;
623         default:
624                 /* not an IEEE exception */
625                 goto not_ieee;
626         }

628         /* get the handling mode */
629         mode = FEX_NOHANDLER;
630         handler = oact.sa_handler; /* for log; just looking, no need to lock */
631         thr_handlers = __fex_get_thr_handlers();
632         if (thr_handlers && thr_handlers[(int)e].__mode != FEX_NOHANDLER) {
633                 mode = thr_handlers[(int)e].__mode;
634                 handler = thr_handlers[(int)e].__handler;
635         }

637         /* make an entry in the log of retro. diag. if need be */
638 #if defined(__amd64)
639         addr = (unsigned long)uap->uc_mcontext.fpregs.fp_reg_set.
640             fpchip_state.rip;
641 #else
642         addr = (unsigned long)uap->uc_mcontext.fpregs.fp_reg_set.
643             fpchip_state.state[3];
644 #endif
645         accrued = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.status &
646             ~te_bit[(int)e];
647         if (test_sse_hw)
648                 accrued |= uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.
649                     mxcsr;
650         ap = __fex_accrued();
651         accrued |= *ap;
652         accrued &= 0x3d;
653         __fex_mklog(uap, (char *)addr, accrued, e, mode, (void *)handler);
```

```
655         /* handle the exception based on the mode */
656         if (mode == FEX_NOHANDLER)
657                 goto not_ieee;
658         else if (mode == FEX_ABORT)
659                 abort();
660         else if (mode == FEX_SIGNAL) {
661                 handler(sig, &osip, uap);
662                 return;
663         }

665         /* disable all traps and clear flags */
666         __fenv_getcwsw(&cwsw);
667         cwsw = (cwsw & ~0x3f) | 0x003f0000;
668         __fenv_setcwsw(&cwsw);
669         if (test_sse_hw) {
670                 __fenv_getmxcsr(&mxcsr);
671                 mxcsr = (mxcsr & ~0x3f) | 0x1f80;
672                 __fenv_setmxcsr(&mxcsr);
673         }
674         *ap = 0;

676         /* decode the operation */
677         __fex_get_op(sip, uap, &info);

679         /* if a custom mode handler is installed, invoke it */
680         if (mode == FEX_CUSTOM) {
681                 /* if we got here from feraiseexcept, pass dummy info */
682                 if (addr >= (unsigned long)feraiseexcept &&
683                     addr < (unsigned long)fetestexcept ) {
684                         info.op = fex_other;
685                         info.op1.type = info.op2.type = info.res.type =
686                             fex_nodata;
687                 }

689                 handler(1 << (int)e, &info);

691                 /* restore modes in case the user's handler changed them */
692                 __fenv_setcwsw(&cwsw);
693                 if (test_sse_hw)
694                         __fenv_setmxcsr(&mxcsr);
695         }

697         /* stuff the result */
698         __fex_st_result(sip, uap, &info);
699         accrued |= info.flags;

701 update_state:
702         accrued &= 0x3d;
703         i = __fex_te_needed(thr_handlers, accrued);
704         *ap = accrued & i;
705 #if defined(__amd64)
706         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw &= ~0x3d;
707         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw |= (accrued & ~i);
708         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.cw |= 0x3d;
709         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.cw &= ~i;
710 #else
711         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[1] &= ~0x3d;
712         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[1] |=
713             (accrued & ~i);
714         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[0] |= 0x3d;
715         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[0] &= ~i;
716 #endif
717         if (test_sse_hw) {
718                 uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.mxcsr &= ~0x3d;
719                 uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.mxcsr |=
```



```
720                     0x1e80 | (accrued & ~i);
721                 uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.mxcsr &=
722                     ~(i << 7);
723         }
724         return;

726 not_ieee:
727         /* revert to the saved handler (if any) */
728         mutex_lock(&hdlr_lock);
729         act = oact;
730         mutex_unlock(&hdlr_lock);
731         switch ((unsigned long)act.sa_handler) {
732         case (unsigned long)SIG_DFL:
733                 /* simulate trap with no handler installed */
734                 sigaction(SIGFPE, &act, NULL);
735                 kill(getpid(), SIGFPE);
736                 break;
737 #if !defined(__lint)
738         case (unsigned long)SIG_IGN:
739                 break;
740 #endif
741         default:
742                 act.sa_handler(sig, &osip, uap);
743         }
744 }

746 #else
747 #error Unknown architecture
748 #endif

750 /*
751 *  Return a pointer to the thread-specific handler data, and
752 *  initialize it if necessary
753 */
754 struct fex_handler_data *
755 __fex_get_thr_handlers()
756 {
757         struct fex_handler_data *ptr;
758         unsigned long                   fsr;
759         int                                             i, te;

761         if (thr_main()) {
762                 if (!handlers_initialized) {
763                         /* initialize to FEX_NOHANDLER if trap is enabled,
764                            FEX_NONSTOP if trap is disabled */
765                         __fenv_getfsr(&fsr);
766                         te = (int)__fenv_get_te(fsr);
767                         for (i = 0; i < FEX_NUM_EXC; i++)
768                                 main_handlers[i].__mode =
769                                         ((te & te_bit[i])? FEX_NOHANDLER : FEX_N
770                         handlers_initialized = 1;
771                 }
772                 return main_handlers;
773         }
774         else {
775                 ptr = NULL;
776                 mutex_lock(&handlers_key_lock);
777                 if (thr_getspecific(handlers_key, (void **)&ptr) != 0 &&
778                         thr_keycreate(&handlers_key, free) != 0) {
779                         mutex_unlock(&handlers_key_lock);
780                         return NULL;
781                 }
782                 mutex_unlock(&handlers_key_lock);
783                 if (!ptr) {
784                         if ((ptr = (struct fex_handler_data *)
785                                 malloc(sizeof(fex_handler_t))) == NULL) {
```

```
786                                 return NULL;
787                         }
788                         if (thr_setspecific(handlers_key, (void *)ptr) != 0) {
789                                 (void)free(ptr);
790                                 return NULL;
791                         }
792                         /* initialize to FEX_NOHANDLER if trap is enabled,
793                            FEX_NONSTOP if trap is disabled */
794                         __fenv_getfsr(&fsr);
795                         te = (int)__fenv_get_te(fsr);
796                         for (i = 0; i < FEX_NUM_EXC; i++)
797                                 ptr[i].__mode = ((te & te_bit[i])? FEX_NOHANDLER
798                 }
799                 return ptr;
800         }
801 }

803 /*
804 *  Update the trap enable bits according to the selected modes
805 */
806 void
807 __fex_update_te()
808 {
809         struct fex_handler_data *thr_handlers;
810         struct sigaction                act, tmpact;
811         sigset_t                                blocked;
812         unsigned long                   fsr;
813         int                                             te;

815         /* determine which traps are needed */
816         thr_handlers = __fex_get_thr_handlers();
817         __fenv_getfsr(&fsr);
818         te = __fex_te_needed(thr_handlers, fsr);

820         /* install __fex_hdlr as necessary */
821         if (!hdlr_installed && te) {
822                 act.sa_handler = __fex_hdlr;
823                 sigemptyset(&act.sa_mask);
824                 act.sa_flags = SA_SIGINFO;
825                 sigaction(SIGFPE, &act, &tmpact);
826                 if (tmpact.sa_handler != __fex_hdlr)
827                 {
828                         mutex_lock(&hdlr_lock);
829                         oact = tmpact;
830                         mutex_unlock(&hdlr_lock);
831                 }
832                 hdlr_installed = 1;
833         }

835         /* set the new trap enable bits (only if SIGFPE is not blocked) */
836         if (sigprocmask(0, NULL, &blocked) == 0 &&
837                 !sigismember(&blocked, SIGFPE)) {
838                 __fenv_set_te(fsr, te);
839                 __fenv_setfsr(&fsr);
840         }

842         /* synchronize with libmtsk */
843         __mt_fex_sync = __fex_sync_with_libmtsk;

845 #ifdef LIBM_MT_FEX_SYNC
846         /* synchronize with other projects */
847         __libm_mt_fex_sync = __fex_sync_with_threads;
848 #endif
849 }
```

```
**********************************************************
   36583 Sat May 10 12:09:25 2014
new/usr/src/lib/libm/common/m9x/__fex_i386.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

/*
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 */

#include "fenv_synonyms.h"
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <string.h>
#include <signal.h>
#include <siginfo.h>
#include <ucontext.h>
#include <thread.h>
#include <math.h>
#if defined(__SUNPRO_C)
#include <sunmath.h>
#endif
#include <fenv.h>
#include "fex_handler.h"
#include "fenv_inlines.h"

#if defined(__amd64)
#define test_sse_hw     1
#else
/*
 * The following variable lives in libc on Solaris 10, where it
 * gets set to a nonzero value at startup time on systems with SSE.
 */
int _sse_hw = 0;
#pragma weak _sse_hw
#define test_sse_hw     &_sse_hw && _sse_hw
#endif

static int accrued = 0;
static thread_key_t accrued_key;
```



```
static mutex_t accrued_key_lock = DEFAULTMUTEX;

int *
__fex_accrued()
{
        int             *p;

        if (thr_main())
                return &accrued;
        else {
                p = NULL;
                mutex_lock(&accrued_key_lock);
                if (thr_getspecific(accrued_key, (void **)&p) != 0 &&
                        thr_keycreate(&accrued_key, free) != 0) {
                        mutex_unlock(&accrued_key_lock);
                        return NULL;
                }
                mutex_unlock(&accrued_key_lock);
                if (!p) {
                        if ((p = (int*) malloc(sizeof(int))) == NULL)
                                return NULL;
                        if (thr_setspecific(accrued_key, (void *)p) != 0) {
                                (void)free(p);
                                return NULL;
                        }
                        *p = 0;
                }
                return p;
        }
}

void
__fenv_getfsr(unsigned long *fsr)
{
        unsigned int    cwsw, mxcsr;

        __fenv_getcwsw(&cwsw);
        /* clear reserved bits for no particularly good reason */
        cwsw &= ~0xe0c00000u;
        if (test_sse_hw) {
                /* pick up exception flags (excluding denormal operand
                   flag) from mxcsr */
                __fenv_getmxcsr(&mxcsr);
                cwsw |= (mxcsr & 0x3d);
        }
        cwsw |= *__fex_accrued();
        *fsr = cwsw ^ 0x003f0000u;
}

void
__fenv_setfsr(const unsigned long *fsr)
{
        unsigned int    cwsw, mxcsr;
        int                             te;

        /* save accrued exception flags corresponding to enabled exceptions */
        cwsw = (unsigned int)*fsr;
        te = __fenv_get_te(cwsw);
        *__fex_accrued() = cwsw & te;
        cwsw = (cwsw & ~te) ^ 0x003f0000;
        if (test_sse_hw) {
                /* propagate rounding direction, masks, and exception flags
                   (excluding denormal operand mask and flag) to mxcsr */
                __fenv_getmxcsr(&mxcsr);
                mxcsr = (mxcsr & ~0x7ebd) | ((cwsw >> 13) & 0x6000) |
                        ((cwsw >> 9) & 0x1e80) | (cwsw & 0x3d);
```

```
127                 __fenv_setmxcsr(&mxcsr);
128         }
129         __fenv_setcwsw(&cwsw);
130 }

132 /* Offsets into the fp environment save area (assumes 32-bit protected mode) */
133 #define CW      0       /* control word */
134 #define SW      1       /* status word */
135 #define TW      2       /* tag word */
136 #define IP      3       /* instruction pointer */
137 #define OP      4       /* opcode */
138 #define EA      5       /* operand address */

140 /* macro for accessing fp registers in the save area */
141 #if defined(__amd64)
142 #define fpreg(u,x)      *(long double *)(10*(x)+(char*)&(u)->uc_mcontext.fpregs.
143 #else
144 #define fpreg(u,x)      *(long double *)(10*(x)+(char*)&(u)->uc_mcontext.fpregs.
145 #endif

147 /*
148 *  Fix sip->si_code; the Solaris x86 kernel can get it wrong
149 */
150 void
151 __fex_get_x86_exc(siginfo_t *sip, ucontext_t *uap)
152 {
153         unsigned        sw, cw;

155         sw = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.status;
156 #if defined(__amd64)
157         cw = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.cw;
158 #else
159         cw = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[CW];
160 #endif
161         if ((sw & FE_INVALID) && !(cw & (1 << fp_trap_invalid)))
162                 /* store 0 for stack fault, FPE_FLTINV for IEEE invalid op */
163                 sip->si_code = ((sw & 0x40)? 0 : FPE_FLTINV);
164         else if ((sw & FE_DIVBYZERO) && !(cw & (1 << fp_trap_division)))
165                 sip->si_code = FPE_FLTDIV;
166         else if ((sw & FE_OVERFLOW) && !(cw & (1 << fp_trap_overflow)))
167                 sip->si_code = FPE_FLTOVF;
168         else if ((sw & FE_UNDERFLOW) && !(cw & (1 << fp_trap_underflow)))
169                 sip->si_code = FPE_FLTUND;
170         else if ((sw & FE_INEXACT) && !(cw & (1 << fp_trap_inexact)))
171                 sip->si_code = FPE_FLTRES;
172         else
173                 sip->si_code = 0;
174 }

176 static enum fp_class_type
177 my_fp_classf(float *x)
178 {
179         int             i = *(int*)x & ~0x80000000;

181         if (i < 0x7f800000) {
182                 if (i < 0x00800000)
183                         return ((i == 0)? fp_zero : fp_subnormal);
184                 return fp_normal;
185         }
186         else if (i == 0x7f800000)
187                 return fp_infinity;
188         else if (i & 0x400000)
189                 return fp_quiet;
190         else
191                 return fp_signaling;
192 }
```



```
194 static enum fp_class_type
195 my_fp_class(double *x)
196 {
197         int             i = *(1+(int*)x) & ~0x80000000;

199         if (i < 0x7ff00000) {
200                 if (i < 0x00100000)
201                         return (((i | *(int*)x) == 0)? fp_zero : fp_subnormal);
202                 return fp_normal;
203         }
204         else if (i == 0x7ff00000 && *(int*)x == 0)
205                 return fp_infinity;
206         else if (i & 0x80000)
207                 return fp_quiet;
208         else
209                 return fp_signaling;
210 }

212 static enum fp_class_type
213 my_fp_classl(long double *x)
214 {
215         int             i = *(2+(int*)x) & 0x7fff;

217         if (i < 0x7fff) {
218                 if (i < 1) {
219                         if (*(1+(int*)x) < 0) return fp_normal; /* pseudo-denorm
220                         return (((*(1+(int*)x) | *(int*)x) == 0)?
221                                 fp_zero : fp_subnormal);
222                 }
223                 return ((*(1+(int*)x) < 0)? fp_normal :
224                         (enum fp_class_type) -1); /* unsupported format */
225         }
226         else if (*(1+(int*)x) == 0x80000000 && *(int*)x == 0)
227                 return fp_infinity;
228         else if (*(1+(unsigned*)x) >= 0xc0000000)
229                 return fp_quiet;
230         else if (*(1+(int*)x) < 0)
231                 return fp_signaling;
232         else
233                 return (enum fp_class_type) -1; /* unsupported format */
234 }

236 /*
237 *  Determine which type of invalid operation exception occurred
238 */
239 enum fex_exception
240 __fex_get_invalid_type(siginfo_t *sip, ucontext_t *uap)
241 {
242         unsigned                        op;
243         unsigned long                   ea;
244         enum fp_class_type      t1, t2;

246         /* get the opcode and data address */
247 #if defined(__amd64)
248         op = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.fop >> 16;
249         ea = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.rdp;
250 #else
251         op = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[OP] >> 16;
252         ea = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[EA];
253 #endif

255         /* if the instruction is fld, the source must be snan (it can't be
256            an unsupported format, since fldt doesn't raise any exceptions) */
257         switch (op & 0x7f8) {
258         case 0x100:
```

```
259         case 0x140:
260         case 0x180:
261         case 0x500:
262         case 0x540:
263         case 0x580:
264                 return fex_inv_snan;
265         }

267         /* otherwise st is one of the operands; see if it's snan */
268         t1 = my_fp_classl(&fpreg(uap, 0));
269         if (t1 == fp_signaling)
270                 return fex_inv_snan;
271         else if (t1 == (enum fp_class_type) -1)
272                 return (enum fex_exception) -1;

274         /* determine the class of the second operand if there is one */
275         t2 = fp_normal;
276         switch (op & 0x7e0) {
277         case 0x600:
278         case 0x620:
279         case 0x640:
280         case 0x660:
281         case 0x680:
282         case 0x6a0:
283                 /* short memory operand */
284                 if (!ea)
285                         return (enum fex_exception) -1;
286                 if (*(short *)ea == 0)
287                         t2 = fp_zero;
288                 break;

290         case 0x200:
291         case 0x220:
292         case 0x240:
293         case 0x260:
294         case 0x280:
295         case 0x2a0:
296                 /* int memory operand */
297                 if (!ea)
298                         return (enum fex_exception) -1;
299                 if (*(int *)ea == 0)
300                         t2 = fp_zero;
301                 break;

303         case 0x000:
304         case 0x020:
305         case 0x040:
306         case 0x060:
307         case 0x080:
308         case 0x0a0:
309                 /* single precision memory operand */
310                 if (!ea)
311                         return (enum fex_exception) -1;
312                 t2 = my_fp_classf((float *)ea);
313                 break;

315         case 0x400:
316         case 0x420:
317         case 0x440:
318         case 0x460:
319         case 0x480:
320         case 0x4a0:
321                 /* double precision memory operand */
322                 if (!ea)
323                         return (enum fex_exception) -1;
324                 t2 = my_fp_class((double *)ea);
```



```
325                 break;

327         case 0x0c0:
328         case 0x0e0:
329         case 0x3e0:
330         case 0x4c0:
331         case 0x4e0:
332         case 0x5e0:
333         case 0x6c0:
334         case 0x6e0:
335         case 0x7e0:
336                 /* register operand determined by opcode */
337                 switch (op & 0x7f8) {
338                 case 0x3e0:
339                 case 0x3f8:
340                 case 0x5f0:
341                 case 0x5f8:
342                 case 0x7e0:
343                 case 0x7f8:
344                         /* weed out nonexistent opcodes */
345                         break;

347                 default:
348                         t2 = my_fp_classl(&fpreg(uap, op & 7));
349                 }
350                 break;

352         case 0x1e0:
353         case 0x2e0:
354                 /* special forms */
355                 switch (op) {
356                 case 0x1f1: /* fyl2x */
357                 case 0x1f3: /* fpatan */
358                 case 0x1f5: /* fprem1 */
359                 case 0x1f8: /* fprem */
360                 case 0x1f9: /* fyl2xp1 */
361                 case 0x1fd: /* fscale */
362                 case 0x2e9: /* fucompp */
363                         t2 = my_fp_classl(&fpreg(uap, 1));
364                         break;
365                 }
366                 break;
367         }

369         /* see if the second op is snan */
370         if (t2 == fp_signaling)
371                 return fex_inv_snan;
372         else if (t2 == (enum fp_class_type) -1)
373                 return (enum fex_exception) -1;

375         /* determine the type of operation */
376         switch (op & 0x7f8) {
377         case 0x000:
378         case 0x020:
379         case 0x028:
380         case 0x040:
381         case 0x060:
382         case 0x068:
383         case 0x080:
384         case 0x0a0:
385         case 0x0a8:
386         case 0x0c0:
387         case 0x0e0:
388         case 0x0e8:
389         case 0x400:
390         case 0x420:
```

```
391         case 0x428:
392         case 0x440:
393         case 0x460:
394         case 0x468:
395         case 0x480:
396         case 0x4a0:
397         case 0x4a8:
398         case 0x4c0:
399         case 0x4e0:
400         case 0x4e8:
401         case 0x6c0:
402         case 0x6e0:
403         case 0x6e8:
404                 /* fadd, fsub, fsubr */
405                 if (t1 == fp_infinity && t2 == fp_infinity)
406                         return fex_inv_isi;
407                 break;

409         case 0x008:
410         case 0x048:
411         case 0x088:
412         case 0x0c8:
413         case 0x208:
414         case 0x248:
415         case 0x288:
416         case 0x408:
417         case 0x448:
418         case 0x488:
419         case 0x4c8:
420         case 0x608:
421         case 0x648:
422         case 0x688:
423         case 0x6c8:
424                 /* fmul */
425                 if ((t1 == fp_zero && t2 == fp_infinity) || (t2 == fp_zero &&
426                   t1 == fp_infinity))
427                         return fex_inv_zmi;
428                 break;

430         case 0x030:
431         case 0x038:
432         case 0x070:
433         case 0x078:
434         case 0x0b0:
435         case 0x0b8:
436         case 0x0f0:
437         case 0x0f8:
438         case 0x230:
439         case 0x238:
440         case 0x270:
441         case 0x278:
442         case 0x2b0:
443         case 0x2b8:
444         case 0x430:
445         case 0x438:
446         case 0x470:
447         case 0x478:
448         case 0x4b0:
449         case 0x4b8:
450         case 0x4f0:
451         case 0x4f8:
452         case 0x630:
453         case 0x638:
454         case 0x670:
455         case 0x678:
456         case 0x6b0:
```



```
457         case 0x6b8:
458         case 0x6f0:
459         case 0x6f8:
460                 /* fdiv */
461                 if (t1 == fp_zero && t2 == fp_zero)
462                         return fex_inv_zdz;
463                 else if (t1 == fp_infinity && t2 == fp_infinity)
464                         return fex_inv_idi;
465                 break;

467         case 0x1f0:
468         case 0x1f8:
469                 /* fsqrt, other special ops */
470                 return fex_inv_sqrt;

472         case 0x010:
473         case 0x018:
474         case 0x050:
475         case 0x058:
476         case 0x090:
477         case 0x098:
478         case 0x0d0:
479         case 0x0d8:
480         case 0x210:
481         case 0x218:
482         case 0x250:
483         case 0x258:
484         case 0x290:
485         case 0x298:
486         case 0x2e8:
487         case 0x3f0:
488         case 0x410:
489         case 0x418:
490         case 0x450:
491         case 0x458:
492         case 0x490:
493         case 0x498:
494         case 0x4d0:
495         case 0x4d8:
496         case 0x5e0:
497         case 0x5e8:
498         case 0x610:
499         case 0x618:
500         case 0x650:
501         case 0x658:
502         case 0x690:
503         case 0x698:
504         case 0x6d0:
505         case 0x6d8:
506         case 0x7f0:
507                 /* fcom */
508                 if (t1 == fp_quiet || t2 == fp_quiet)
509                         return fex_inv_cmp;
510                 break;

512         case 0x1e0:
513                 /* ftst */
514                 if (op == 0x1e4 && t1 == fp_quiet)
515                         return fex_inv_cmp;
516                 break;

518         case 0x310:
519         case 0x318:
520         case 0x350:
521         case 0x358:
522         case 0x390:
```

```
523         case 0x398:
524         case 0x710:
525         case 0x718:
526         case 0x730:
527         case 0x738:
528         case 0x750:
529         case 0x758:
530         case 0x770:
531         case 0x778:
532         case 0x790:
533         case 0x798:
534         case 0x7b0:
535         case 0x7b8:
536                 /* fist, fbst */
537                 return fex_inv_int;
538         }

540         return (enum fex_exception) -1;
541 }

543 /* scale factors for exponent unwrapping */
544 static const long double
545         two12288 = 1.139165225263043370845938579315932009e+3699l,       /* 2^122
546         twom12288 = 8.778357852076208839765066529179033145e-3700l,      /* 2^-12
547         twom12288mulp = 8.778357852076208839289190796475222545e-3700l;
548                 /* (")*(1-2^-64) */

550 /* inline templates */
551 extern long double f2xm1(long double);
552 extern long double fyl2x(long double, long double);
553 extern long double fptan(long double);
554 extern long double fpatan(long double, long double);
555 extern long double fxtract(long double);
556 extern long double fprem1(long double, long double);
557 extern long double fprem(long double, long double);
558 extern long double fyl2xp1(long double, long double);
559 extern long double fsqrt(long double);
560 extern long double fsincos(long double);
561 extern long double frndint(long double);
562 extern long double fscale(long double, long double);
563 extern long double fsin(long double);
564 extern long double fcos(long double);

566 /*
567 *  Get the operands, generate the default untrapped result with
568 *  exceptions, and set a code indicating the type of operation
569 */
570 void
571 __fex_get_op(siginfo_t *sip, ucontext_t *uap, fex_info_t *info)
572 {
573         fex_numeric_t                   t;
574         long double                     op2v, x;
575         unsigned int                    cwsw, ex, sw, op;
576         unsigned long                   ea;
577         volatile int                    c;

579         /* get the exception type, status word, opcode, and data address */
580         ex = sip->si_code;
581         sw = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.status;
582 #if defined(__amd64)
583         op = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.fop >> 16;
584         ea = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.rdp;
585 #else
586         op = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[OP] >> 16;
587         ea = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[EA];
588 #endif
```



```
590         /* initialize res to the default untrapped result and ex to the
591            corresponding flags (assume trapping is disabled and flags
592            are clear) */

594         /* single operand instructions */
595         info->op = fex_cnvt;
596         info->op2.type = fex_nodata;
597         switch (op & 0x7f8) {
598         /* load instructions */
599         case 0x100:
600         case 0x140:
601         case 0x180:
602                 if (!ea) {
603                         info->op = fex_other;
604                         info->op1.type = info->op2.type = info->res.type = fex_n
605                         info->flags = 0;
606                         return;
607                 }
608                 info->op1.type = fex_float;
609                 info->op1.val.f = *(float *)ea;
610                 info->res.type = fex_ldouble;
611                 info->res.val.q = (long double) info->op1.val.f;
612                 goto done;

614         case 0x500:
615         case 0x540:
616         case 0x580:
617                 if (!ea) {
618                         info->op = fex_other;
619                         info->op1.type = info->op2.type = info->res.type = fex_n
620                         info->flags = 0;
621                         return;
622                 }
623                 info->op1.type = fex_double;
624                 info->op1.val.d = *(double *)ea;
625                 info->res.type = fex_ldouble;
626                 info->res.val.q = (long double) info->op1.val.d;
627                 goto done;

629         /* store instructions */
630         case 0x110:
631         case 0x118:
632         case 0x150:
633         case 0x158:
634         case 0x190:
635         case 0x198:
636                 info->res.type = fex_float;
637                 if (ex == FPE_FLTRES && (op & 8) != 0) {
638                         /* inexact, stack popped */
639                         if (!ea) {
640                                 info->op = fex_other;
641                                 info->op1.type = info->op2.type = info->res.type
642                                 info->flags = 0;
643                                 return;
644                         }
645                         info->op1.type = fex_nodata;
646                         info->res.val.f = *(float *)ea;
647                         info->flags = FE_INEXACT;
648                         return;
649                 }
650                 info->op1.type = fex_ldouble;
651                 info->op1.val.q = fpreg(uap, 0);
652                 info->res.val.f = (float) info->op1.val.q;
653                 goto done;
```

```
655         case 0x310:
656         case 0x318:
657         case 0x350:
658         case 0x358:
659         case 0x390:
660         case 0x398:
661                 info->res.type = fex_int;
662                 if (ex == FPE_FLTRES && (op & 8) != 0) {
663                         /* inexact, stack popped */
664                         if (!ea) {
665                                 info->op = fex_other;
666                                 info->op1.type = info->op2.type = info->res.type
667                                 info->flags = 0;
668                                 return;
669                         }
670                         info->op1.type = fex_nodata;
671                         info->res.val.i = *(int *)ea;
672                         info->flags = FE_INEXACT;
673                         return;
674                 }
675                 info->op1.type = fex_ldouble;
676                 info->op1.val.q = fpreg(uap, 0);
677                 info->res.val.i = (int) info->op1.val.q;
678                 goto done;

679         case 0x510:
680         case 0x518:
681         case 0x550:
682         case 0x558:
683         case 0x590:
684         case 0x598:
685                 info->res.type = fex_double;
686                 if (ex == FPE_FLTRES && (op & 8) != 0) {
687                         /* inexact, stack popped */
688                         if (!ea) {
689                                 info->op = fex_other;
690                                 info->op1.type = info->op2.type = info->res.type
691                                 info->flags = 0;
692                                 return;
693                         }
694                         info->op1.type = fex_nodata;
695                         info->res.val.d = *(double *)ea;
696                         info->flags = FE_INEXACT;
697                         return;
698                 }
699                 info->op1.type = fex_ldouble;
700                 info->op1.val.q = fpreg(uap, 0);
701                 info->res.val.d = (double) info->op1.val.q;
702                 goto done;

703         case 0x710:
704         case 0x718:
705         case 0x750:
706         case 0x758:
707         case 0x790:
708         case 0x798:
709                 info->res.type = fex_int;
710                 if (ex == FPE_FLTRES && (op & 8) != 0) {
711                         /* inexact, stack popped */
712                         if (!ea) {
713                                 info->op = fex_other;
714                                 info->op1.type = info->op2.type = info->res.type
715                                 info->flags = 0;
716                                 return;
717                         }
718                         info->op1.type = fex_nodata;
719                         info->res.val.i = *(short *)ea;
720                         info->flags = FE_INEXACT;
```



```
721                         return;
722                 }
723                 info->op1.type = fex_ldouble;
724                 info->op1.val.q = fpreg(uap, 0);
725                 info->res.val.i = (short) info->op1.val.q;
726                 goto done;

727         case 0x730:
728         case 0x770:
729         case 0x7b0:
730                 /* fbstp; don't bother */
731                 info->op = fex_other;
732                 info->op1.type = info->res.type = fex_nodata;
733                 info->flags = 0;
734                 return;

735         case 0x738:
736         case 0x778:
737         case 0x7b8:
738                 info->res.type = fex_llong;
739                 if (ex == FPE_FLTRES) {
740                         /* inexact, stack popped */
741                         if (!ea) {
742                                 info->op = fex_other;
743                                 info->op1.type = info->op2.type = info->res.type
744                                 info->flags = 0;
745                                 return;
746                         }
747                         info->op1.type = fex_nodata;
748                         info->res.val.l = *(long long *)ea;
749                         info->flags = FE_INEXACT;
750                         return;
751                 }
752                 info->op1.type = fex_ldouble;
753                 info->op1.val.q = fpreg(uap, 0);
754                 info->res.val.l = (long long) info->op1.val.q;
755                 goto done;
756         }

757         /* all other ops (except compares) have destinations on the stack
758            so overflow, underflow, and inexact will stomp their operands */
759         if (ex == FPE_FLTOVF || ex == FPE_FLTUND || ex == FPE_FLTRES) {
760                 /* find the trapped result */
761                 info->op1.type = info->op2.type = fex_nodata;
762                 info->res.type = fex_ldouble;
763                 switch (op & 0x7f8) {
764                 case 0x1f0:
765                         /* fptan pushes 1.0 afterward, so result is in st(1) */
766                         info->res.val.q = ((op == 0x1f2)? fpreg(uap, 1) :
767                                 fpreg(uap, 0));
768                         break;

769                 case 0x4c0:
770                 case 0x4c8:
771                 case 0x4e0:
772                 case 0x4e8:
773                 case 0x4f0:
774                 case 0x4f8:
775                         info->res.val.q = fpreg(uap, op & 7);
776                         break;

777                 case 0x6c0:
778                 case 0x6c8:
779                 case 0x6e0:
780                 case 0x6e8:
781                 case 0x6f0:
782                 case 0x6f8:
783                         info->res.val.q = fpreg(uap, op & 7);
784                         break;

785                 case 0x2c0:
786                 case 0x2c8:
787                 case 0x2e0:
788                 case 0x2e8:
789                 case 0x2f0:
790                 case 0x2f8:
791                         info->res.val.q = fpreg(uap, op & 7);
792                         break;

793                 case 0x3c0:
794                 case 0x3c8:
795                 case 0x3e0:
796                 case 0x3e8:
797                 case 0x3f0:
798                 case 0x3f8:
799                         info->res.val.q = fpreg(uap, op & 7);
800                         break;

801                 default:
802                         info->op = fex_other;
803                         info->flags = 0;
804                         return;
805                 }
806         }

807 done:
808         info->op = fex_other;
809         info->flags = 0;
810         return;
811 }
```

```
787                 case 0x6e8:
788                 case 0x6f0:
789                 case 0x6f8:
790                         /* stack was popped afterward */
791                         info->res.val.q = fpreg(uap, (op - 1) & 7);
792                         break;

794                 default:
795                         info->res.val.q = fpreg(uap, 0);
796                 }

798                 /* reconstruct default untrapped result */
799                 if (ex == FPE_FLTOVF) {
800                         /* generate an overflow with the sign of the result */
801                         x = two12288;
802                         *(4+(short*)&x) |= (*(4+(short*)&info->res.val.q) & 0x80
803                         info->res.val.q = x * two12288;
804                         info->flags = FE_OVERFLOW | FE_INEXACT;
805                         __fenv_getcwsw(&cwsw);
806                         cwsw &= ~FE_ALL_EXCEPT;
807                         __fenv_setcwsw(&cwsw);
808                 }
809                 else if (ex == FPE_FLTUND) {
810                         /* undo the scaling; we can't distinguish a chopped resu
811                            from an exact one without futzing around to trap all
812                            exact exceptions so as to keep the flag clear, so we
813                            punt */
814                         if (sw & 0x200) /* result was rounded up */
815                                 info->res.val.q = (info->res.val.q * twom12288)
816                         else
817                                 info->res.val.q = (info->res.val.q * twom12288)
818                         __fenv_getcwsw(&cwsw);
819                         info->flags = (cwsw & FE_INEXACT) | FE_UNDERFLOW;
820                         cwsw &= ~FE_ALL_EXCEPT;
821                         __fenv_setcwsw(&cwsw);
822                 }
823                 else
824                         info->flags = FE_INEXACT;

826                 /* determine the operation code */
827                 switch (op) {
828                 case 0x1f0: /* f2xm1 */
829                 case 0x1f1: /* fyl2x */
830                 case 0x1f2: /* fptan */
831                 case 0x1f3: /* fpatan */
832                 case 0x1f5: /* fprem1 */
833                 case 0x1f8: /* fprem */
834                 case 0x1f9: /* fyl2xp1 */
835                 case 0x1fb: /* fsincos */
836                 case 0x1fc: /* frndint */
837                 case 0x1fd: /* fscale */
838                 case 0x1fe: /* fsin */
839                 case 0x1ff: /* fcos */
840                         info->op = fex_other;
841                         return;

843                 case 0x1fa: /* fsqrt */
844                         info->op = fex_sqrt;
845                         return;
846                 }

848                 info->op = fex_other;
849                 switch (op & 0x7c0) {
850                 case 0x000:
851                 case 0x040:
852                 case 0x080:
```



```
853                 case 0x0c0:
854                 case 0x200:
855                 case 0x240:
856                 case 0x280:
857                 case 0x400:
858                 case 0x440:
859                 case 0x480:
860                 case 0x4c0:
861                 case 0x600:
862                 case 0x640:
863                 case 0x680:
864                 case 0x6c0:
865                         switch (op & 0x38) {
866                         case 0x00:
867                                 info->op = fex_add;
868                                 break;

870                         case 0x08:
871                                 info->op = fex_mul;
872                                 break;

874                         case 0x20:
875                         case 0x28:
876                                 info->op = fex_sub;
877                                 break;

879                         case 0x30:
880                         case 0x38:
881                                 info->op = fex_div;
882                                 break;
883                         }
884                 }
885                 return;
886         }

888         /* for other exceptions, the operands are preserved, so we can
889            just emulate the operation with traps disabled */

891         /* one operand is always in st */
892         info->op1.type = fex_ldouble;
893         info->op1.val.q = fpreg(uap, 0);

895         /* oddball instructions */
896         info->op = fex_other;
897         switch (op) {
898         case 0x1e4: /* ftst */
899                 info->op = fex_cmp;
900                 info->op2.type = fex_ldouble;
901                 info->op2.val.q = 0.0l;
902                 info->res.type = fex_nodata;
903                 c = (info->op1.val.q < info->op2.val.q);
904                 goto done;

906         case 0x1f0: /* f2xm1 */
907                 info->res.type = fex_ldouble;
908                 info->res.val.q = f2xm1(info->op1.val.q);
909                 goto done;

911         case 0x1f1: /* fyl2x */
912                 info->op2.type = fex_ldouble;
913                 info->op2.val.q = fpreg(uap, 1);
914                 info->res.type = fex_ldouble;
915                 info->res.val.q = fyl2x(info->op1.val.q, info->op2.val.q);
916                 goto done;

918         case 0x1f2: /* fptan */
```

```
919                 info->res.type = fex_ldouble;
920                 info->res.val.q = fptan(info->op1.val.q);
921                 goto done;

923         case 0x1f3: /* fpatan */
924                 info->op2.type = fex_ldouble;
925                 info->op2.val.q = fpreg(uap, 1);
926                 info->res.type = fex_ldouble;
927                 info->res.val.q = fpatan(info->op1.val.q, info->op2.val.q);
928                 goto done;

930         case 0x1f4: /* fxtract */
931                 info->res.type = fex_ldouble;
932                 info->res.val.q = fxtract(info->op1.val.q);
933                 goto done;

935         case 0x1f5: /* fprem1 */
936                 info->op2.type = fex_ldouble;
937                 info->op2.val.q = fpreg(uap, 1);
938                 info->res.type = fex_ldouble;
939                 info->res.val.q = fprem1(info->op1.val.q, info->op2.val.q);
940                 goto done;

942         case 0x1f8: /* fprem */
943                 info->op2.type = fex_ldouble;
944                 info->op2.val.q = fpreg(uap, 1);
945                 info->res.type = fex_ldouble;
946                 info->res.val.q = fprem(info->op1.val.q, info->op2.val.q);
947                 goto done;

949         case 0x1f9: /* fyl2xp1 */
950                 info->op2.type = fex_ldouble;
951                 info->op2.val.q = fpreg(uap, 1);
952                 info->res.type = fex_ldouble;
953                 info->res.val.q = fyl2xp1(info->op1.val.q, info->op2.val.q);
954                 goto done;

956         case 0x1fa: /* fsqrt */
957                 info->op = fex_sqrt;
958                 info->res.type = fex_ldouble;
959                 info->res.val.q = fsqrt(info->op1.val.q);
960                 goto done;

962         case 0x1fb: /* fsincos */
963                 info->res.type = fex_ldouble;
964                 info->res.val.q = fsincos(info->op1.val.q);
965                 goto done;

967         case 0x1fc: /* frndint */
968                 info->res.type = fex_ldouble;
969                 info->res.val.q = frndint(info->op1.val.q);
970                 goto done;

972         case 0x1fd: /* fscale */
973                 info->op2.type = fex_ldouble;
974                 info->op2.val.q = fpreg(uap, 1);
975                 info->res.type = fex_ldouble;
976                 info->res.val.q = fscale(info->op1.val.q, info->op2.val.q);
977                 goto done;

979         case 0x1fe: /* fsin */
980                 info->res.type = fex_ldouble;
981                 info->res.val.q = fsin(info->op1.val.q);
982                 goto done;

984         case 0x1ff: /* fcos */
```



```
985                 info->res.type = fex_ldouble;
986                 info->res.val.q = fcos(info->op1.val.q);
987                 goto done;

989         case 0x2e9: /* fucompp */
990                 info->op = fex_cmp;
991                 info->op2.type = fex_ldouble;
992                 info->op2.val.q = fpreg(uap, 1);
993                 info->res.type = fex_nodata;
994                 c = (info->op1.val.q == info->op2.val.q);
995                 goto done;
996         }

998         /* fucom[p], fcomi[p], fucomi[p] */
999         switch (op & 0x7f8) {
1000        case 0x3e8:
1001        case 0x5e0:
1002        case 0x5e8:
1003        case 0x7e8: /* unordered compares */
1004                info->op = fex_cmp;
1005                info->op2.type = fex_ldouble;
1006                info->op2.val.q = fpreg(uap, op & 7);
1007                info->res.type = fex_nodata;
1008                c = (info->op1.val.q == info->op2.val.q);
1009                goto done;

1011        case 0x3f0:
1012        case 0x7f0: /* ordered compares */
1013                info->op = fex_cmp;
1014                info->op2.type = fex_ldouble;
1015                info->op2.val.q = fpreg(uap, op & 7);
1016                info->res.type = fex_nodata;
1017                c = (info->op1.val.q < info->op2.val.q);
1018                goto done;
1019        }

1021        /* all other instructions come in groups of the form
1022           fadd, fmul, fcom, fcomp, fsub, fsubr, fdiv, fdivr */

1024        /* get the second operand */
1025        switch (op & 0x7c0) {
1026        case 0x000:
1027        case 0x040:
1028        case 0x080:
1029                if (!ea) {
1030                        info->op = fex_other;
1031                        info->op1.type = info->op2.type = info->res.type = fex_n
1032                        info->flags = 0;
1033                        return;
1034                }
1035                info->op2.type = fex_float;
1036                info->op2.val.f = *(float *)ea;
1037                op2v = (long double) info->op2.val.f;
1038                break;

1040        case 0x0c0:
1041                info->op2.type = fex_ldouble;
1042                op2v = info->op2.val.q = fpreg(uap, op & 7);
1043                break;

1045        case 0x200:
1046        case 0x240:
1047        case 0x280:
1048                if (!ea) {
1049                        info->op = fex_other;
1050                        info->op1.type = info->op2.type = info->res.type = fex_n
```

```
1051                        info->flags = 0;
1052                        return;
1053                }
1054                info->op2.type = fex_int;
1055                info->op2.val.i = *(int *)ea;
1056                op2v = (long double) info->op2.val.i;
1057                break;

1059        case 0x400:
1060        case 0x440:
1061        case 0x480:
1062                if (!ea) {
1063                        info->op = fex_other;
1064                        info->op1.type = info->op2.type = info->res.type = fex_n
1065                        info->flags = 0;
1066                        return;
1067                }
1068                info->op2.type = fex_double;
1069                info->op2.val.d = *(double *)ea;
1070                op2v = (long double) info->op2.val.d;
1071                break;

1073        case 0x4c0:
1074        case 0x6c0:
1075                info->op2.type = fex_ldouble;
1076                info->op2.val.q = fpreg(uap, op & 7);
1077                t = info->op1;
1078                info->op1 = info->op2;
1079                info->op2 = t;
1080                op2v = info->op2.val.q;
1081                break;

1083        case 0x600:
1084        case 0x640:
1085        case 0x680:
1086                if (!ea) {
1087                        info->op = fex_other;
1088                        info->op1.type = info->op2.type = info->res.type = fex_n
1089                        info->flags = 0;
1090                        return;
1091                }
1092                info->op2.type = fex_int;
1093                info->op2.val.i = *(short *)ea;
1094                op2v = (long double) info->op2.val.i;
1095                break;

1097        default:
1098                info->op = fex_other;
1099                info->op1.type = info->op2.type = info->res.type = fex_nodata;
1100                info->flags = 0;
1101                return;
1102        }

1104        /* distinguish different operations in the group */
1105        info->res.type = fex_ldouble;
1106        switch (op & 0x38) {
1107        case 0x00:
1108                info->op = fex_add;
1109                info->res.val.q = info->op1.val.q + op2v;
1110                break;

1112        case 0x08:
1113                info->op = fex_mul;
1114                info->res.val.q = info->op1.val.q * op2v;
1115                break;
```



```
1117        case 0x10:
1118        case 0x18:
1119                info->op = fex_cmp;
1120                info->res.type = fex_nodata;
1121                c = (info->op1.val.q < op2v);
1122                break;

1124        case 0x20:
1125                info->op = fex_sub;
1126                info->res.val.q = info->op1.val.q - op2v;
1127                break;

1129        case 0x28:
1130                info->op = fex_sub;
1131                info->res.val.q = op2v - info->op1.val.q;
1132                t = info->op1;
1133                info->op1 = info->op2;
1134                info->op2 = t;
1135                break;

1137        case 0x30:
1138                info->op = fex_div;
1139                info->res.val.q = info->op1.val.q / op2v;
1140                break;

1142        case 0x38:
1143                info->op = fex_div;
1144                info->res.val.q = op2v / info->op1.val.q;
1145                t = info->op1;
1146                info->op1 = info->op2;
1147                info->op2 = t;
1148                break;

1150        default:
1151                info->op = fex_other;
1152                info->op1.type = info->op2.type = info->res.type = fex_nodata;
1153                info->flags = 0;
1154                return;
1155        }

1157 done:
1158        __fenv_getcwsw(&cwsw);
1159        info->flags = cwsw & FE_ALL_EXCEPT;
1160        cwsw &= ~FE_ALL_EXCEPT;
1161        __fenv_setcwsw(&cwsw);
1162 }

1164 /* pop the saved stack */
1165 static void pop(ucontext_t *uap)
1166 {
1167        unsigned top;

1169        fpreg(uap, 0) = fpreg(uap, 1);
1170        fpreg(uap, 1) = fpreg(uap, 2);
1171        fpreg(uap, 2) = fpreg(uap, 3);
1172        fpreg(uap, 3) = fpreg(uap, 4);
1173        fpreg(uap, 4) = fpreg(uap, 5);
1174        fpreg(uap, 5) = fpreg(uap, 6);
1175        fpreg(uap, 6) = fpreg(uap, 7);
1176 #if defined(__amd64)
1177        top = (uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw >> 10)
1178                & 0xe;
1179        uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.fctw |= (3 << top);
1180        top = (top + 2) & 0xe;
1181        uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw =
1182                (uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw & ~0x3800)
```

```
1183                 | (top << 10);
1184 #else
1185         top = (uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW] >> 10)
1186                 & 0xe;
1187         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[TW] |= (3 << top);
1188         top = (top + 2) & 0xe;
1189         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW] =
1190                 (uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW] & ~0x
1191                 | (top << 10);
1192 #endif
1193 }

1195 /* push x onto the saved stack */
1196 static void push(long double x, ucontext_t *uap)
1197 {
1198         unsigned top;

1200         fpreg(uap, 7) = fpreg(uap, 6);
1201         fpreg(uap, 6) = fpreg(uap, 5);
1202         fpreg(uap, 5) = fpreg(uap, 4);
1203         fpreg(uap, 4) = fpreg(uap, 3);
1204         fpreg(uap, 3) = fpreg(uap, 2);
1205         fpreg(uap, 2) = fpreg(uap, 1);
1206         fpreg(uap, 1) = fpreg(uap, 0);
1207         fpreg(uap, 0) = x;
1208 #if defined(__amd64)
1209         top = (uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw >> 10)
1210                 & 0xe;
1211         top = (top - 2) & 0xe;
1212         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.fctw &= ~(3 << top);
1213         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw =
1214                 (uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw & ~0x3800)
1215                 | (top << 10);
1216 #else
1217         top = (uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW] >> 10)
1218                 & 0xe;
1219         top = (top - 2) & 0xe;
1220         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[TW] &= ~(3 << top)
1221         uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW] =
1222                 (uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW] & ~0x
1223                 | (top << 10);
1224 #endif
1225 }

1227 /* scale factors for exponent wrapping */
1228 static const float
1229         fun = 7.922816251e+28f, /* 2^96 */
1230         fov = 1.262177448e-29f; /* 2^-96 */
1231 static const double
1232         dun = 1.552518092300708935e+231,        /* 2^768 */
1233         dov = 6.441148769597133308e-232;        /* 2^-768 */

1235 /*
1236 *  Store the specified result; if no result is given but the exception
1237 *  is underflow or overflow, use the default trapped result
1238 */
1239 void
1240 __fex_st_result(siginfo_t *sip, ucontext_t *uap, fex_info_t *info)
1241 {
1242         fex_numeric_t   r;
1243         unsigned long           ex, op, ea, stack;

1245         /* get the exception type, opcode, and data address */
1246         ex = sip->si_code;
1247 #if defined(__amd64)
1248         op = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.fop >> 16;
```



```
1249         ea = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.rdp; /*???*/
1250 #else
1251         op = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[OP] >> 16;
1252         ea = uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[EA];
1253 #endif

1255         /* if the instruction is a compare, set the condition codes
1256            to unordered and update the stack */
1257         switch (op & 0x7f8) {
1258         case 0x010:
1259         case 0x050:
1260         case 0x090:
1261         case 0x0d0:
1262         case 0x210:
1263         case 0x250:
1264         case 0x290:
1265         case 0x410:
1266         case 0x450:
1267         case 0x490:
1268         case 0x4d0:
1269         case 0x5e0:
1270         case 0x610:
1271         case 0x650:
1272         case 0x690:
1273                 /* f[u]com */
1274 #if defined(__amd64)
1275                 uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw |= 0x4500;
1276 #else
1277                 uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW] |= 0x4
1278 #endif
1279                 return;

1281         case 0x018:
1282         case 0x058:
1283         case 0x098:
1284         case 0x0d8:
1285         case 0x218:
1286         case 0x258:
1287         case 0x298:
1288         case 0x418:
1289         case 0x458:
1290         case 0x498:
1291         case 0x4d8:
1292         case 0x5e8:
1293         case 0x618:
1294         case 0x658:
1295         case 0x698:
1296         case 0x6d0:
1297                 /* f[u]comp */
1298 #if defined(__amd64)
1299                 uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw |= 0x4500;
1300 #else
1301                 uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW] |= 0x4
1302 #endif
1303                 pop(uap);
1304                 return;

1306         case 0x2e8:
1307         case 0x6d8:
1308                 /* f[u]compp */
1309 #if defined(__amd64)
1310                 uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw |= 0x4500;
1311 #else
1312                 uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW] |= 0x4
1313 #endif
1314                 pop(uap);
```

```
1315                pop(uap);
1316                return;

1318        case 0x1e0:
1319                if (op == 0x1e4) { /* ftst */
1320 #if defined(__amd64)
1321                        uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.sw |= 0x
1322 #else
1323                        uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.state[SW
1324 #endif
1325                        return;
1326                }
1327                break;

1329        case 0x3e8:
1330        case 0x3f0:
1331                /* f[u]comi */
1332 #if defined(__amd64)
1333                uap->uc_mcontext.gregs[REG_PS] |= 0x45;
1334 #else
1335                uap->uc_mcontext.gregs[EFL] |= 0x45;
1336 #endif
1337                return;

1339        case 0x7e8:
1340        case 0x7f0:
1341                /* f[u]comip */
1342 #if defined(__amd64)
1343                uap->uc_mcontext.gregs[REG_PS] |= 0x45;
1344 #else
1345                uap->uc_mcontext.gregs[EFL] |= 0x45;
1346 #endif
1347                pop(uap);
1348                return;
1349        }

1351        /* if there is no result available and the exception is overflow
1352           or underflow, use the wrapped result */
1353        r = info->res;
1354        if (r.type == fex_nodata) {
1355                if (ex == FPE_FLTOVF || ex == FPE_FLTUND) {
1356                        /* for store instructions, do the scaling and store */
1357                        switch (op & 0x7f8) {
1358                        case 0x110:
1359                        case 0x118:
1360                        case 0x150:
1361                        case 0x158:
1362                        case 0x190:
1363                        case 0x198:
1364                                if (!ea)
1365                                        return;
1366                                if (ex == FPE_FLTOVF)
1367                                        *(float *)ea = (fpreg(uap, 0) * fov) * f
1368                                else
1369                                        *(float *)ea = (fpreg(uap, 0) * fun) * f
1370                                if ((op & 8) != 0)
1371                                        pop(uap);
1372                                break;

1374                        case 0x510:
1375                        case 0x518:
1376                        case 0x550:
1377                        case 0x558:
1378                        case 0x590:
1379                        case 0x598:
1380                                if (!ea)
```



```
1381                                        return;
1382                                if (ex == FPE_FLTOVF)
1383                                        *(double *)ea = (fpreg(uap, 0) * dov) *
1384                                else
1385                                        *(double *)ea = (fpreg(uap, 0) * dun) *
1386                                if ((op & 8) != 0)
1387                                        pop(uap);
1388                                break;
1389                        }
1390                }
1391 #ifdef DEBUG
1392                else if (ex != FPE_FLTRES)
1393                        printf( "No result supplied, stack may be hosed\n" );
1394 #endif
1395                return;
1396        }

1398        /* otherwise convert the supplied result to the correct type,
1399           put it in the destination, and update the stack as need be */

1401        /* store instructions */
1402        switch (op & 0x7f8) {
1403        case 0x110:
1404        case 0x118:
1405        case 0x150:
1406        case 0x158:
1407        case 0x190:
1408        case 0x198:
1409                if (!ea)
1410                        return;
1411                switch (r.type) {
1412                case fex_int:
1413                        *(float *)ea = (float) r.val.i;
1414                        break;

1416                case fex_llong:
1417                        *(float *)ea = (float) r.val.l;
1418                        break;

1420                case fex_float:
1421                        *(float *)ea = r.val.f;
1422                        break;

1424                case fex_double:
1425                        *(float *)ea = (float) r.val.d;
1426                        break;

1428                case fex_ldouble:
1429                        *(float *)ea = (float) r.val.q;
1430                        break;

1432                default:
1433                        break;
1434                }
1435                if (ex != FPE_FLTRES && (op & 8) != 0)
1436                        pop(uap);
1437                return;

1439        case 0x310:
1440        case 0x318:
1441        case 0x350:
1442        case 0x358:
1443        case 0x390:
1444        case 0x398:
1445                if (!ea)
1446                        return;
```

```
1447                switch (r.type) {
1448                case fex_int:
1449                        *(int *)ea = r.val.i;
1450                        break;

1452                case fex_llong:
1453                        *(int *)ea = (int) r.val.l;
1454                        break;

1456                case fex_float:
1457                        *(int *)ea = (int) r.val.f;
1458                        break;

1460                case fex_double:
1461                        *(int *)ea = (int) r.val.d;
1462                        break;

1464                case fex_ldouble:
1465                        *(int *)ea = (int) r.val.q;
1466                        break;

1468                default:
1469                        break;
1470                }
1471                if (ex != FPE_FLTRES && (op & 8) != 0)
1472                        pop(uap);
1473                return;

1475        case 0x510:
1476        case 0x518:
1477        case 0x550:
1478        case 0x558:
1479        case 0x590:
1480        case 0x598:
1481                if (!ea)
1482                        return;
1483                switch (r.type) {
1484                case fex_int:
1485                        *(double *)ea = (double) r.val.i;
1486                        break;

1488                case fex_llong:
1489                        *(double *)ea = (double) r.val.l;
1490                        break;

1492                case fex_float:
1493                        *(double *)ea = (double) r.val.f;
1494                        break;

1496                case fex_double:
1497                        *(double *)ea = r.val.d;
1498                        break;

1500                case fex_ldouble:
1501                        *(double *)ea = (double) r.val.q;
1502                        break;

1504                default:
1505                        break;
1506                }
1507                if (ex != FPE_FLTRES && (op & 8) != 0)
1508                        pop(uap);
1509                return;

1511        case 0x710:
1512        case 0x718:
```



```
1513        case 0x750:
1514        case 0x758:
1515        case 0x790:
1516        case 0x798:
1517                if (!ea)
1518                        return;
1519                switch (r.type) {
1520                case fex_int:
1521                        *(short *)ea = (short) r.val.i;
1522                        break;

1524                case fex_llong:
1525                        *(short *)ea = (short) r.val.l;
1526                        break;

1528                case fex_float:
1529                        *(short *)ea = (short) r.val.f;
1530                        break;

1532                case fex_double:
1533                        *(short *)ea = (short) r.val.d;
1534                        break;

1536                case fex_ldouble:
1537                        *(short *)ea = (short) r.val.q;
1538                        break;

1540                default:
1541                        break;
1542                }
1543                if (ex != FPE_FLTRES && (op & 8) != 0)
1544                        pop(uap);
1545                return;

1547        case 0x730:
1548        case 0x770:
1549        case 0x7b0:
1550                /* fbstp; don't bother */
1551                if (ea && ex != FPE_FLTRES)
1552                        pop(uap);
1553                return;

1555        case 0x738:
1556        case 0x778:
1557        case 0x7b8:
1558                if (!ea)
1559                        return;
1560                switch (r.type) {
1561                case fex_int:
1562                        *(long long *)ea = (long long) r.val.i;
1563                        break;

1565                case fex_llong:
1566                        *(long long *)ea = r.val.l;
1567                        break;

1569                case fex_float:
1570                        *(long long *)ea = (long long) r.val.f;
1571                        break;

1573                case fex_double:
1574                        *(long long *)ea = (long long) r.val.d;
1575                        break;

1577                case fex_ldouble:
1578                        *(long long *)ea = (long long) r.val.q;
```

```
1579                            break;

1581                    default:
1582                            break;
1583                    }
1584                    if (ex != FPE_FLTRES)
1585                            pop(uap);
1586                    return;
1587            }

1589            /* for all other instructions, the result goes into a register */
1590            switch (r.type) {
1591            case fex_int:
1592                    r.val.q = (long double) r.val.i;
1593                    break;

1595            case fex_llong:
1596                    r.val.q = (long double) r.val.l;
1597                    break;

1599            case fex_float:
1600                    r.val.q = (long double) r.val.f;
1601                    break;

1603            case fex_double:
1604                    r.val.q = (long double) r.val.d;
1605                    break;

1607            default:
1608                    break;
1609            }

1611            /* for load instructions, push the result onto the stack */
1612            switch (op & 0x7f8) {
1613            case 0x100:
1614            case 0x140:
1615            case 0x180:
1616            case 0x500:
1617            case 0x540:
1618            case 0x580:
1619                    if (ea)
1620                            push(r.val.q, uap);
1621                    return;
1622            }

1624            /* for all other instructions, if the exception is overflow,
1625               underflow, or inexact, the stack has already been updated */
1626            stack = (ex == FPE_FLTOVF || ex == FPE_FLTUND || ex == FPE_FLTRES);
1627            switch (op & 0x7f8) {
1628            case 0x1f0: /* oddballs */
1629                    switch (op) {
1630                    case 0x1f1: /* fyl2x */
1631                    case 0x1f3: /* fpatan */
1632                    case 0x1f9: /* fyl2xp1 */
1633                            /* pop the stack, leaving the result in st */
1634                            if (!stack)
1635                                    pop(uap);
1636                            fpreg(uap, 0) = r.val.q;
1637                            return;

1639                    case 0x1f2: /* fpatan */
1640                            /* fptan pushes 1.0 afterward */
1641                            if (stack)
1642                                    fpreg(uap, 1) = r.val.q;
1643                            else {
1644                                    fpreg(uap, 0) = r.val.q;
```



```
1645                                    push(1.0L, uap);
1646                            }
1647                            return;

1649                    case 0x1f4: /* fxtract */
1650                    case 0x1fb: /* fsincos */
1651                            /* leave the supplied result in st */
1652                            if (stack)
1653                                    fpreg(uap, 0) = r.val.q;
1654                            else {
1655                                    fpreg(uap, 0) = 0.0; /* punt */
1656                                    push(r.val.q, uap);
1657                            }
1658                            return;
1659                    }

1661                    /* all others leave the stack alone and the result in st */
1662                    fpreg(uap, 0) = r.val.q;
1663                    return;

1665            case 0x4c0:
1666            case 0x4c8:
1667            case 0x4e0:
1668            case 0x4e8:
1669            case 0x4f0:
1670            case 0x4f8:
1671                    fpreg(uap, op & 7) = r.val.q;
1672                    return;

1674            case 0x6c0:
1675            case 0x6c8:
1676            case 0x6e0:
1677            case 0x6e8:
1678            case 0x6f0:
1679            case 0x6f8:
1680                    /* stack is popped afterward */
1681                    if (stack)
1682                            fpreg(uap, (op - 1) & 7) = r.val.q;
1683                    else {
1684                            fpreg(uap, op & 7) = r.val.q;
1685                            pop(uap);
1686                    }
1687                    return;

1689            default:
1690                    fpreg(uap, 0) = r.val.q;
1691                    return;
1692            }
1693 }
```

```
**********************************************************
   21370 Sat May 10 12:09:25 2014
new/usr/src/lib/libm/common/m9x/__fex_sparc.c
14071:dece9aafe99a - fix build problems on sparc
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(__sparc)
#include "fenv_synonyms.h"
#include <stdio.h>
#include <unistd.h>
#include <string.h>
#include <signal.h>
#include <siginfo.h>
#include <thread.h>
#include <ucontext.h>
#include <math.h>
#if defined(__SUNPRO_C)
#include <sunmath.h>
#endif
#include <fenv.h>

#include "fenv_inlines.h"
#include "libm_inlines.h"

#ifdef __sparcv9

#define FPreg(X)        &uap->uc_mcontext.fpregs.fpu_fr.fpu_regs[X]

#define FPREG(X)        &uap->uc_mcontext.fpregs.fpu_fr.fpu_dregs[(X>>1)| \
                                        ((X&1)<<4)]

#else

#include <sys/procfs.h>

#define FPxreg(X)       &((prxregset_t*)uap->uc_mcontext.xrs.xrs_ptr)->pr_un.pr_
```



```
#define FPreg(X)        &uap->uc_mcontext.fpregs.fpu_fr.fpu_regs[X]

#define FPREG(X)        ((X & 1)? FPxreg(X - 1) : FPreg(X))

#endif  /* __sparcv9 */

#include "fex_handler.h"

/* avoid dependence on libsunmath */
static enum fp_class_type
my_fp_classl(long double *a)
{
        int             msw = *(int*)a & ~0x80000000;

        if (msw >= 0x7fff0000) {
                if (((msw & 0xffff) | *(1+(int*)a) | *(2+(int*)a) | *(3+(int*)a)
                        return fp_infinity;
                else if (msw & 0x8000)
                        return fp_quiet;
                else
                        return fp_signaling;
        } else if (msw < 0x10000) {
                if ((msw | *(1+(int*)a) | *(2+(int*)a) | *(3+(int*)a)) == 0)
                        return fp_zero;
                else
                        return fp_subnormal;
        } else
                return fp_normal;
}

/*
*  Determine which type of invalid operation exception occurred
*/
enum fex_exception
__fex_get_invalid_type(siginfo_t *sip, ucontext_t *uap)
{
        unsigned                        instr, opf, rs1, rs2;
        enum fp_class_type      t1, t2;

        /* parse the instruction which caused the exception */
        instr = uap->uc_mcontext.fpregs.fpu_q->FQu.fpq.fpq_instr;
        opf = (instr >> 5) & 0x1ff;
        rs1 = (instr >> 14) & 0x1f;
        rs2 = instr & 0x1f;

        /* determine the classes of the operands */
        switch (opf & 3) {
        case 1: /* single */
                t1 = fp_classf(*(float*)FPreg(rs1));
                t2 = fp_classf(*(float*)FPreg(rs2));
                break;

        case 2: /* double */
                t1 = fp_class(*(double*)FPREG(rs1));
                t2 = fp_class(*(double*)FPREG(rs2));
                break;

        case 3: /* quad */
                t1 = my_fp_classl((long double*)FPREG(rs1));
                t2 = my_fp_classl((long double*)FPREG(rs2));
                break;

        default: /* integer operands never cause an invalid operation */
                return (enum fex_exception) -1;
        }
```

```
127         /* if rs2 is snan, return immediately */
128         if (t2 == fp_signaling)
129                 return fex_inv_snan;

131         /* determine the type of operation */
132         switch ((instr >> 19) & 0x183f) {
133         case 0x1034: /* add, subtract, multiply, divide, square root, convert */
134                 switch (opf & 0x1fc) {
135                 case 0x40:
136                 case 0x44: /* add or subtract */
137                         if (t1 == fp_signaling)
138                                 return fex_inv_snan;
139                         else
140                                 return fex_inv_isi;

142                 case 0x48:
143                 case 0x68:
144                 case 0x6c: /* multiply */
145                         if (t1 == fp_signaling)
146                                 return fex_inv_snan;
147                         else
148                                 return fex_inv_zmi;

150                 case 0x4c: /* divide */
151                         if (t1 == fp_signaling)
152                                 return fex_inv_snan;
153                         else if (t1 == fp_zero)
154                                 return fex_inv_zdz;
155                         else
156                                 return fex_inv_idi;

158                 case 0x28: /* square root */
159                         return fex_inv_sqrt;

161                 case 0x80:
162                 case 0xd0: /* convert to integer */
163                         return fex_inv_int;
164                 }
165                 break;

167         case 0x1035: /* compare */
168                 if (t1 == fp_signaling)
169                         return fex_inv_snan;
170                 else
171                         return fex_inv_cmp;
172         }

174         return (enum fex_exception) -1;
175 }

177 #ifdef __sparcv9
178 extern void _Qp_sqrt(long double *, const long double *);
179 #else
180 extern long double _Q_sqrt(long double);
181 #endif

183 /*
184 *  Get the operands, generate the default untrapped result with
185 *  exceptions, and set a code indicating the type of operation
186 */
187 void
188 __fex_get_op(siginfo_t *sip, ucontext_t *uap, fex_info_t *info)
189 {
190         unsigned long   fsr;
191         unsigned                instr, opf, rs1, rs2;
192         volatile int    c;
```



```
194         /* parse the instruction which caused the exception */
195         instr = uap->uc_mcontext.fpregs.fpu_q->FQu.fpq.fpq_instr;
196         opf = (instr >> 5) & 0x1ff;
197         rs1 = (instr >> 14) & 0x1f;
198         rs2 = instr & 0x1f;

200         /* get the operands */
201         switch (opf & 3) {
202         case 0: /* integer */
203                 info->op1.type = fex_nodata;
204                 if (opf & 0x40) {
205                         info->op2.type = fex_int;
206                         info->op2.val.i = *(int*)FPreg(rs2);
207                 }
208                 else {
209                         info->op2.type = fex_llong;
210                         info->op2.val.l = *(long long*)FPREG(rs2);
211                 }
212                 break;

214         case 1: /* single */
215                 info->op1.type = info->op2.type = fex_float;
216                 info->op1.val.f = *(float*)FPreg(rs1);
217                 info->op2.val.f = *(float*)FPreg(rs2);
218                 break;

220         case 2: /* double */
221                 info->op1.type = info->op2.type = fex_double;
222                 info->op1.val.d = *(double*)FPREG(rs1);
223                 info->op2.val.d = *(double*)FPREG(rs2);
224                 break;

226         case 3: /* quad */
227                 info->op1.type = info->op2.type = fex_ldouble;
228                 info->op1.val.q = *(long double*)FPREG(rs1);
229                 info->op2.val.q = *(long double*)FPREG(rs2);
230                 break;
231         }

233         /* initialize res to the default untrapped result and ex to the
234            corresponding flags (assume trapping is disabled and flags
235            are clear) */
236         info->op = fex_other;
237         info->res.type = fex_nodata;
238         switch ((instr >> 19) & 0x183f) {
239         case 0x1035: /* compare */
240                 info->op = fex_cmp;
241                 switch (opf) {
242                 case 0x51: /* compare single */
243                         c = (info->op1.val.f == info->op2.val.f);
244                         break;

246                 case 0x52: /* compare double */
247                         c = (info->op1.val.d == info->op2.val.d);
248                         break;

250                 case 0x53: /* compare quad */
251                         c = (info->op1.val.q == info->op2.val.q);
252                         break;

254                 case 0x55: /* compare single with exception */
255                         c = (info->op1.val.f < info->op2.val.f);
256                         break;

258                 case 0x56: /* compare double with exception */
```

```
259                         c = (info->op1.val.d < info->op2.val.d);
260                         break;
261
262                 case 0x57: /* compare quad with exception */
263                         c = (info->op1.val.q < info->op2.val.q);
264                         break;
265                 }
266                 break;
267
268         case 0x1034: /* add, subtract, multiply, divide, square root, convert */
269                 switch (opf) {
270                 case 0x41: /* add single */
271                         info->op = fex_add;
272                         info->res.type = fex_float;
273                         info->res.val.f = info->op1.val.f + info->op2.val.f;
274                         break;
275
276                 case 0x42: /* add double */
277                         info->op = fex_add;
278                         info->res.type = fex_double;
279                         info->res.val.d = info->op1.val.d + info->op2.val.d;
280                         break;
281
282                 case 0x43: /* add quad */
283                         info->op = fex_add;
284                         info->res.type = fex_ldouble;
285                         info->res.val.q = info->op1.val.q + info->op2.val.q;
286                         break;
287
288                 case 0x45: /* subtract single */
289                         info->op = fex_sub;
290                         info->res.type = fex_float;
291                         info->res.val.f = info->op1.val.f - info->op2.val.f;
292                         break;
293
294                 case 0x46: /* subtract double */
295                         info->op = fex_sub;
296                         info->res.type = fex_double;
297                         info->res.val.d = info->op1.val.d - info->op2.val.d;
298                         break;
299
300                 case 0x47: /* subtract quad */
301                         info->op = fex_sub;
302                         info->res.type = fex_ldouble;
303                         info->res.val.q = info->op1.val.q - info->op2.val.q;
304                         break;
305
306                 case 0x49: /* multiply single */
307                         info->op = fex_mul;
308                         info->res.type = fex_float;
309                         info->res.val.f = info->op1.val.f * info->op2.val.f;
310                         break;
311
312                 case 0x4a: /* multiply double */
313                         info->op = fex_mul;
314                         info->res.type = fex_double;
315                         info->res.val.d = info->op1.val.d * info->op2.val.d;
316                         break;
317
318                 case 0x4b: /* multiply quad */
319                         info->op = fex_mul;
320                         info->res.type = fex_ldouble;
321                         info->res.val.q = info->op1.val.q * info->op2.val.q;
322                         break;
323
324                 case 0x69: /* fsmuld */
```



```
325                         info->op = fex_mul;
326                         info->res.type = fex_double;
327                         info->res.val.d = (double)info->op1.val.f * (double)info
328                         break;
329
330                 case 0x6e: /* fdmulq */
331                         info->op = fex_mul;
332                         info->res.type = fex_ldouble;
333                         info->res.val.q = (long double)info->op1.val.d *
334                                 (long double)info->op2.val.d;
335                         break;
336
337                 case 0x4d: /* divide single */
338                         info->op = fex_div;
339                         info->res.type = fex_float;
340                         info->res.val.f = info->op1.val.f / info->op2.val.f;
341                         break;
342
343                 case 0x4e: /* divide double */
344                         info->op = fex_div;
345                         info->res.type = fex_double;
346                         info->res.val.d = info->op1.val.d / info->op2.val.d;
347                         break;
348
349                 case 0x4f: /* divide quad */
350                         info->op = fex_div;
351                         info->res.type = fex_ldouble;
352                         info->res.val.q = info->op1.val.q / info->op2.val.q;
353                         break;
354
355                 case 0x29: /* square root single */
356                         info->op = fex_sqrt;
357                         info->op1 = info->op2;
358                         info->op2.type = fex_nodata;
359                         info->res.type = fex_float;
360                         info->res.val.f = sqrtf(info->op1.val.f);
361                         break;
362
363                 case 0x2a: /* square root double */
364                         info->op = fex_sqrt;
365                         info->op1 = info->op2;
366                         info->op2.type = fex_nodata;
367                         info->res.type = fex_double;
368                         info->res.val.d = sqrt(info->op1.val.d);
369                         break;
370
371                 case 0x2b: /* square root quad */
372                         info->op = fex_sqrt;
373                         info->op1 = info->op2;
374                         info->op2.type = fex_nodata;
375                         info->res.type = fex_ldouble;
376 #ifdef __sparcv9
377                         _Qp_sqrt(&info->res.val.q, &info->op1.val.q);
378 #else
379                         info->res.val.q = _Q_sqrt(info->op1.val.q);
380 #endif
381                         break;
382
383                 default: /* conversions */
384                         info->op = fex_cnvt;
385                         info->op1 = info->op2;
386                         info->op2.type = fex_nodata;
387                         switch (opf) {
388                         case 0xd1: /* convert single to int */
389                                 info->res.type = fex_int;
390                                 info->res.val.i = (int) info->op1.val.f;
```

```
391                                 break;
392
393                         case 0xd2: /* convert double to int */
394                                 info->res.type = fex_int;
395                                 info->res.val.i = (int) info->op1.val.d;
396                                 break;
397
398                         case 0xd3: /* convert quad to int */
399                                 info->res.type = fex_int;
400                                 info->res.val.i = (int) info->op1.val.q;
401                                 break;
402
403                         case 0x81: /* convert single to long long */
404                                 info->res.type = fex_llong;
405                                 info->res.val.l = (long long) info->op1.val.f;
406                                 break;
407
408                         case 0x82: /* convert double to long long */
409                                 info->res.type = fex_llong;
410                                 info->res.val.l = (long long) info->op1.val.d;
411                                 break;
412
413                         case 0x83: /* convert quad to long long */
414                                 info->res.type = fex_llong;
415                                 info->res.val.l = (long long) info->op1.val.q;
416                                 break;
417
418                         case 0xc4: /* convert int to single */
419                                 info->res.type = fex_float;
420                                 info->res.val.f = (float) info->op1.val.i;
421                                 break;
422
423                         case 0x84: /* convert long long to single */
424                                 info->res.type = fex_float;
425                                 info->res.val.f = (float) info->op1.val.l;
426                                 break;
427
428                         case 0x88: /* convert long long to double */
429                                 info->res.type = fex_double;
430                                 info->res.val.d = (double) info->op1.val.l;
431                                 break;
432
433                         case 0xc6: /* convert double to single */
434                                 info->res.type = fex_float;
435                                 info->res.val.f = (float) info->op1.val.d;
436                                 break;
437
438                         case 0xc7: /* convert quad to single */
439                                 info->res.type = fex_float;
440                                 info->res.val.f = (float) info->op1.val.q;
441                                 break;
442
443                         case 0xc9: /* convert single to double */
444                                 info->res.type = fex_double;
445                                 info->res.val.d = (double) info->op1.val.f;
446                                 break;
447
448                         case 0xcb: /* convert quad to double */
449                                 info->res.type = fex_double;
450                                 info->res.val.d = (double) info->op1.val.q;
451                                 break;
452
453                         case 0xcd: /* convert single to quad */
454                                 info->res.type = fex_ldouble;
455                                 info->res.val.q = (long double) info->op1.val.f;
456                                 break;
```



```
458                         case 0xce: /* convert double to quad */
459                                 info->res.type = fex_ldouble;
460                                 info->res.val.q = (long double) info->op1.val.d;
461                                 break;
462                         }
463                 }
464                 break;
465         }
466         __fenv_getfsr(&fsr);
467         info->flags = (int)__fenv_get_ex(fsr);
468         __fenv_set_ex(fsr, 0);
469         __fenv_setfsr(&fsr);
470 }
471
472 /*
473 *  Store the specified result; if no result is given but the exception
474 *  is underflow or overflow, supply the default trapped result
475 */
476 void
477 __fex_st_result(siginfo_t *sip, ucontext_t *uap, fex_info_t *info)
478 {
479         unsigned                instr, opf, rs1, rs2, rd;
480         long double             qscl;
481         double                  dscl;
482         float                   fscl;
483
484         /* parse the instruction which caused the exception */
485         instr = uap->uc_mcontext.fpregs.fpu_q->FQu.fpq.fpq_instr;
486         opf = (instr >> 5) & 0x1ff;
487         rs1 = (instr >> 14) & 0x1f;
488         rs2 = instr & 0x1f;
489         rd = (instr >> 25) & 0x1f;
490
491         /* if the instruction is a compare, just set fcc to unordered */
492         if (((instr >> 19) & 0x183f) == 0x1035) {
493                 if (rd == 0)
494                         uap->uc_mcontext.fpregs.fpu_fsr |= 0xc00;
495                 else {
496 #ifdef __sparcv9
497                         uap->uc_mcontext.fpregs.fpu_fsr |= (3l << ((rd << 1) + 3
498 #else
499                         ((prxregset_t*)uap->uc_mcontext.xrs.xrs_ptr)->pr_un.pr_v
500 #endif
501                 }
502                 return;
503         }
504
505         /* if there is no result available, try to generate the untrapped
506            default */
507         if (info->res.type == fex_nodata) {
508                 /* set scale factors for exponent wrapping */
509                 switch (sip->si_code) {
510                 case FPE_FLTOVF:
511                         fscl = 1.262177448e-29f;        /* 2^-96 */
512                         dscl = 6.441148769597133308e-232;       /* 2^-768 */
513                         qscl = 8.778357852076208839765066529179033145e-3700l;/*
514                         break;
515
516                 case FPE_FLTUND:
517                         fscl = 7.922816251e+28f;        /* 2^96 */
518                         dscl = 1.5525180923007089350e+231;      /* 2^768 */
519                         qscl = 1.139165225263043370845938579315932009e+3699l;/*
520                         break;
521
522                 default:
```

```
523                     /* user may have blown away the default result by mistak
524                        so try to regenerate it */
525                     (void) __fex_get_op(sip, uap, info);
526                     if (info->res.type != fex_nodata)
527                             goto stuff;
528                     /* couldn't do it */
529                     return;
530             }

532             /* get the operands */
533             switch (opf & 3) {
534             case 1: /* single */
535                     info->op1.val.f = *(float*)FPreg(rs1);
536                     info->op2.val.f = *(float*)FPreg(rs2);
537                     break;

539             case 2: /* double */
540                     info->op1.val.d = *(double*)FPREG(rs1);
541                     info->op2.val.d = *(double*)FPREG(rs2);
542                     break;

544             case 3: /* quad */
545                     info->op1.val.q = *(long double*)FPREG(rs1);
546                     info->op2.val.q = *(long double*)FPREG(rs2);
547                     break;
548             }

550             /* generate the wrapped result */
551             switch (opf) {
552             case 0x41: /* add single */
553                     info->res.type = fex_float;
554                     info->res.val.f = fscl * ( fscl * info->op1.val.f +
555                             fscl * info->op2.val.f );
556                     break;

558             case 0x42: /* add double */
559                     info->res.type = fex_double;
560                     info->res.val.d = dscl * ( dscl * info->op1.val.d +
561                             dscl * info->op2.val.d );
562                     break;

564             case 0x43: /* add quad */
565                     info->res.type = fex_ldouble;
566                     info->res.val.q = qscl * ( qscl * info->op1.val.q +
567                             qscl * info->op2.val.q );
568                     break;

570             case 0x45: /* subtract single */
571                     info->res.type = fex_float;
572                     info->res.val.f = fscl * ( fscl * info->op1.val.f -
573                             fscl * info->op2.val.f );
574                     break;

576             case 0x46: /* subtract double */
577                     info->res.type = fex_double;
578                     info->res.val.d = dscl * ( dscl * info->op1.val.d -
579                             dscl * info->op2.val.d );
580                     break;

582             case 0x47: /* subtract quad */
583                     info->res.type = fex_ldouble;
584                     info->res.val.q = qscl * ( qscl * info->op1.val.q -
585                             qscl * info->op2.val.q );
586                     break;

588             case 0x49: /* multiply single */
```



```
589                     info->res.type = fex_float;
590                     info->res.val.f = ( fscl * info->op1.val.f ) *
591                             ( fscl * info->op2.val.f );
592                     break;

594             case 0x4a: /* multiply double */
595                     info->res.type = fex_double;
596                     info->res.val.d = ( dscl * info->op1.val.d ) *
597                             ( dscl * info->op2.val.d );
598                     break;

600             case 0x4b: /* multiply quad */
601                     info->res.type = fex_ldouble;
602                     info->res.val.q = ( qscl * info->op1.val.q ) *
603                             ( qscl * info->op2.val.q );
604                     break;

606             case 0x4d: /* divide single */
607                     info->res.type = fex_float;
608                     info->res.val.f = ( fscl * info->op1.val.f ) /
609                             ( info->op2.val.f / fscl );
610                     break;

612             case 0x4e: /* divide double */
613                     info->res.type = fex_double;
614                     info->res.val.d = ( dscl * info->op1.val.d ) /
615                             ( info->op2.val.d / dscl );
616                     break;

618             case 0x4f: /* divide quad */
619                     info->res.type = fex_ldouble;
620                     info->res.val.q = ( qscl * info->op1.val.q ) /
621                             ( info->op2.val.q / qscl );
622                     break;

624             case 0xc6: /* convert double to single */
625                     info->res.type = fex_float;
626                     info->res.val.f = (float) ( fscl * ( fscl * info->op1.va
627                     break;

629             case 0xc7: /* convert quad to single */
630                     info->res.type = fex_float;
631                     info->res.val.f = (float) ( fscl * ( fscl * info->op1.va
632                     break;

634             case 0xcb: /* convert quad to double */
635                     info->res.type = fex_double;
636                     info->res.val.d = (double) ( dscl * ( dscl * info->op1.v
637                     break;
638             }

640             if (info->res.type == fex_nodata)
641                     /* couldn't do it */
642                     return;
643     }

645 stuff:
646     /* stick the result in the destination */
647     if (opf & 0x80) { /* conversion */
648             if (opf & 0x10) { /* result is an int */
649                     switch (info->res.type) {
650                     case fex_llong:
651                             info->res.val.i = (int) info->res.val.l;
652                             break;

654                     case fex_float:
```

```
655                             info->res.val.i = (int) info->res.val.f;
656                             break;
657
658                     case fex_double:
659                             info->res.val.i = (int) info->res.val.d;
660                             break;
661
662                     case fex_ldouble:
663                             info->res.val.i = (int) info->res.val.q;
664                             break;
665
666                     default:
667                             break;
668                     }
669                     *(int*)FPreg(rd) = info->res.val.i;
670                     return;
671             }
672
673             switch (opf & 0xc) {
674             case 0: /* result is long long */
675                     switch (info->res.type) {
676                     case fex_int:
677                             info->res.val.l = (long long) info->res.val.i;
678                             break;
679
680                     case fex_float:
681                             info->res.val.l = (long long) info->res.val.f;
682                             break;
683
684                     case fex_double:
685                             info->res.val.l = (long long) info->res.val.d;
686                             break;
687
688                     case fex_ldouble:
689                             info->res.val.l = (long long) info->res.val.q;
690                             break;
691
692                     default:
693                             break;
694                     }
695                     *(long long*)FPREG(rd) = info->res.val.l;
696                     break;
697
698             case 0x4: /* result is float */
699                     switch (info->res.type) {
700                     case fex_int:
701                             info->res.val.f = (float) info->res.val.i;
702                             break;
703
704                     case fex_llong:
705                             info->res.val.f = (float) info->res.val.l;
706                             break;
707
708                     case fex_double:
709                             info->res.val.f = (float) info->res.val.d;
710                             break;
711
712                     case fex_ldouble:
713                             info->res.val.f = (float) info->res.val.q;
714                             break;
715
716                     default:
717                             break;
718                     }
719                     *(float*)FPreg(rd) = info->res.val.f;
720                     break;
```



```
721
722             case 0x8: /* result is double */
723                     switch (info->res.type) {
724                     case fex_int:
725                             info->res.val.d = (double) info->res.val.i;
726                             break;
727
728                     case fex_llong:
729                             info->res.val.d = (double) info->res.val.l;
730                             break;
731
732                     case fex_float:
733                             info->res.val.d = (double) info->res.val.f;
734                             break;
735
736                     case fex_ldouble:
737                             info->res.val.d = (double) info->res.val.q;
738                             break;
739
740                     default:
741                             break;
742                     }
743                     *(double*)FPREG(rd) = info->res.val.d;
744                     break;
745
746             case 0xc: /* result is long double */
747                     switch (info->res.type) {
748                     case fex_int:
749                             info->res.val.q = (long double) info->res.val.i;
750                             break;
751
752                     case fex_llong:
753                             info->res.val.q = (long double) info->res.val.l;
754                             break;
755
756                     case fex_float:
757                             info->res.val.q = (long double) info->res.val.f;
758                             break;
759
760                     case fex_double:
761                             info->res.val.q = (long double) info->res.val.d;
762                             break;
763
764                     default:
765                             break;
766                     }
767                     *(long double*)FPREG(rd) = info->res.val.q;
768                     break;
769             }
770             return;
771     }
772
773     if ((opf & 0xf0) == 0x60) { /* fsmuld, fdmulq */
774             switch (opf & 0xc0) {
775             case 0x8: /* result is double */
776                     switch (info->res.type) {
777                     case fex_int:
778                             info->res.val.d = (double) info->res.val.i;
779                             break;
780
781                     case fex_llong:
782                             info->res.val.d = (double) info->res.val.l;
783                             break;
784
785                     case fex_float:
786                             info->res.val.d = (double) info->res.val.f;
```

```
787                                 break;
788
789                         case fex_ldouble:
790                                 info->res.val.d = (double) info->res.val.q;
791                                 break;
792
793                         default:
794                                 break;
795                         }
796                         *(double*)FPREG(rd) = info->res.val.d;
797                         break;
798
799                 case 0xc: /* result is long double */
800                         switch (info->res.type) {
801                         case fex_int:
802                                 info->res.val.q = (long double) info->res.val.i;
803                                 break;
804
805                         case fex_llong:
806                                 info->res.val.q = (long double) info->res.val.l;
807                                 break;
808
809                         case fex_float:
810                                 info->res.val.q = (long double) info->res.val.f;
811                                 break;
812
813                         case fex_double:
814                                 info->res.val.q = (long double) info->res.val.d;
815                                 break;
816
817                         default:
818                                 break;
819                         }
820                         *(long double*)FPREG(rd) = info->res.val.q;
821                         break;
822                 }
823                 return;
824         }
825
826         switch (opf & 3) { /* other arithmetic op */
827         case 1: /* result is float */
828                 switch (info->res.type) {
829                 case fex_int:
830                         info->res.val.f = (float) info->res.val.i;
831                         break;
832
833                 case fex_llong:
834                         info->res.val.f = (float) info->res.val.l;
835                         break;
836
837                 case fex_double:
838                         info->res.val.f = (float) info->res.val.d;
839                         break;
840
841                 case fex_ldouble:
842                         info->res.val.f = (float) info->res.val.q;
843                         break;
844
845                 default:
846                         break;
847                 }
848                 *(float*)FPreg(rd) = info->res.val.f;
849                 break;
850
851         case 2: /* result is double */
852                 switch (info->res.type) {
```



```
853                 case fex_int:
854                         info->res.val.d = (double) info->res.val.i;
855                         break;
856
857                 case fex_llong:
858                         info->res.val.d = (double) info->res.val.l;
859                         break;
860
861                 case fex_float:
862                         info->res.val.d = (double) info->res.val.f;
863                         break;
864
865                 case fex_ldouble:
866                         info->res.val.d = (double) info->res.val.q;
867                         break;
868
869                 default:
870                         break;
871                 }
872                 *(double*)FPREG(rd) = info->res.val.d;
873                 break;
874
875         case 3: /* result is long double */
876                 switch (info->res.type) {
877                 case fex_int:
878                         info->res.val.q = (long double) info->res.val.i;
879                         break;
880
881                 case fex_llong:
882                         info->res.val.q = (long double) info->res.val.l;
883                         break;
884
885                 case fex_float:
886                         info->res.val.q = (long double) info->res.val.f;
887                         break;
888
889                 case fex_double:
890                         info->res.val.q = (long double) info->res.val.d;
891                         break;
892
893                 default:
894                         break;
895                 }
896                 *(long double*)FPREG(rd) = info->res.val.q;
897                 break;
898         }
899 }
900 #endif  /* defined(__sparc) */
```

```
**********************************************************
   39094 Sat May 10 12:09:26 2014
new/usr/src/lib/libm/common/m9x/__fex_sse.c
patch06 - libm: fixed compilation issues after updates
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include "fenv_synonyms.h"
#include <ucontext.h>
#include <fenv.h>
#if defined(__SUNPRO_C)
#include <sunmath.h>
#else
#include <sys/ieeefp.h>
#endif
#include "fex_handler.h"
#include "fenv_inlines.h"

#if !defined(REG_PC)
#define REG_PC  EIP
#endif

#if !defined(REG_PS)
#define REG_PS  EFL
#endif

#ifdef __amd64
#define regno(X)        ((X < 4)? REG_RAX - X : \
                        ((X > 4)? REG_RAX + 1 - X : REG_RSP))
#else
#define regno(X)        (EAX - X)
#endif

/*
 * Support for SSE instructions
 */
```



```
/*
 * Decode an SSE instruction.  Fill in *inst and return the length of the
 * instruction in bytes.  Return 0 if the instruction is not recognized.
 */
int
__fex_parse_sse(ucontext_t *uap, sseinst_t *inst)
{
        unsigned char   *ip;
        char            *addr;
        int             i, dbl, simd, rex, modrm, sib, r;

        i = 0;
        ip = (unsigned char *)uap->uc_mcontext.gregs[REG_PC];

        /* look for pseudo-prefixes */
        dbl = 0;
        simd = SIMD;
        if (ip[i] == 0xF3) {
                simd = 0;
                i++;
        } else if (ip[i] == 0x66) {
                dbl = DOUBLE;
                i++;
        } else if (ip[i] == 0xF2) {
                dbl = DOUBLE;
                simd = 0;
                i++;
        }

        /* look for AMD64 REX prefix */
        rex = 0;
        if (ip[i] >= 0x40 && ip[i] <= 0x4F) {
                rex = ip[i];
                i++;
        }

        /* parse opcode */
        if (ip[i++] != 0x0F)
                return 0;
        switch (ip[i++]) {
        case 0x2A:
                inst->op = (int)cvtsi2ss + simd + dbl;
                if (!simd)
                        inst->op = (int)inst->op + (rex & 8);
                break;

        case 0x2C:
                inst->op = (int)cvttss2si + simd + dbl;
                if (!simd)
                        inst->op = (int)inst->op + (rex & 8);
                break;

        case 0x2D:
                inst->op = (int)cvtss2si + simd + dbl;
                if (!simd)
                        inst->op = (int)inst->op + (rex & 8);
                break;

        case 0x2E:
                /* oddball: scalar instruction in a SIMD opcode group */
                if (!simd)
                        return 0;
                inst->op = (int)ucomiss + dbl;
                break;

        case 0x2F:
```

```
126                 /* oddball: scalar instruction in a SIMD opcode group */
127                 if (!simd)
128                         return 0;
129                 inst->op = (int)comiss + dbl;
130                 break;
131
132         case 0x51:
133                 inst->op = (int)sqrtss + simd + dbl;
134                 break;
135
136         case 0x58:
137                 inst->op = (int)addss + simd + dbl;
138                 break;
139
140         case 0x59:
141                 inst->op = (int)mulss + simd + dbl;
142                 break;
143
144         case 0x5A:
145                 inst->op = (int)cvtss2sd + simd + dbl;
146                 break;
147
148         case 0x5B:
149                 if (dbl) {
150                         if (simd)
151                                 inst->op = cvtps2dq;
152                         else
153                                 return 0;
154                 } else {
155                         inst->op = (simd)? cvtdq2ps : cvttps2dq;
156                 }
157                 break;
158
159         case 0x5C:
160                 inst->op = (int)subss + simd + dbl;
161                 break;
162
163         case 0x5D:
164                 inst->op = (int)minss + simd + dbl;
165                 break;
166
167         case 0x5E:
168                 inst->op = (int)divss + simd + dbl;
169                 break;
170
171         case 0x5F:
172                 inst->op = (int)maxss + simd + dbl;
173                 break;
174
175         case 0xC2:
176                 inst->op = (int)cmpss + simd + dbl;
177                 break;
178
179         case 0xE6:
180                 if (simd) {
181                         if (dbl)
182                                 inst->op = cvttpd2dq;
183                         else
184                                 return 0;
185                 } else {
186                         inst->op = (dbl)? cvtpd2dq : cvtdq2pd;
187                 }
188                 break;
189
190         default:
191                 return 0;
```



```
192         }
193
194         /* locate operands */
195         modrm = ip[i++];
196
197         if (inst->op == cvtss2si || inst->op == cvttss2si ||
198             inst->op == cvtsd2si || inst->op == cvttsd2si ||
199             inst->op == cvtss2siq || inst->op == cvttss2siq ||
200             inst->op == cvtsd2siq || inst->op == cvttsd2siq) {
201                 /* op1 is a gp register */
202                 r = ((rex & 4) << 1) | ((modrm >> 3) & 7);
203                 inst->op1 = (sseoperand_t *)&uap->uc_mcontext.gregs[regno(r)];
204         } else if (inst->op == cvtps2pi || inst->op == cvttps2pi ||
205             inst->op == cvtpd2pi || inst->op == cvttpd2pi) {
206                 /* op1 is a mmx register */
207 #ifdef __amd64
208                 inst->op1 = (sseoperand_t *)&uap->uc_mcontext.fpregs.fp_reg_set.
209                     fpchip_state.st[(modrm >> 3) & 7];
210 #else
211                 inst->op1 = (sseoperand_t *)(10 * ((modrm >> 3) & 7) +
212                     (char *)&uap->uc_mcontext.fpregs.fp_reg_set.
213                     fpchip_state.state[7]);
214 #endif
215         } else {
216                 /* op1 is a xmm register */
217                 r = ((rex & 4) << 1) | ((modrm >> 3) & 7);
218                 inst->op1 = (sseoperand_t *)&uap->uc_mcontext.fpregs.
219                     fp_reg_set.fpchip_state.xmm[r];
220         }
221
222         if ((modrm >> 6) == 3) {
223                 if (inst->op == cvtsi2ss || inst->op == cvtsi2sd ||
224                     inst->op == cvtsi2ssq || inst->op == cvtsi2sdq) {
225                         /* op2 is a gp register */
226                         r = ((rex & 1) << 3) | (modrm & 7);
227                         inst->op2 = (sseoperand_t *)&uap->uc_mcontext.
228                             gregs[regno(r)];
229                 } else if (inst->op == cvtpi2ps || inst->op == cvtpi2pd) {
230                         /* op2 is a mmx register */
231 #ifdef __amd64
232                         inst->op2 = (sseoperand_t *)&uap->uc_mcontext.fpregs.
233                             fp_reg_set.fpchip_state.st[modrm & 7];
234 #else
235                         inst->op2 = (sseoperand_t *)(10 * (modrm & 7) +
236                             (char *)&uap->uc_mcontext.fpregs.fp_reg_set.
237                             fpchip_state.state[7]);
238 #endif
239                 } else {
240                         /* op2 is a xmm register */
241                         r = ((rex & 1) << 3) | (modrm & 7);
242                         inst->op2 = (sseoperand_t *)&uap->uc_mcontext.fpregs.
243                             fp_reg_set.fpchip_state.xmm[r];
244                 }
245         } else if ((modrm & 0xc7) == 0x05) {
246 #ifdef __amd64
247                 /* address of next instruction + offset */
248                 r = i + 4;
249                 if (inst->op == cmpss || inst->op == cmpps ||
250                     inst->op == cmpsd || inst->op == cmppd)
251                         r++;
252                 inst->op2 = (sseoperand_t *)(ip + r + *(int *)(ip + i));
253 #else
254                 /* absolute address */
255                 inst->op2 = (sseoperand_t *)(*(int *)(ip + i));
256 #endif
257                 i += 4;
```

```
258         } else {
259                 /* complex address */
260                 if ((modrm & 7) == 4) {
261                         /* parse sib byte */
262                         sib = ip[i++];
263                         if ((sib & 7) == 5 && (modrm >> 6) == 0) {
264                                 /* start with absolute address */
265                                 addr = (char *)(uintptr_t)(*(int *)(ip + i));
266                                 i += 4;
267                         } else {
268                                 /* start with base */
269                                 r = ((rex & 1) << 3) | (sib & 7);
270                                 addr = (char *)uap->uc_mcontext.gregs[regno(r)];
271                         }
272                         r = ((rex & 2) << 2) | ((sib >> 3) & 7);
273                         if (r != 4) {
274                                 /* add scaled index */
275                                 addr += uap->uc_mcontext.gregs[regno(r)]
276                                     << (sib >> 6);
277                         }
278                 } else {
279                         r = ((rex & 1) << 3) | (modrm & 7);
280                         addr = (char *)uap->uc_mcontext.gregs[regno(r)];
281                 }

283                 /* add displacement, if any */
284                 if ((modrm >> 6) == 1) {
285                         addr += (char)ip[i++];
286                 } else if ((modrm >> 6) == 2) {
287                         addr += *(int *)(ip + i);
288                         i += 4;
289                 }
290                 inst->op2 = (sseoperand_t *)addr;
291         }

293         if (inst->op == cmpss || inst->op == cmpps || inst->op == cmpsd ||
294             inst->op == cmppd) {
295                 /* get the immediate operand */
296                 inst->imm = ip[i++];
297         }

299         return i;
300 }

302 static enum fp_class_type
303 my_fp_classf(float *x)
304 {
305         int     i = *(int *)x & ~0x80000000;

307         if (i < 0x7f800000) {
308                 if (i < 0x00800000)
309                         return ((i == 0)? fp_zero : fp_subnormal);
310                 return fp_normal;
311         }
312         else if (i == 0x7f800000)
313                 return fp_infinity;
314         else if (i & 0x400000)
315                 return fp_quiet;
316         else
317                 return fp_signaling;
318 }

320 static enum fp_class_type
321 my_fp_class(double *x)
322 {
323         int     i = *(1+(int *)x) & ~0x80000000;
```



```
325         if (i < 0x7ff00000) {
326                 if (i < 0x00100000)
327                         return (((i | *(int *)x) == 0)? fp_zero : fp_subnormal);
328                 return fp_normal;
329         }
330         else if (i == 0x7ff00000 && *(int *)x == 0)
331                 return fp_infinity;
332         else if (i & 0x80000)
333                 return fp_quiet;
334         else
335                 return fp_signaling;
336 }

338 /*
339  * Inspect a scalar SSE instruction that incurred an invalid operation
340  * exception to determine which type of exception it was.
341  */
342 static enum fex_exception
343 __fex_get_sse_invalid_type(sseinst_t *inst)
344 {
345         enum fp_class_type      t1, t2;

347         /* check op2 for signaling nan */
348         t2 = ((int)inst->op & DOUBLE)? my_fp_class(&inst->op2->d[0]) :
349             my_fp_classf(&inst->op2->f[0]);
350         if (t2 == fp_signaling)
351                 return fex_inv_snan;

353         /* eliminate all single-operand instructions */
354         switch (inst->op) {
355         case cvtsd2ss:
356         case cvtss2sd:
357                 /* hmm, this shouldn't have happened */
358                 return (enum fex_exception) -1;

360         case sqrtss:
361         case sqrtsd:
362                 return fex_inv_sqrt;

364         case cvtss2si:
365         case cvtsd2si:
366         case cvttss2si:
367         case cvttsd2si:
368         case cvtss2siq:
369         case cvtsd2siq:
370         case cvttss2siq:
371         case cvttsd2siq:
372                 return fex_inv_int;
373         default:
374                 break;
375         }

377         /* check op1 for signaling nan */
378         t1 = ((int)inst->op & DOUBLE)? my_fp_class(&inst->op1->d[0]) :
379             my_fp_classf(&inst->op1->f[0]);
380         if (t1 == fp_signaling)
381                 return fex_inv_snan;

383         /* check two-operand instructions for other cases */
384         switch (inst->op) {
385         case cmpss:
386         case cmpsd:
387         case minss:
388         case minsd:
389         case maxss:
```

```
390         case maxsd:
391         case comiss:
392         case comisd:
393                 return fex_inv_cmp;

395         case addss:
396         case addsd:
397         case subss:
398         case subsd:
399                 if (t1 == fp_infinity && t2 == fp_infinity)
400                         return fex_inv_isi;
401                 break;

403         case mulss:
404         case mulsd:
405                 if ((t1 == fp_zero && t2 == fp_infinity) ||
406                     (t2 == fp_zero && t1 == fp_infinity))
407                         return fex_inv_zmi;
408                 break;

410         case divss:
411         case divsd:
412                 if (t1 == fp_zero && t2 == fp_zero)
413                         return fex_inv_zdz;
414                 if (t1 == fp_infinity && t2 == fp_infinity)
415                         return fex_inv_idi;
416         default:
417                 break;
418         }

420         return (enum fex_exception)-1;
421 }

423 /* inline templates */
424 extern void sse_cmpeqss(float *, float *, int *);
425 extern void sse_cmpltss(float *, float *, int *);
426 extern void sse_cmpless(float *, float *, int *);
427 extern void sse_cmpunordss(float *, float *, int *);
428 extern void sse_minss(float *, float *, float *);
429 extern void sse_maxss(float *, float *, float *);
430 extern void sse_addss(float *, float *, float *);
431 extern void sse_subss(float *, float *, float *);
432 extern void sse_mulss(float *, float *, float *);
433 extern void sse_divss(float *, float *, float *);
434 extern void sse_sqrtss(float *, float *);
435 extern void sse_ucomiss(float *, float *);
436 extern void sse_comiss(float *, float *);
437 extern void sse_cvtss2sd(float *, double *);
438 extern void sse_cvtsi2ss(int *, float *);
439 extern void sse_cvttss2si(float *, int *);
440 extern void sse_cvtss2si(float *, int *);
441 #ifdef __amd64
442 extern void sse_cvtsi2ssq(long long *, float *);
443 extern void sse_cvttss2siq(float *, long long *);
444 extern void sse_cvtss2siq(float *, long long *);
445 #endif
446 extern void sse_cmpeqsd(double *, double *, long long *);
447 extern void sse_cmpltsd(double *, double *, long long *);
448 extern void sse_cmplesd(double *, double *, long long *);
449 extern void sse_cmpunordsd(double *, double *, long long *);
450 extern void sse_minsd(double *, double *, double *);
451 extern void sse_maxsd(double *, double *, double *);
452 extern void sse_addsd(double *, double *, double *);
453 extern void sse_subsd(double *, double *, double *);
454 extern void sse_mulsd(double *, double *, double *);
455 extern void sse_divsd(double *, double *, double *);
```



```
456 extern void sse_sqrtsd(double *, double *);
457 extern void sse_ucomisd(double *, double *);
458 extern void sse_comisd(double *, double *);
459 extern void sse_cvtsd2ss(double *, float *);
460 extern void sse_cvtsi2sd(int *, double *);
461 extern void sse_cvttsd2si(double *, int *);
462 extern void sse_cvtsd2si(double *, int *);
463 #ifdef __amd64
464 extern void sse_cvtsi2sdq(long long *, double *);
465 extern void sse_cvttsd2siq(double *, long long *);
466 extern void sse_cvtsd2siq(double *, long long *);
467 #endif

469 /*
470  * Fill in *info with the operands, default untrapped result, and
471  * flags produced by a scalar SSE instruction, and return the type
472  * of trapped exception (if any).  On entry, the mxcsr must have
473  * all exceptions masked and all flags clear.  The same conditions
474  * will hold on exit.
475  *
476  * This routine does not work if the instruction specified by *inst
477  * is not a scalar instruction.
478  */
479 enum fex_exception
480 __fex_get_sse_op(ucontext_t *uap, sseinst_t *inst, fex_info_t *info)
481 {
482         unsigned int    e, te, mxcsr, oldmxcsr, subnorm;

484         /*
485          * Perform the operation with traps disabled and check the
486          * exception flags.  If the underflow trap was enabled, also
487          * check for an exact subnormal result.
488          */
489         __fenv_getmxcsr(&oldmxcsr);
490         subnorm = 0;
491         if ((int)inst->op & DOUBLE) {
492                 if (inst->op == cvtsi2sd) {
493                         info->op1.type = fex_int;
494                         info->op1.val.i = inst->op2->i[0];
495                         info->op2.type = fex_nodata;
496                 } else if (inst->op == cvtsi2sdq) {
497                         info->op1.type = fex_llong;
498                         info->op1.val.l = inst->op2->l[0];
499                         info->op2.type = fex_nodata;
500                 } else if (inst->op == sqrtsd || inst->op == cvtsd2ss ||
501                     inst->op == cvttsd2si || inst->op == cvtsd2si ||
502                     inst->op == cvttsd2siq || inst->op == cvtsd2siq) {
503                         info->op1.type = fex_double;
504                         info->op1.val.d = inst->op2->d[0];
505                         info->op2.type = fex_nodata;
506                 } else {
507                         info->op1.type = fex_double;
508                         info->op1.val.d = inst->op1->d[0];
509                         info->op2.type = fex_double;
510                         info->op2.val.d = inst->op2->d[0];
511                 }
512                 info->res.type = fex_double;
513                 switch (inst->op) {
514                 case cmpsd:
515                         info->op = fex_cmp;
516                         info->res.type = fex_llong;
517                         switch (inst->imm & 3) {
518                         case 0:
519                                 sse_cmpeqsd(&info->op1.val.d, &info->op2.val.d,
520                                     &info->res.val.l);
521                                 break;
```

```
523                         case 1:
524                                 sse_cmpltsd(&info->op1.val.d, &info->op2.val.d,
525                                     &info->res.val.l);
526                                 break;

528                         case 2:
529                                 sse_cmplesd(&info->op1.val.d, &info->op2.val.d,
530                                     &info->res.val.l);
531                                 break;

533                         case 3:
534                                 sse_cmpunordsd(&info->op1.val.d,
535                                     &info->op2.val.d, &info->res.val.l);
536                         }
537                         if (inst->imm & 4)
538                                 info->res.val.l ^= 0xffffffffffffffffull;
539                         break;

541                 case minsd:
542                         info->op = fex_other;
543                         sse_minsd(&info->op1.val.d, &info->op2.val.d,
544                             &info->res.val.d);
545                         break;

547                 case maxsd:
548                         info->op = fex_other;
549                         sse_maxsd(&info->op1.val.d, &info->op2.val.d,
550                             &info->res.val.d);
551                         break;

553                 case addsd:
554                         info->op = fex_add;
555                         sse_addsd(&info->op1.val.d, &info->op2.val.d,
556                             &info->res.val.d);
557                         if (my_fp_class(&info->res.val.d) == fp_subnormal)
558                                 subnorm = 1;
559                         break;

561                 case subsd:
562                         info->op = fex_sub;
563                         sse_subsd(&info->op1.val.d, &info->op2.val.d,
564                             &info->res.val.d);
565                         if (my_fp_class(&info->res.val.d) == fp_subnormal)
566                                 subnorm = 1;
567                         break;

569                 case mulsd:
570                         info->op = fex_mul;
571                         sse_mulsd(&info->op1.val.d, &info->op2.val.d,
572                             &info->res.val.d);
573                         if (my_fp_class(&info->res.val.d) == fp_subnormal)
574                                 subnorm = 1;
575                         break;

577                 case divsd:
578                         info->op = fex_div;
579                         sse_divsd(&info->op1.val.d, &info->op2.val.d,
580                             &info->res.val.d);
581                         if (my_fp_class(&info->res.val.d) == fp_subnormal)
582                                 subnorm = 1;
583                         break;

585                 case sqrtsd:
586                         info->op = fex_sqrt;
587                         sse_sqrtsd(&info->op1.val.d, &info->res.val.d);
```



```
588                         break;

590                 case cvtsd2ss:
591                         info->op = fex_cnvt;
592                         info->res.type = fex_float;
593                         sse_cvtsd2ss(&info->op1.val.d, &info->res.val.f);
594                         if (my_fp_classf(&info->res.val.f) == fp_subnormal)
595                                 subnorm = 1;
596                         break;

598                 case cvtsi2sd:
599                         info->op = fex_cnvt;
600                         sse_cvtsi2sd(&info->op1.val.i, &info->res.val.d);
601                         break;

603                 case cvttsd2si:
604                         info->op = fex_cnvt;
605                         info->res.type = fex_int;
606                         sse_cvttsd2si(&info->op1.val.d, &info->res.val.i);
607                         break;

609                 case cvtsd2si:
610                         info->op = fex_cnvt;
611                         info->res.type = fex_int;
612                         sse_cvtsd2si(&info->op1.val.d, &info->res.val.i);
613                         break;

615 #ifdef __amd64
616                 case cvtsi2sdq:
617                         info->op = fex_cnvt;
618                         sse_cvtsi2sdq(&info->op1.val.l, &info->res.val.d);
619                         break;

621                 case cvttsd2siq:
622                         info->op = fex_cnvt;
623                         info->res.type = fex_llong;
624                         sse_cvttsd2siq(&info->op1.val.d, &info->res.val.l);
625                         break;

627                 case cvtsd2siq:
628                         info->op = fex_cnvt;
629                         info->res.type = fex_llong;
630                         sse_cvtsd2siq(&info->op1.val.d, &info->res.val.l);
631                         break;
632 #endif

634                 case ucomisd:
635                         info->op = fex_cmp;
636                         info->res.type = fex_nodata;
637                         sse_ucomisd(&info->op1.val.d, &info->op2.val.d);
638                         break;

640                 case comisd:
641                         info->op = fex_cmp;
642                         info->res.type = fex_nodata;
643                         sse_comisd(&info->op1.val.d, &info->op2.val.d);
644                         break;
645                 default:
646                         break;
647                 }
648         } else {
649                 if (inst->op == cvtsi2ss) {
650                         info->op1.type = fex_int;
651                         info->op1.val.i = inst->op2->i[0];
652                         info->op2.type = fex_nodata;
653                 } else if (inst->op == cvtsi2ssq) {
```

```
654                         info->op1.type = fex_llong;
655                         info->op1.val.l = inst->op2->l[0];
656                         info->op2.type = fex_nodata;
657                 } else if (inst->op == sqrtss || inst->op == cvtss2sd ||
658                     inst->op == cvttss2si || inst->op == cvtss2si ||
659                     inst->op == cvttss2siq || inst->op == cvtss2siq) {
660                         info->op1.type = fex_float;
661                         info->op1.val.f = inst->op2->f[0];
662                         info->op2.type = fex_nodata;
663                 } else {
664                         info->op1.type = fex_float;
665                         info->op1.val.f = inst->op1->f[0];
666                         info->op2.type = fex_float;
667                         info->op2.val.f = inst->op2->f[0];
668                 }
669                 info->res.type = fex_float;
670                 switch (inst->op) {
671                 case cmpss:
672                         info->op = fex_cmp;
673                         info->res.type = fex_int;
674                         switch (inst->imm & 3) {
675                         case 0:
676                                 sse_cmpeqss(&info->op1.val.f, &info->op2.val.f,
677                                     &info->res.val.i);
678                                 break;

680                         case 1:
681                                 sse_cmpltss(&info->op1.val.f, &info->op2.val.f,
682                                     &info->res.val.i);
683                                 break;

685                         case 2:
686                                 sse_cmpless(&info->op1.val.f, &info->op2.val.f,
687                                     &info->res.val.i);
688                                 break;

690                         case 3:
691                                 sse_cmpunordss(&info->op1.val.f,
692                                     &info->op2.val.f, &info->res.val.i);
693                         }
694                         if (inst->imm & 4)
695                                 info->res.val.i ^= 0xffffffffu;
696                         break;

698                 case minss:
699                         info->op = fex_other;
700                         sse_minss(&info->op1.val.f, &info->op2.val.f,
701                             &info->res.val.f);
702                         break;

704                 case maxss:
705                         info->op = fex_other;
706                         sse_maxss(&info->op1.val.f, &info->op2.val.f,
707                             &info->res.val.f);
708                         break;

710                 case addss:
711                         info->op = fex_add;
712                         sse_addss(&info->op1.val.f, &info->op2.val.f,
713                             &info->res.val.f);
714                         if (my_fp_classf(&info->res.val.f) == fp_subnormal)
715                                 subnorm = 1;
716                         break;

718                 case subss:
719                         info->op = fex_sub;
```



```
720                         sse_subss(&info->op1.val.f, &info->op2.val.f,
721                             &info->res.val.f);
722                         if (my_fp_classf(&info->res.val.f) == fp_subnormal)
723                                 subnorm = 1;
724                         break;

726                 case mulss:
727                         info->op = fex_mul;
728                         sse_mulss(&info->op1.val.f, &info->op2.val.f,
729                             &info->res.val.f);
730                         if (my_fp_classf(&info->res.val.f) == fp_subnormal)
731                                 subnorm = 1;
732                         break;

734                 case divss:
735                         info->op = fex_div;
736                         sse_divss(&info->op1.val.f, &info->op2.val.f,
737                             &info->res.val.f);
738                         if (my_fp_classf(&info->res.val.f) == fp_subnormal)
739                                 subnorm = 1;
740                         break;

742                 case sqrtss:
743                         info->op = fex_sqrt;
744                         sse_sqrtss(&info->op1.val.f, &info->res.val.f);
745                         break;

747                 case cvtss2sd:
748                         info->op = fex_cnvt;
749                         info->res.type = fex_double;
750                         sse_cvtss2sd(&info->op1.val.f, &info->res.val.d);
751                         break;

753                 case cvtsi2ss:
754                         info->op = fex_cnvt;
755                         sse_cvtsi2ss(&info->op1.val.i, &info->res.val.f);
756                         break;

758                 case cvttss2si:
759                         info->op = fex_cnvt;
760                         info->res.type = fex_int;
761                         sse_cvttss2si(&info->op1.val.f, &info->res.val.i);
762                         break;

764                 case cvtss2si:
765                         info->op = fex_cnvt;
766                         info->res.type = fex_int;
767                         sse_cvtss2si(&info->op1.val.f, &info->res.val.i);
768                         break;

770 #ifdef __amd64
771                 case cvtsi2ssq:
772                         info->op = fex_cnvt;
773                         sse_cvtsi2ssq(&info->op1.val.l, &info->res.val.f);
774                         break;

776                 case cvttss2siq:
777                         info->op = fex_cnvt;
778                         info->res.type = fex_llong;
779                         sse_cvttss2siq(&info->op1.val.f, &info->res.val.l);
780                         break;

782                 case cvtss2siq:
783                         info->op = fex_cnvt;
784                         info->res.type = fex_llong;
785                         sse_cvtss2siq(&info->op1.val.f, &info->res.val.l);
```

```
786                         break;
787 #endif

789                 case ucomiss:
790                         info->op = fex_cmp;
791                         info->res.type = fex_nodata;
792                         sse_ucomiss(&info->op1.val.f, &info->op2.val.f);
793                         break;

795                 case comiss:
796                         info->op = fex_cmp;
797                         info->res.type = fex_nodata;
798                         sse_comiss(&info->op1.val.f, &info->op2.val.f);
799                         break;
800                 default:
801                         break;
802                 }
803         }
804         __fenv_getmxcsr(&mxcsr);
805         info->flags = mxcsr & 0x3d;
806         __fenv_setmxcsr(&oldmxcsr);

808         /* determine which exception would have been trapped */
809         te = ~(uap->uc_mcontext.fpregs.fp_reg_set.fpchip_state.mxcsr
810             >> 7) & 0x3d;
811         e = mxcsr & te;
812         if (e & FE_INVALID)
813                 return __fex_get_sse_invalid_type(inst);
814         if (e & FE_DIVBYZERO)
815                 return fex_division;
816         if (e & FE_OVERFLOW)
817                 return fex_overflow;
818         if ((e & FE_UNDERFLOW) || (subnorm && (te & FE_UNDERFLOW)))
819                 return fex_underflow;
820         if (e & FE_INEXACT)
821                 return fex_inexact;
822         return (enum fex_exception)-1;
823 }

825 /*
826  * Emulate a SIMD SSE instruction to determine which exceptions occur
827  * in each part.  For i = 0, 1, 2, and 3, set e[i] to indicate the
828  * trapped exception that would occur if the i-th part of the SIMD
829  * instruction were executed in isolation; set e[i] to -1 if no
830  * trapped exception would occur in this part.  Also fill in info[i]
831  * with the corresponding operands, default untrapped result, and
832  * flags.
833  *
834  * This routine does not work if the instruction specified by *inst
835  * is not a SIMD instruction.
836  */
837 void
838 __fex_get_simd_op(ucontext_t *uap, sseinst_t *inst, enum fex_exception *e,
839     fex_info_t *info)
840 {
841         sseinst_t       dummy;
842         int             i;

844         e[0] = e[1] = e[2] = e[3] = -1;

846         /* perform each part of the SIMD operation */
847         switch (inst->op) {
848         case cmpps:
849                 dummy.op = cmpss;
850                 dummy.imm = inst->imm;
851                 for (i = 0; i < 4; i++) {
```



```
852                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
853                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
854                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
855                 }
856                 break;

858         case minps:
859                 dummy.op = minss;
860                 for (i = 0; i < 4; i++) {
861                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
862                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
863                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
864                 }
865                 break;

867         case maxps:
868                 dummy.op = maxss;
869                 for (i = 0; i < 4; i++) {
870                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
871                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
872                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
873                 }
874                 break;

876         case addps:
877                 dummy.op = addss;
878                 for (i = 0; i < 4; i++) {
879                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
880                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
881                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
882                 }
883                 break;

885         case subps:
886                 dummy.op = subss;
887                 for (i = 0; i < 4; i++) {
888                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
889                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
890                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
891                 }
892                 break;

894         case mulps:
895                 dummy.op = mulss;
896                 for (i = 0; i < 4; i++) {
897                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
898                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
899                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
900                 }
901                 break;

903         case divps:
904                 dummy.op = divss;
905                 for (i = 0; i < 4; i++) {
906                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
907                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
908                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
909                 }
910                 break;

912         case sqrtps:
913                 dummy.op = sqrtss;
914                 for (i = 0; i < 4; i++) {
915                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
916                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
917                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
```

```
918                 }
919                 break;

921         case cvtdq2ps:
922                 dummy.op = cvtsi2ss;
923                 for (i = 0; i < 4; i++) {
924                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
925                         dummy.op2 = (sseoperand_t *)&inst->op2->i[i];
926                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
927                 }
928                 break;

930         case cvttps2dq:
931                 dummy.op = cvttss2si;
932                 for (i = 0; i < 4; i++) {
933                         dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
934                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
935                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
936                 }
937                 break;

939         case cvtps2dq:
940                 dummy.op = cvtss2si;
941                 for (i = 0; i < 4; i++) {
942                         dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
943                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
944                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
945                 }
946                 break;

948         case cvtpi2ps:
949                 dummy.op = cvtsi2ss;
950                 for (i = 0; i < 2; i++) {
951                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
952                         dummy.op2 = (sseoperand_t *)&inst->op2->i[i];
953                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
954                 }
955                 break;

957         case cvttps2pi:
958                 dummy.op = cvttss2si;
959                 for (i = 0; i < 2; i++) {
960                         dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
961                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
962                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
963                 }
964                 break;

966         case cvtps2pi:
967                 dummy.op = cvtss2si;
968                 for (i = 0; i < 2; i++) {
969                         dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
970                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
971                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
972                 }
973                 break;

975         case cmppd:
976                 dummy.op = cmpsd;
977                 dummy.imm = inst->imm;
978                 for (i = 0; i < 2; i++) {
979                         dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
980                         dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
981                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
982                 }
983                 break;
```



```
985         case minpd:
986                 dummy.op = minsd;
987                 for (i = 0; i < 2; i++) {
988                         dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
989                         dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
990                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
991                 }
992                 break;

994         case maxpd:
995                 dummy.op = maxsd;
996                 for (i = 0; i < 2; i++) {
997                         dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
998                         dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
999                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1000                }
1001                break;

1003        case addpd:
1004                dummy.op = addsd;
1005                for (i = 0; i < 2; i++) {
1006                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1007                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1008                        e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1009                }
1010                break;

1012        case subpd:
1013                dummy.op = subsd;
1014                for (i = 0; i < 2; i++) {
1015                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1016                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1017                        e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1018                }
1019                break;

1021        case mulpd:
1022                dummy.op = mulsd;
1023                for (i = 0; i < 2; i++) {
1024                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1025                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1026                        e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1027                }
1028                break;

1030        case divpd:
1031                dummy.op = divsd;
1032                for (i = 0; i < 2; i++) {
1033                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1034                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1035                        e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1036                }
1037                break;

1039        case sqrtpd:
1040                dummy.op = sqrtsd;
1041                for (i = 0; i < 2; i++) {
1042                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1043                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1044                        e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1045                }
1046                break;

1048        case cvtpi2pd:
1049        case cvtdq2pd:
```

```
1050                 dummy.op = cvtsi2sd;
1051                 for (i = 0; i < 2; i++) {
1052                         dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1053                         dummy.op2 = (sseoperand_t *)&inst->op2->i[i];
1054                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1055                 }
1056                 break;

1058         case cvttpd2pi:
1059         case cvttpd2dq:
1060                 dummy.op = cvttsd2si;
1061                 for (i = 0; i < 2; i++) {
1062                         dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
1063                         dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1064                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1065                 }
1066                 break;

1068         case cvtpd2pi:
1069         case cvtpd2dq:
1070                 dummy.op = cvtsd2si;
1071                 for (i = 0; i < 2; i++) {
1072                         dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
1073                         dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1074                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1075                 }
1076                 break;

1078         case cvtps2pd:
1079                 dummy.op = cvtss2sd;
1080                 for (i = 0; i < 2; i++) {
1081                         dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1082                         dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1083                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1084                 }
1085                 break;

1087         case cvtpd2ps:
1088                 dummy.op = cvtsd2ss;
1089                 for (i = 0; i < 2; i++) {
1090                         dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1091                         dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1092                         e[i] = __fex_get_sse_op(uap, &dummy, &info[i]);
1093                 }
1094         default:
1095                 break;
1096         }
1097 }

1099 /*
1100  * Store the result value from *info in the destination of the scalar
1101  * SSE instruction specified by *inst.  If no result is given but the
1102  * exception is underflow or overflow, supply the default trapped result.
1103  *
1104  * This routine does not work if the instruction specified by *inst
1105  * is not a scalar instruction.
1106  */
1107 void
1108 __fex_st_sse_result(ucontext_t *uap, sseinst_t *inst, enum fex_exception e,
1109     fex_info_t *info)
1110 {
1111         int             i = 0;
1112         long long       l = 0L;;
1113         float           f = 0.0, fscl;
1114         double          d = 0.0L, dscl;
```



```
1116         /* for compares that write eflags, just set the flags
1117            to indicate "unordered" */
1118         if (inst->op == ucomiss || inst->op == comiss ||
1119             inst->op == ucomisd || inst->op == comisd) {
1120                 uap->uc_mcontext.gregs[REG_PS] |= 0x45;
1121                 return;
1122         }

1124         /* if info doesn't specify a result value, try to generate
1125            the default trapped result */
1126         if (info->res.type == fex_nodata) {
1127                 /* set scale factors for exponent wrapping */
1128                 switch (e) {
1129                 case fex_overflow:
1130                         fscl = 1.262177448e-29f; /* 2^-96 */
1131                         dscl = 6.441148769597133308e-232; /* 2^-768 */
1132                         break;

1134                 case fex_underflow:
1135                         fscl = 7.922816251e+28f; /* 2^96 */
1136                         dscl = 1.552518092300708935e+231; /* 2^768 */
1137                         break;

1139                 default:
1140                         (void) __fex_get_sse_op(uap, inst, info);
1141                         if (info->res.type == fex_nodata)
1142                                 return;
1143                         goto stuff;
1144                 }

1146                 /* generate the wrapped result */
1147                 if (inst->op == cvtsd2ss) {
1148                         info->op1.type = fex_double;
1149                         info->op1.val.d = inst->op2->d[0];
1150                         info->op2.type = fex_nodata;
1151                         info->res.type = fex_float;
1152                         info->res.val.f = (float)(fscl * (fscl *
1153                             info->op1.val.d));
1154                 } else if ((int)inst->op & DOUBLE) {
1155                         info->op1.type = fex_double;
1156                         info->op1.val.d = inst->op1->d[0];
1157                         info->op2.type = fex_double;
1158                         info->op2.val.d = inst->op2->d[0];
1159                         info->res.type = fex_double;
1160                         switch (inst->op) {
1161                         case addsd:
1162                                 info->res.val.d = dscl * (dscl *
1163                                     info->op1.val.d + dscl * info->op2.val.d);
1164                                 break;

1166                         case subsd:
1167                                 info->res.val.d = dscl * (dscl *
1168                                     info->op1.val.d - dscl * info->op2.val.d);
1169                                 break;

1171                         case mulsd:
1172                                 info->res.val.d = (dscl * info->op1.val.d) *
1173                                     (dscl * info->op2.val.d);
1174                                 break;

1176                         case divsd:
1177                                 info->res.val.d = (dscl * info->op1.val.d) /
1178                                     (info->op2.val.d / dscl);
1179                                 break;

1181                         default:
```

```
1182                                return;
1183                        }
1184                } else {
1185                        info->op1.type = fex_float;
1186                        info->op1.val.f = inst->op1->f[0];
1187                        info->op2.type = fex_float;
1188                        info->op2.val.f = inst->op2->f[0];
1189                        info->res.type = fex_float;
1190                        switch (inst->op) {
1191                        case addss:
1192                                info->res.val.f = fscl * (fscl *
1193                                    info->op1.val.f + fscl * info->op2.val.f);
1194                                break;

1196                        case subss:
1197                                info->res.val.f = fscl * (fscl *
1198                                    info->op1.val.f - fscl * info->op2.val.f);
1199                                break;

1201                        case mulss:
1202                                info->res.val.f = (fscl * info->op1.val.f) *
1203                                    (fscl * info->op2.val.f);
1204                                break;

1206                        case divss:
1207                                info->res.val.f = (fscl * info->op1.val.f) /
1208                                    (info->op2.val.f / fscl);
1209                                break;

1211                        default:
1212                                return;
1213                        }
1214                }
1215        }

1217        /* put the result in the destination */
1218 stuff:
1219        if (inst->op == cmpss || inst->op == cvttss2si || inst->op == cvtss2si
1220            || inst->op == cvttsd2si || inst->op == cvtsd2si) {
1221                switch (info->res.type) {
1222                case fex_int:
1223                        i = info->res.val.i;
1224                        break;

1226                case fex_llong:
1227                        i = info->res.val.l;
1228                        break;

1230                case fex_float:
1231                        i = info->res.val.f;
1232                        break;

1234                case fex_double:
1235                        i = info->res.val.d;
1236                        break;

1238                case fex_ldouble:
1239                        i = info->res.val.q;
1240                        break;

1242                default:
1243                        break;
1244                }
1245                inst->op1->i[0] = i;
1246        } else if (inst->op == cmpsd || inst->op == cvttss2siq ||
1247            inst->op == cvtss2siq || inst->op == cvttsd2siq ||
```



```
1248            inst->op == cvtsd2siq) {
1249                switch (info->res.type) {
1250                case fex_int:
1251                        l = info->res.val.i;
1252                        break;

1254                case fex_llong:
1255                        l = info->res.val.l;
1256                        break;

1258                case fex_float:
1259                        l = info->res.val.f;
1260                        break;

1262                case fex_double:
1263                        l = info->res.val.d;
1264                        break;

1266                case fex_ldouble:
1267                        l = info->res.val.q;
1268                        break;

1270                default:
1271                        break;
1272                }
1273                inst->op1->l[0] = l;
1274        } else if ((((int)inst->op & DOUBLE) && inst->op != cvtsd2ss) ||
1275            inst->op == cvtss2sd) {
1276                switch (info->res.type) {
1277                case fex_int:
1278                        d = info->res.val.i;
1279                        break;

1281                case fex_llong:
1282                        d = info->res.val.l;
1283                        break;

1285                case fex_float:
1286                        d = info->res.val.f;
1287                        break;

1289                case fex_double:
1290                        d = info->res.val.d;
1291                        break;

1293                case fex_ldouble:
1294                        d = info->res.val.q;
1295                        break;

1297                default:
1298                        break;
1299                }
1300                inst->op1->d[0] = d;
1301        } else {
1302                switch (info->res.type) {
1303                case fex_int:
1304                        f = info->res.val.i;
1305                        break;

1307                case fex_llong:
1308                        f = info->res.val.l;
1309                        break;

1311                case fex_float:
1312                        f = info->res.val.f;
1313                        break;
```

```
1315                case fex_double:
1316                        f = info->res.val.d;
1317                        break;

1319                case fex_ldouble:
1320                        f = info->res.val.q;
1321                        break;

1323                default:
1324                        break;
1325                }
1326                inst->op1->f[0] = f;
1327        }
1328 }

1330 /*
1331  * Store the results from a SIMD instruction.  For each i, store
1332  * the result value from info[i] in the i-th part of the destination
1333  * of the SIMD SSE instruction specified by *inst.  If no result
1334  * is given but the exception indicated by e[i] is underflow or
1335  * overflow, supply the default trapped result.
1336  *
1337  * This routine does not work if the instruction specified by *inst
1338  * is not a SIMD instruction.
1339  */
1340 void
1341 __fex_st_simd_result(ucontext_t *uap, sseinst_t *inst, enum fex_exception *e,
1342     fex_info_t *info)
1343 {
1344        sseinst_t       dummy;
1345        int             i;

1347        /* store each part */
1348        switch (inst->op) {
1349        case cmpps:
1350                dummy.op = cmpss;
1351                dummy.imm = inst->imm;
1352                for (i = 0; i < 4; i++) {
1353                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1354                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1355                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1356                }
1357                break;

1359        case minps:
1360                dummy.op = minss;
1361                for (i = 0; i < 4; i++) {
1362                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1363                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1364                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1365                }
1366                break;

1368        case maxps:
1369                dummy.op = maxss;
1370                for (i = 0; i < 4; i++) {
1371                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1372                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1373                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1374                }
1375                break;

1377        case addps:
1378                dummy.op = addss;
1379                for (i = 0; i < 4; i++) {
```



```
1380                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1381                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1382                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1383                }
1384                break;

1386        case subps:
1387                dummy.op = subss;
1388                for (i = 0; i < 4; i++) {
1389                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1390                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1391                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1392                }
1393                break;

1395        case mulps:
1396                dummy.op = mulss;
1397                for (i = 0; i < 4; i++) {
1398                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1399                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1400                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1401                }
1402                break;

1404        case divps:
1405                dummy.op = divss;
1406                for (i = 0; i < 4; i++) {
1407                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1408                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1409                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1410                }
1411                break;

1413        case sqrtps:
1414                dummy.op = sqrtss;
1415                for (i = 0; i < 4; i++) {
1416                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1417                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1418                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1419                }
1420                break;

1422        case cvtdq2ps:
1423                dummy.op = cvtsi2ss;
1424                for (i = 0; i < 4; i++) {
1425                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1426                        dummy.op2 = (sseoperand_t *)&inst->op2->i[i];
1427                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1428                }
1429                break;

1431        case cvttps2dq:
1432                dummy.op = cvttss2si;
1433                for (i = 0; i < 4; i++) {
1434                        dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
1435                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1436                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1437                }
1438                break;

1440        case cvtps2dq:
1441                dummy.op = cvtss2si;
1442                for (i = 0; i < 4; i++) {
1443                        dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
1444                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1445                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
```

```
1446                }
1447                break;

1449        case cvtpi2ps:
1450                dummy.op = cvtsi2ss;
1451                for (i = 0; i < 2; i++) {
1452                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1453                        dummy.op2 = (sseoperand_t *)&inst->op2->i[i];
1454                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1455                }
1456                break;

1458        case cvttps2pi:
1459                dummy.op = cvttss2si;
1460                for (i = 0; i < 2; i++) {
1461                        dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
1462                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1463                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1464                }
1465                break;

1467        case cvtps2pi:
1468                dummy.op = cvtss2si;
1469                for (i = 0; i < 2; i++) {
1470                        dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
1471                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1472                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1473                }
1474                break;

1476        case cmppd:
1477                dummy.op = cmpsd;
1478                dummy.imm = inst->imm;
1479                for (i = 0; i < 2; i++) {
1480                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1481                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1482                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1483                }
1484                break;

1486        case minpd:
1487                dummy.op = minsd;
1488                for (i = 0; i < 2; i++) {
1489                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1490                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1491                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1492                }
1493                break;

1495        case maxpd:
1496                dummy.op = maxsd;
1497                for (i = 0; i < 2; i++) {
1498                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1499                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1500                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1501                }
1502                break;

1504        case addpd:
1505                dummy.op = addsd;
1506                for (i = 0; i < 2; i++) {
1507                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1508                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1509                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1510                }
1511                break;
```



```
1513        case subpd:
1514                dummy.op = subsd;
1515                for (i = 0; i < 2; i++) {
1516                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1517                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1518                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1519                }
1520                break;

1522        case mulpd:
1523                dummy.op = mulsd;
1524                for (i = 0; i < 2; i++) {
1525                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1526                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1527                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1528                }
1529                break;

1531        case divpd:
1532                dummy.op = divsd;
1533                for (i = 0; i < 2; i++) {
1534                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1535                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1536                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1537                }
1538                break;

1540        case sqrtpd:
1541                dummy.op = sqrtsd;
1542                for (i = 0; i < 2; i++) {
1543                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1544                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1545                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1546                }
1547                break;

1549        case cvtpi2pd:
1550        case cvtdq2pd:
1551                dummy.op = cvtsi2sd;
1552                for (i = 0; i < 2; i++) {
1553                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1554                        dummy.op2 = (sseoperand_t *)&inst->op2->i[i];
1555                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1556                }
1557                break;

1559        case cvttpd2pi:
1560        case cvttpd2dq:
1561                dummy.op = cvttsd2si;
1562                for (i = 0; i < 2; i++) {
1563                        dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
1564                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1565                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1566                }
1567                /* for cvttpd2dq, zero the high 64 bits of the destination */
1568                if (inst->op == cvttpd2dq)
1569                        inst->op1->l[1] = 0ll;
1570                break;

1572        case cvtpd2pi:
1573        case cvtpd2dq:
1574                dummy.op = cvtsd2si;
1575                for (i = 0; i < 2; i++) {
1576                        dummy.op1 = (sseoperand_t *)&inst->op1->i[i];
1577                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
```

```
1578                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1579                }
1580                /* for cvtpd2dq, zero the high 64 bits of the destination */
1581                if (inst->op == cvtpd2dq)
1582                        inst->op1->l[1] = 0ll;
1583                break;

1585        case cvtps2pd:
1586                dummy.op = cvtss2sd;
1587                for (i = 0; i < 2; i++) {
1588                        dummy.op1 = (sseoperand_t *)&inst->op1->d[i];
1589                        dummy.op2 = (sseoperand_t *)&inst->op2->f[i];
1590                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1591                }
1592                break;

1594        case cvtpd2ps:
1595                dummy.op = cvtsd2ss;
1596                for (i = 0; i < 2; i++) {
1597                        dummy.op1 = (sseoperand_t *)&inst->op1->f[i];
1598                        dummy.op2 = (sseoperand_t *)&inst->op2->d[i];
1599                        __fex_st_sse_result(uap, &dummy, e[i], &info[i]);
1600                }
1601                /* zero the high 64 bits of the destination */
1602                inst->op1->l[1] = 0ll;

1604        default:
1605                break;
1606        }
1607 }
```

```
**********************************************************
    7695 Sat May 10 12:09:26 2014
new/usr/src/lib/libm/common/m9x/__fex_sym.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include "fenv_synonyms.h"
#include <elf.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <fcntl.h>
#include <procfs.h>
#include <string.h>
#include <sys/stat.h>

#if defined(__sparcv9) || defined(__amd64)

#define Elf_Ehdr        Elf64_Ehdr
#define Elf_Phdr        Elf64_Phdr
#define Elf_Shdr        Elf64_Shdr
#define Elf_Sym         Elf64_Sym
#define ELF_ST_BIND     ELF64_ST_BIND
#define ELF_ST_TYPE     ELF64_ST_TYPE

#else

#define Elf_Ehdr        Elf32_Ehdr
#define Elf_Phdr        Elf32_Phdr
#define Elf_Shdr        Elf32_Shdr
#define Elf_Sym         Elf32_Sym
#define ELF_ST_BIND     ELF32_ST_BIND
#define ELF_ST_TYPE     ELF32_ST_TYPE

#endif  /* __sparcv9 */

/* semi-permanent data established by __fex_sym_init */
static  prmap_t         *pm = NULL;             /* prmap_t array */
```



```
static  int                     npm = 0;                /* number of entries in

/* transient data modified by __fex_sym */
static  prmap_t         *lpm = NULL;    /* prmap_t found in last call */
static  Elf_Phdr        *ph = NULL;             /* program header array */
static  int                     phsize = 0;             /* size of ph */
static  int                     nph;                    /* number of entries in
static  char            *stbuf = NULL;  /* symbol and string table buffer */
static  int                     stbufsize = 0;  /* size of stbuf */
static  int                     stoffset;               /* offset of string tabl
static  int                     nsyms;                  /* number of symbols in

/* get a current prmap_t list (must call this before each stack trace) */
void
__fex_sym_init()
{
        struct stat     statbuf;
        long            n;
        int                     i;

        /* clear out the previous prmap_t list */
        if (pm != NULL)
                free(pm);
        pm = lpm = NULL;
        npm = 0;

        /* get the current prmap_t list */
        if (stat("/proc/self/map", &statbuf) < 0 || statbuf.st_size <= 0 ||
                (pm = (prmap_t*)malloc(statbuf.st_size)) == NULL)
                return;
        if ((i = open("/proc/self/map", O_RDONLY)) < 0)
        {
                free(pm);
                pm = NULL;
                return;
        }
        n = read(i, pm, statbuf.st_size);
        close(i);
        if (n != statbuf.st_size)
        {
                free(pm);
                pm = NULL;
        }
        else
                npm = (int) (n / sizeof(prmap_t));
}

/* read ELF program headers and symbols; return -1 on error, 0 otherwise */
static int
__fex_read_syms(int fd)
{
        Elf_Ehdr        h;
        Elf_Shdr        *sh;
        int                     i, size;

        /* read the ELF header */
        if (read(fd, &h, sizeof(h)) != sizeof(h))
                return -1;
        if (h.e_ident[EI_MAG0] != ELFMAG0 ||
                h.e_ident[EI_MAG1] != ELFMAG1 ||
                h.e_ident[EI_MAG2] != ELFMAG2 ||
                h.e_ident[EI_MAG3] != ELFMAG3 ||
                h.e_phentsize != sizeof(Elf_Phdr) ||
                h.e_shentsize != sizeof(Elf_Shdr))
                return -1;
```

```
128         /* get space for the program headers */
129         size = h.e_phnum * h.e_phentsize;
130         if (size > phsize)
131         {
132                 if (ph)
133                         free(ph);
134                 phsize = nph = 0;
135                 if ((ph = (Elf_Phdr*)malloc(size)) == NULL)
136                         return -1;
137                 phsize = size;
138         }
139
140         /* read the program headers */
141         if (lseek(fd, h.e_phoff, SEEK_SET) != h.e_phoff ||
142                 read(fd, ph, size) != (ssize_t)size)
143         {
144                 nph = 0;
145                 return -1;
146         }
147         nph = h.e_phnum;
148
149         /* read the section headers */
150         size = h.e_shnum * h.e_shentsize;
151         if ((sh = (Elf_Shdr*)malloc(size)) == NULL)
152                 return -1;
153         if (lseek(fd, h.e_shoff, SEEK_SET) != h.e_shoff ||
154                 read(fd, sh, size) != (ssize_t)size)
155         {
156                 free(sh);
157                 return -1;
158         }
159
160         /* find the symtab section header */
161         for (i = 0; i < h.e_shnum; i++)
162         {
163                 if (sh[i].sh_type == SHT_SYMTAB)
164                         break; /* assume there is only one */
165         }
166         if (i == h.e_shnum || sh[i].sh_size == 0 ||
167                 sh[i].sh_entsize != sizeof(Elf_Sym) ||
168                 sh[i].sh_link < 1 || sh[i].sh_link >= h.e_shnum ||
169                 sh[sh[i].sh_link].sh_type != SHT_STRTAB ||
170                 sh[sh[i].sh_link].sh_size == 0)
171         {
172                 free(sh);
173                 return -1;
174         }
175
176         /* get space for the symbol and string tables */
177         size = (int) (sh[i].sh_size + sh[sh[i].sh_link].sh_size);
178         if (size > stbufsize)
179         {
180                 if (stbuf)
181                         free(stbuf);
182                 stbufsize = nsyms = 0;
183                 if ((stbuf = (char*)malloc(size)) == NULL)
184                 {
185                         free(sh);
186                         return -1;
187                 }
188                 stbufsize = size;
189         }
190
191         /* read the symbol and string tables */
192         if (lseek(fd, sh[i].sh_offset, SEEK_SET) != sh[i].sh_offset ||
193                 read(fd, stbuf, sh[i].sh_size) != sh[i].sh_size ||
```



```
194                 lseek(fd, sh[sh[i].sh_link].sh_offset, SEEK_SET) !=
195                         sh[sh[i].sh_link].sh_offset ||
196                 read(fd, stbuf + sh[i].sh_size, sh[sh[i].sh_link].sh_size) !=
197                         sh[sh[i].sh_link].sh_size)
198         {
199                 free(sh);
200                 return -1;
201         }
202         nsyms = (int) (sh[i].sh_size / sh[i].sh_entsize);
203         stoffset = (int) sh[i].sh_size;
204
205         free(sh);
206         return 0;
207 }
208
209 /* find the symbol corresponding to the given text address;
210    return NULL on error, symbol address otherwise */
211 char *
212 __fex_sym(char *a, char **name)
213 {
214         Elf_Sym                 *s;
215         unsigned long   fo, va, value;
216         int                             fd, i, j, nm;
217         char                    fname[PRMAPSZ+20];
218
219         /* see if the last prmap_t found contains the indicated address */
220         if (lpm)
221         {
222                 if (a >= (char*)lpm->pr_vaddr && a < (char*)lpm->pr_vaddr +
223                         lpm->pr_size)
224                         goto cont;
225         }
226
227         /* look for a prmap_t that contains the indicated address */
228         for (i = 0; i < npm; i++)
229         {
230                 if (a >= (char*)pm[i].pr_vaddr && a < (char*)pm[i].pr_vaddr +
231                         pm[i].pr_size)
232                         break;
233         }
234         if (i == npm)
235                 return NULL;
236
237         /* get an open file descriptor for the mapped object */
238         if (pm[i].pr_mapname[0] == '\0')
239                 return NULL;
240         strcpy(fname, "/proc/self/object/");
241         strncat(fname, pm[i].pr_mapname, PRMAPSZ);
242         fd = open(fname, O_RDONLY);
243         if (fd < 0)
244                 return NULL;
245
246         /* read the program headers and symbols */
247         lpm = NULL;
248         j = __fex_read_syms(fd);
249         close(fd);
250         if (j < 0)
251                 return NULL;
252         lpm = &pm[i];
253
254 cont:
255         /* compute the file offset corresponding to the mapped address */
256         fo = (a - (char*)lpm->pr_vaddr) + lpm->pr_offset;
257
258         /* find the program header containing the file offset */
259         for (i = 0; i < nph; i++)
```

```
260         {
261                 if (ph[i].p_type == PT_LOAD && fo >= ph[i].p_offset &&
262                         fo < ph[i].p_offset + ph[i].p_filesz)
263                         break;
264         }
265         if (i == nph)
266                 return NULL;
267
268         /* compute the virtual address corresponding to the file offset */
269         va = (fo - ph[i].p_offset) + ph[i].p_vaddr;
270
271         /* find the symbol in this segment with the highest value
272            less than or equal to the virtual address */
273         s = (Elf_Sym*)stbuf;
274         value = nm = 0;
275         for (j = 0; j < nsyms; j++)
276         {
277                 if (s[j].st_name == 0 || s[j].st_shndx == SHN_UNDEF ||
278                         (ELF_ST_BIND(s[j].st_info) != STB_LOCAL &&
279                         ELF_ST_BIND(s[j].st_info) != STB_GLOBAL &&
280                         ELF_ST_BIND(s[j].st_info) != STB_WEAK) ||
281                         (ELF_ST_TYPE(s[j].st_info) != STT_NOTYPE &&
282                         ELF_ST_TYPE(s[j].st_info) != STT_OBJECT &&
283                         ELF_ST_TYPE(s[j].st_info) != STT_FUNC))
284                 {
285                         continue;
286                 }
287
288                 if (s[j].st_value < ph[i].p_vaddr || s[j].st_value >= ph[i].p_va
289                         + ph[i].p_memsz)
290                 {
291                         continue;
292                 }
293
294                 if (s[j].st_value < value || s[j].st_value > va)
295                         continue;
296
297                 value = s[j].st_value;
298                 nm = s[j].st_name;
299         }
300         if (nm == 0)
301                 return NULL;
302
303         /* pass back the name and return the mapped address of the symbol */
304         *name = stbuf + stoffset + nm;
305         fo = (value - ph[i].p_vaddr) + ph[i].p_offset;
306         return (char*)lpm->pr_vaddr + (fo - lpm->pr_offset);
307 }
```

```
**********************************************************
    1487 Sat May 10 12:09:26 2014
new/usr/src/lib/libm/common/m9x/fdim.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak fdim = __fdim
#endif

/*
 * fdim(x,y) returns x - y if x > y, +0 if x <= y, and NaN if x and
 * y are unordered.
 *
 * fdim(x,y) raises overflow or inexact if x > y and x - y overflows
 * or is inexact.  It raises invalid if either operand is a signaling
 * NaN.  Otherwise, it raises no exceptions.
 */

#include "libm.h"       /* for islessequal macro */

double
__fdim(double x, double y) {
        if (islessequal(x, y)) {
                x = 0.0;
                y = -x;
        }
        return (x - y);
}
```

```
**********************************************************
    1549 Sat May 10 12:09:26 2014
new/usr/src/lib/libm/common/m9x/fdimf.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak fdimf = __fdimf
#endif

#include "libm.h"       /* for islessequal macro */

float
__fdimf(float x, float y) {
        /*
         * On SPARC v8plus/v9, this could be implemented as follows
         * (assuming %f0 = x, %f1 = y, return value left in %f0):
         *
         * fcmps        %fcc0,%f0,%f1
         * st           %g0,[scratch]   ! use fzero instead of st/ld
         * ld           [scratch],%f2   ! if VIS is available
         * fnegs        %f2,%f3
         * fmovsle      %fcc0,%f2,%f0
         * fmovsle      %fcc0,%f3,%f1
         * fsubs        %f0,%f1,%f0
         */
        if (islessequal(x, y)) {
                x = 0.0f;
                y = -x;
        }
        return (x - y);
}
```

```
**********************************************************
    1223 Sat May 10 12:09:26 2014
new/usr/src/lib/libm/common/m9x/fdiml.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak fdiml = __fdiml
#endif

#include "libm.h"       /* for islessequal macro */

long double
__fdiml(long double x, long double y) {
        if (islessequal(x, y)) {
                x = 0.0l;
                y = -x;
        }
        return (x - y);
}
```

```
**********************************************************
    3243 Sat May 10 12:09:26 2014
new/usr/src/lib/libm/common/m9x/feexcept.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak feclearexcept = __feclearexcept
#pragma weak feraiseexcept = __feraiseexcept
#pragma weak fetestexcept = __fetestexcept
#pragma weak fegetexceptflag = __fegetexceptflag
#pragma weak fesetexceptflag = __fesetexceptflag

#pragma weak feclearexcept96 = __feclearexcept
#pragma weak feraiseexcept96 = __feraiseexcept
#pragma weak fetestexcept96 = __fetestexcept
#pragma weak fegetexceptflag96 = __fegetexceptflag
#pragma weak fesetexceptflag96 = __fesetexceptflag

#include "fenv_synonyms.h"
#include <fenv.h>
#include <sys/ieeefp.h>
#include <ucontext.h>
#include <thread.h>
#include "fex_handler.h"
#include "fenv_inlines.h"


int feclearexcept(int e)
{
        unsigned long   fsr;

        __fenv_getfsr(&fsr);
        __fenv_set_ex(fsr, __fenv_get_ex(fsr) & ~e);
        __fenv_setfsr(&fsr);
        if (fex_get_log())
                __fex_update_te();
        return 0;
}
```



```
/*
*  note - __fex_hdlr depends on fetestexcept following feraiseexcept
*/
int feraiseexcept(int e)
{
        volatile double t;
        unsigned long   fsr;

        if (e & FE_INVALID) {
                t = 0.0;
                t /= 0.0;
        }
        if (e & FE_DIVBYZERO) {
                t = 1.0e300;
                t /= 0.0;
        }
        if (e & FE_OVERFLOW) {
                /* if overflow is not trapped, avoid raising inexact */
                __fenv_getfsr(&fsr);
                if (!(__fenv_get_te(fsr) & (1 << fp_trap_overflow))) {
                        __fenv_set_ex(fsr, __fenv_get_ex(fsr) | FE_OVERFLOW);
                        __fenv_setfsr(&fsr);
                }
                else {
                        t = 1.0e300;
                        t *= 1.0e300;
                }
        }
        if (e & FE_UNDERFLOW) {
                /* if underflow is not trapped, avoid raising inexact */
                __fenv_getfsr(&fsr);
                if (!(__fenv_get_te(fsr) & (1 << fp_trap_underflow))) {
                        __fenv_set_ex(fsr, __fenv_get_ex(fsr) | FE_UNDERFLOW);
                        __fenv_setfsr(&fsr);
                }
                else {
                        t = 1.0e-307;
                        t -= 1.001e-307;
                }
        }
        if (e & FE_INEXACT) {
                t = 1.0e300;
                t += 1.0e-307;
        }
        return 0;
}

int fetestexcept(int e)
{
        unsigned long   fsr;

        __fenv_getfsr(&fsr);
        return (int)__fenv_get_ex(fsr) & e;
}

int fegetexceptflag(fexcept_t *p, int e)
{
        unsigned long   fsr;

        __fenv_getfsr(&fsr);
        *p = (int)__fenv_get_ex(fsr) & e;
        return 0;
}

int fesetexceptflag(const fexcept_t *p, int e)
```

```
128 {
129         unsigned long   fsr;

131         __fenv_getfsr(&fsr);
132         __fenv_set_ex(fsr, (((int)__fenv_get_ex(fsr) & ~e) | (*p & e)) &
133                 FE_ALL_EXCEPT);
134         __fenv_setfsr(&fsr);
135         if (fex_get_log())
136                 __fex_update_te();
137         return 0;
138 }
```

```
**********************************************************
    2893 Sat May 10 12:09:26 2014
new/usr/src/lib/libm/common/m9x/fenv.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
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 */

#pragma weak fex_merge_flags = __fex_merge_flags

#pragma weak feholdexcept = __feholdexcept
#pragma weak feupdateenv = __feupdateenv
#pragma weak fegetenv = __fegetenv
#pragma weak fesetenv = __fesetenv

#pragma weak feholdexcept96 = __feholdexcept96
#pragma weak feupdateenv96 = __feupdateenv
#pragma weak fegetenv96 = __fegetenv
#pragma weak fesetenv96 = __fesetenv

#include "fenv_synonyms.h"
#include <fenv.h>
#include <ucontext.h>
#include <thread.h>
#include "fex_handler.h"
#include "fenv_inlines.h"

const fenv_t __fenv_dfl_env = {
        {
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
```



```
                { FEX_NONSTOP, (void(*)())0 },
                { FEX_NONSTOP, (void(*)())0 },
        },
#ifdef __x86
        0x13000000
#else
        0
#endif
};

int feholdexcept(fenv_t *p)
{
        (void) fegetenv(p);
        (void) feclearexcept(FE_ALL_EXCEPT);
        return !fex_set_handling(FEX_ALL, FEX_NONSTOP, NULL);
}

int feholdexcept96(fenv_t *p)
{
        (void) fegetenv(p);
        (void) feclearexcept(FE_ALL_EXCEPT);
        return fex_set_handling(FEX_ALL, FEX_NONSTOP, NULL);
}

int feupdateenv(const fenv_t *p)
{
        unsigned long   fsr;

        __fenv_getfsr(&fsr);
        (void) fesetenv(p);
        (void) feraiseexcept((int)__fenv_get_ex(fsr));
        return 0;
}

int fegetenv(fenv_t *p)
{
        fex_getexcepthandler(&p->__handlers, FEX_ALL);
        __fenv_getfsr(&p->__fsr);
        return 0;
}

int fesetenv(const fenv_t *p)
{
        __fenv_setfsr(&p->__fsr);
        fex_setexcepthandler(&p->__handlers, FEX_ALL);
        return 0;
}

void fex_merge_flags(const fenv_t *p)
{
        unsigned long   fsr;

        __fenv_getfsr(&fsr);
        __fenv_set_ex(fsr, __fenv_get_ex(fsr) | __fenv_get_ex(p->__fsr));
        __fenv_setfsr(&fsr);
        if (fex_get_log())
                __fex_update_te();
}
```

```
**********************************************************
   12598 Sat May 10 12:09:26 2014
new/usr/src/lib/libm/common/m9x/fenv_inlines.h
patch05 - fixed amd64 issues with LIBM
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * This file and its contents are supplied under the terms of the
 * Common Development and Distribution License ("CDDL"), version 1.0.
 * You may only use this file in accordance with the terms of version
 * 1.0 of the CDDL.
 *
 * A full copy of the text of the CDDL should have accompanied this
 * source.  A copy of the CDDL is also available via the Internet at
 * http://www.illumos.org/license/CDDL.
 */

/*
 * Copyright 2011, Richard Lowe
 */

#ifndef _FENV_INLINES_H
#define _FENV_INLINES_H

#ifdef __GNUC__

#ifdef __cplusplus
extern "C" {
#endif

#include <sys/types.h>

#if defined(__x86)

/*
 * Floating point Control Word and Status Word
 * Definition should actually be shared with x86
 * (much of this 'amd64' code can be, in fact.)
 */
union fp_cwsw {
        uint32_t cwsw;
        struct {
                uint16_t cw;
                uint16_t sw;
        } words;
};

extern __inline__ void
__fenv_getcwsw(unsigned int *value)
{
        union fp_cwsw *u = (union fp_cwsw *)value;

        __asm__ __volatile__(
            "fstsw %0\n\t"
            "fstcw %1\n\t"
            : "=m" (u->words.cw), "=m" (u->words.sw));
}

extern __inline__ void
__fenv_setcwsw(const unsigned int *value)
{
        union fp_cwsw cwsw;
        short fenv[16];

        cwsw.cwsw = *value;
```



```
        __asm__ __volatile__(
            "fstenv %0\n\t"
            "movw   %4,%1\n\t"
            "movw   %3,%2\n\t"
            "fldenv %0\n\t"
            "fwait\n\t"
            : "=m" (fenv), "=m" (fenv[0]), "=m" (fenv[2])
            : "r" (cwsw.words.cw), "r" (cwsw.words.sw)
            /* For practical purposes, we clobber the whole FPU */
            : "cc", "st", "st(1)", "st(2)", "st(3)", "st(4)", "st(5)",
              "st(6)", "st(7)");
}

extern __inline__ void
__fenv_getmxcsr(unsigned int *value)
{
        __asm__ __volatile__("stmxcsr %0" : "=m" (*value));
}

extern __inline__ void
__fenv_setmxcsr(const unsigned int *value)
{
        __asm__ __volatile__("ldmxcsr %0" : : "m" (*value));
}

extern __inline__ long double
f2xm1(long double x)
{
        long double ret;

        __asm__ __volatile__("f2xm1" : "=t" (ret) : "0" (x) : "cc");
        return (ret);
}

extern __inline__ long double
fyl2x(long double y, long double x)
{
        long double ret;

        __asm__ __volatile__("fyl2x"
            : "=t" (ret)
            : "0" (x), "u" (y)
            : "st(1)", "cc");
        return (ret);
}

extern __inline__ long double
fptan(long double x)
{
        /*
         * fptan pushes 1.0 then the result on completion, so we want to pop
         * the FP stack twice, so we need a dummy value into which to pop it.
         */
        long double ret;
        long double dummy;

        __asm__ __volatile__("fptan"
            : "=t" (dummy), "=u" (ret)
            : "0" (x)
            : "cc");
        return (ret);
}

extern __inline__ long double
fpatan(long double x, long double y)
```

```
126 {
127         long double ret;
129         __asm__ __volatile__("fpatan"
130             : "=t" (ret)
131             : "0" (y), "u" (x)
132             : "st(1)", "cc");
133         return (ret);
134 }
136 extern __inline__ long double
137 fxtract(long double x)
138 {
139         __asm__ __volatile__("fxtract" : "+t" (x) : : "cc");
140         return (x);
141 }
143 extern __inline__ long double
144 fprem1(long double idend, long double div)
145 {
146         __asm__ __volatile__("fprem1" : "+t" (div) : "u" (idend) : "cc");
147         return (div);
148 }
150 extern __inline__ long double
151 fprem(long double idend, long double div)
152 {
153         __asm__ __volatile__("fprem" : "+t" (div) : "u" (idend) : "cc");
154         return (div);
155 }
157 extern __inline__ long double
158 fyl2xp1(long double y, long double x)
159 {
160         long double ret;
162         __asm__ __volatile__("fyl2xp1"
163             : "=t" (ret)
164             : "0" (x), "u" (y)
165             : "st(1)", "cc");
166         return (ret);
167 }
169 extern __inline__ long double
170 fsqrt(long double x)
171 {
172         __asm__ __volatile__("fsqrt" : "+t" (x) : : "cc");
173         return (x);
174 }
176 extern __inline__ long double
177 fsincos(long double x)
178 {
179         __asm__ __volatile__("fsincos" : "+t" (x) : : "cc");
180         return (x);
181 }
183 extern __inline__ long double
184 frndint(long double x)
185 {
186         __asm__ __volatile__("frndint" : "+t" (x) : : "cc");
187         return (x);
188 }
190 extern __inline__ long double
191 fscale(long double x, long double y)
```



```
192 {
193         long double ret;
195         __asm__ __volatile__("fscale" : "=t" (ret) : "0" (y), "u" (x) : "cc");
196         return (ret);
197 }
199 extern __inline__ long double
200 fsin(long double x)
201 {
202         __asm__ __volatile__("fsin" : "+t" (x) : : "cc");
203         return (x);
204 }
206 extern __inline__ long double
207 fcos(long double x)
208 {
209         __asm__ __volatile__("fcos" : "+t" (x) : : "cc");
210         return (x);
211 }
213 extern __inline__ void
214 sse_cmpeqss(float *f1, float *f2, int *i1)
215 {
216         __asm__ __volatile__(
217             "cmpeqss %2, %1\n\t"
218             "movss   %1, %0"
219             : "=m" (*i1), "+x" (*f1)
220             : "x" (*f2)
221             : "cc");
222 }
224 extern __inline__ void
225 sse_cmpltss(float *f1, float *f2, int *i1)
226 {
227         __asm__ __volatile__(
228             "cmpltss %2, %1\n\t"
229             "movss   %1, %0"
230             : "=m" (*i1), "+x" (*f1)
231             : "x" (*f2)
232             : "cc");
233 }
235 extern __inline__ void
236 sse_cmpless(float *f1, float *f2, int *i1)
237 {
238         __asm__ __volatile__(
239             "cmpless %2, %1\n\t"
240             "movss   %1, %0"
241             : "=m" (*i1), "+x" (*f1)
242             : "x" (*f2)
243             : "cc");
244 }
246 extern __inline__ void
247 sse_cmpunordss(float *f1, float *f2, int *i1)
248 {
249         __asm__ __volatile__(
250             "cmpunordss %2, %1\n\t"
251             "movss      %1, %0"
252             : "=m" (*i1), "+x" (*f1)
253             : "x" (*f2)
254             : "cc");
255 }
257 extern __inline__ void
```

```
258 sse_minss(float *f1, float *f2, float *f3)
259 {
260         __asm__ __volatile__(
261             "minss %2, %1\n\t"
262             "movss %1, %0"
263             : "=m" (*f3), "+x" (*f1)
264             : "x" (*f2));
265 }

267 extern __inline__ void
268 sse_maxss(float *f1, float *f2, float *f3)
269 {
270         __asm__ __volatile__(
271             "maxss %2, %1\n\t"
272             "movss %1, %0"
273             : "=m" (*f3), "+x" (*f1)
274             : "x" (*f2));
275 }

277 extern __inline__ void
278 sse_addss(float *f1, float *f2, float *f3)
279 {
280         __asm__ __volatile__(
281             "addss %2, %1\n\t"
282             "movss %1, %0"
283             : "=m" (*f3), "+x" (*f1)
284             : "x" (*f2));
285 }

287 extern __inline__ void
288 sse_subss(float *f1, float *f2, float *f3)
289 {
290         __asm__ __volatile__(
291             "subss %2, %1\n\t"
292             "movss %1, %0"
293             : "=m" (*f3), "+x" (*f1)
294             : "x" (*f2));
295 }

297 extern __inline__ void
298 sse_mulss(float *f1, float *f2, float *f3)
299 {
300         __asm__ __volatile__(
301             "mulss %2, %1\n\t"
302             "movss %1, %0"
303             : "=m" (*f3), "+x" (*f1)
304             : "x" (*f2));
305 }

307 extern __inline__ void
308 sse_divss(float *f1, float *f2, float *f3)
309 {
310         __asm__ __volatile__(
311             "divss %2, %1\n\t"
312             "movss %1, %0"
313             : "=m" (*f3), "+x" (*f1)
314             : "x" (*f2));
315 }

317 extern __inline__ void
318 sse_sqrtss(float *f1, float *f2)
319 {
320         double tmp;

322         __asm__ __volatile__(
323             "sqrtss %2, %1\n\t"
```



```
324             "movss  %1, %0"
325             : "=m" (*f2), "=x" (tmp)
326             : "m" (*f1));
327 }

329 extern __inline__ void
330 sse_ucomiss(float *f1, float *f2)
331 {
332         __asm__ __volatile__("ucomiss %1, %0" : : "x" (*f1), "x" (*f2));

334 }

336 extern __inline__ void
337 sse_comiss(float *f1, float *f2)
338 {
339         __asm__ __volatile__("comiss %1, %0" : : "x" (*f1), "x" (*f2));
340 }

342 extern __inline__ void
343 sse_cvtss2sd(float *f1, double *d1)
344 {
345         double tmp;

347         __asm__ __volatile__(
348             "cvtss2sd %2, %1\n\t"
349             "movsd    %1, %0"
350             : "=m" (*d1), "=x" (tmp)
351             : "m" (*f1));
352 }

354 extern __inline__ void
355 sse_cvtsi2ss(int *i1, float *f1)
356 {
357         double tmp;

359         __asm__ __volatile__(
360             "cvtsi2ss %2, %1\n\t"
361             "movss    %1, %0"
362             : "=m" (*f1), "=x" (tmp)
363             : "m" (*i1));
364 }

366 extern __inline__ void
367 sse_cvttss2si(float *f1, int *i1)
368 {
369         int tmp;

371         __asm__ __volatile__(
372             "cvttss2si %2, %1\n\t"
373             "movl      %1, %0"
374             : "=m" (*i1), "=r" (tmp)
375             : "m" (*f1));
376 }

378 extern __inline__ void
379 sse_cvtss2si(float *f1, int *i1)
380 {
381         int tmp;

383         __asm__ __volatile__(
384             "cvtss2si %2, %1\n\t"
385             "movl     %1, %0"
386             : "=m" (*i1), "=r" (tmp)
387             : "m" (*f1));
388 }
```

```
390 #if defined(__amd64)
391 extern __inline__ void
392 sse_cvtsi2ssq(long long *ll1, float *f1)
393 {
394         double tmp;

396         __asm__ __volatile__(
397             "cvtsi2ssq %2, %1\n\t"
398             "movss     %1, %0"
399             : "=m" (*f1), "=x" (tmp)
400             : "m" (*ll1));
401 }

403 extern __inline__ void
404 sse_cvttss2siq(float *f1, long long *ll1)
405 {
406         uint64_t tmp;

408         __asm__ __volatile__(
409             "cvttss2siq %2, %1\n\t"
410             "movq       %1, %0"
411             : "=m" (*ll1), "=r" (tmp)
412             : "m" (*f1));
413 }

415 extern __inline__ void
416 sse_cvtss2siq(float *f1, long long *ll1)
417 {
418         uint64_t tmp;

420         __asm__ __volatile__(
421             "cvtss2siq %2, %1\n\t"
422             "movq      %1, %0"
423             : "=m" (*ll1), "=r" (tmp)
424             : "m" (*f1));
425 }

427 #endif

429 extern __inline__ void
430 sse_cmpeqsd(double *d1, double *d2, long long *ll1)
431 {
432         __asm__ __volatile__(
433             "cmpeqsd %2,%1\n\t"
434             "movsd   %1,%0"
435             : "=m" (*ll1), "=x" (*d1)
436             : "x" (*d2));
437 }

439 extern __inline__ void
440 sse_cmpltsd(double *d1, double *d2, long long *ll1)
441 {
442         __asm__ __volatile__(
443             "cmpltsd %2,%1\n\t"
444             "movsd   %1,%0"
445             : "=m" (*ll1), "=x" (*d1)
446             : "x" (*d2));
447 }

449 extern __inline__ void
450 sse_cmplesd(double *d1, double *d2, long long *ll1)
451 {
452         __asm__ __volatile__(
453             "cmplesd %2,%1\n\t"
454             "movsd   %1,%0"
455             : "=m" (*ll1), "=x" (*d1)
```



```
456             : "x" (*d2));
457 }

459 extern __inline__ void
460 sse_cmpunordsd(double *d1, double *d2, long long *ll1)
461 {
462         __asm__ __volatile__(
463             "cmpunordsd %2,%1\n\t"
464             "movsd      %1,%0"
465             : "=m" (*ll1), "=x" (*d1)
466             : "x" (*d2));
467 }


470 extern __inline__ void
471 sse_minsd(double *d1, double *d2, double *d3)
472 {
473         __asm__ __volatile__(
474             "minsd %2,%1\n\t"
475             "movsd %1,%0"
476             : "=m" (*d3), "=x" (*d1)
477             : "x" (*d2));
478 }

480 extern __inline__ void
481 sse_maxsd(double *d1, double *d2, double *d3)
482 {
483         __asm__ __volatile__(
484             "maxsd %2,%1\n\t"
485             "movsd %1,%0"
486             : "=m" (*d3), "=x" (*d1)
487             : "x" (*d2));
488 }

490 extern __inline__ void
491 sse_addsd(double *d1, double *d2, double *d3)
492 {
493         __asm__ __volatile__(
494             "addsd %2,%1\n\t"
495             "movsd %1,%0"
496             : "=m" (*d3), "=x" (*d1)
497             : "x" (*d2));
498 }

500 extern __inline__ void
501 sse_subsd(double *d1, double *d2, double *d3)
502 {
503         __asm__ __volatile__(
504             "subsd %2,%1\n\t"
505             "movsd %1,%0"
506             : "=m" (*d3), "=x" (*d1)
507             : "x" (*d2));
508 }

510 extern __inline__ void
511 sse_mulsd(double *d1, double *d2, double *d3)
512 {
513         __asm__ __volatile__(
514             "mulsd %2,%1\n\t"
515             "movsd %1,%0"
516             : "=m" (*d3), "=x" (*d1)
517             : "x" (*d2));
518 }

520 extern __inline__ void
521 sse_divsd(double *d1, double *d2, double *d3)
```

```
522 {
523         __asm__ __volatile__(
524             "divsd %2,%1\n\t"
525             "movsd %1,%0"
526             : "=m" (*d3), "=x" (*d1)
527             : "x" (*d2));
528 }

530 extern __inline__ void
531 sse_sqrtsd(double *d1, double *d2)
532 {
533         double tmp;

535         __asm__ __volatile__(
536             "sqrtsd %2, %1\n\t"
537             "movsd %1, %0"
538             : "=m" (*d2), "=x" (tmp)
539             : "m" (*d1));
540 }

542 extern __inline__ void
543 sse_ucomisd(double *d1, double *d2)
544 {
545         __asm__ __volatile__("ucomisd %1, %0" : : "x" (*d1), "x" (*d2));
546 }

548 extern __inline__ void
549 sse_comisd(double *d1, double *d2)
550 {
551         __asm__ __volatile__("comisd %1, %0" : : "x" (*d1), "x" (*d2));
552 }

554 extern __inline__ void
555 sse_cvtsd2ss(double *d1, float *f1)
556 {
557         double tmp;

559         __asm__ __volatile__(
560             "cvtsd2ss %2,%1\n\t"
561             "movss    %1,%0"
562             : "=m" (*f1), "=x" (tmp)
563             : "m" (*d1));
564 }

566 extern __inline__ void
567 sse_cvtsi2sd(int *i1, double *d1)
568 {
569         double tmp;
570         __asm__ __volatile__(
571             "cvtsi2sd %2,%1\n\t"
572             "movsd    %1,%0"
573             : "=m" (*d1), "=x" (tmp)
574             : "m" (*i1));
575 }

577 extern __inline__ void
578 sse_cvttsd2si(double *d1, int *i1)
579 {
580         int tmp;

582         __asm__ __volatile__(
583             "cvttsd2si %2,%1\n\t"
584             "movl      %1,%0"
585             : "=m" (*i1), "=r" (tmp)
586             : "m" (*d1));
587 }
```



```
589 extern __inline__ void
590 sse_cvtsd2si(double *d1, int *i1)
591 {
592         int tmp;

594         __asm__ __volatile__(
595             "cvtsd2si %2,%1\n\t"
596             "movl     %1,%0"
597             : "=m" (*i1), "=r" (tmp)
598             : "m" (*d1));
599 }

601 #if defined(__amd64)
602 extern __inline__ void
603 sse_cvtsi2sdq(long long *ll1, double *d1)
604 {
605         double tmp;

607         __asm__ __volatile__(
608             "cvtsi2sdq %2,%1\n\t"
609             "movsd     %1,%0"
610             : "=m" (*d1), "=x" (tmp)
611             : "m" (*ll1));
612 }

614 extern __inline__ void
615 sse_cvttsd2siq(double *d1, long long *ll1)
616 {
617         uint64_t tmp;

619         __asm__ __volatile__(
620             "cvttsd2siq %2,%1\n\t"
621             "movq       %1,%0"
622             : "=m" (*ll1), "=r" (tmp)
623             : "m" (*d1));
624 }

626 extern __inline__ void
627 sse_cvtsd2siq(double *d1, long long *ll1)
628 {
629         uint64_t tmp;

631         __asm__ __volatile__(
632             "cvtsd2siq %2,%1\n\t"
633             "movq      %1,%0"
634             : "=m" (*ll1), "=r" (tmp)
635             : "m" (*d1));
636 }
637 #endif

639 #elif defined(__sparc)
640 extern __inline__ void
641 __fenv_getfsr(unsigned long *l)
642 {
643         __asm__ __volatile__(
644 #if defined(__sparcv9)
645                 "stx %%fsr,%0\n\t"
646 #else
647                 "st  %%fsr,%0\n\t"
648 #endif
649                 : "=m" (*l));
650 }

652 extern __inline__ void
653 __fenv_setfsr(const unsigned long *l)
```

```
654 {
655         __asm__ __volatile__(
656 #if defined(__sparcv9)
657                 "ldx %0,%%fsr\n\t"
658 #else
659                 "ld %0,%%fsr\n\t"
660 #endif
661                 : : "m" (*l) : "cc");
662 }

664 extern __inline__ void
665 __fenv_getfsr32(unsigned int *l)
666 {
667         __asm__ __volatile__("st %%fsr,%0\n\t" : "=m" (*l));
668 }

670 extern __inline__ void
671 __fenv_setfsr32(const unsigned int *l)
672 {
673         __asm__ __volatile__("ld %0,%%fsr\n\t" : : "m" (*l));
674 }
675 #else
676 #error "GCC FENV inlines not implemented for this platform"
677 #endif

679 #ifdef __cplusplus
680 }
681 #endif

683 #endif  /* __GNUC__ */

685 #endif /* _FENV_INLINES_H */
```

```
**********************************************************
    2939 Sat May 10 12:09:27 2014
new/usr/src/lib/libm/common/m9x/fenv_synonyms.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
 *
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 */

#include <sys/isa_defs.h>

/* feexcept.c */
#define feclearexcept   __feclearexcept
#define feraiseexcept   __feraiseexcept
#define fetestexcept    __fetestexcept
#define fegetexceptflag __fegetexceptflag
#define fesetexceptflag __fesetexceptflag

/* fenv.c */
#define feholdexcept    __feholdexcept
#define feholdexcept96  __feholdexcept96
#define feupdateenv             __feupdateenv
#define fegetenv                __fegetenv
#define fesetenv                __fesetenv
#define fex_merge_flags __fex_merge_flags

#if defined(__x86)
/* feprec.c */
#define fegetprec               __fegetprec
#define fesetprec               __fesetprec
#endif

/* feround.c */
#define fegetround              __fegetround
#define fesetround              __fesetround
#define fesetround96    __fesetround96

/* fex_handler.c */
#define fex_get_handling                __fex_get_handling
#define fex_set_handling                __fex_set_handling
#define fex_getexcepthandler    __fex_getexcepthandler
```



```
#define fex_setexcepthandler    __fex_setexcepthandler

/* fex_log.c */
#define fex_get_log                     __fex_get_log
#define fex_set_log                     __fex_set_log
#define fex_get_log_depth       __fex_get_log_depth
#define fex_set_log_depth       __fex_set_log_depth
#define fex_log_entry           __fex_log_entry

/* libc, libthread */
#define close                   _close
#define getcontext              _getcontext
#define getpid                  _getpid
#define kill                    _kill
#define lseek                   _lseek
#define mutex_lock              _mutex_lock
#define mutex_unlock    _mutex_unlock
#define open                    _open
#define read                    _read
#define sigaction               _sigaction
#define sigemptyset             _sigemptyset
#define sigismember             _sigismember
#define sigprocmask             _sigprocmask
#define stat                    _stat
#define thr_getspecific _thr_getspecific
#define thr_keycreate   _thr_keycreate
#define thr_main                _thr_main
#define thr_setspecific _thr_setspecific
#define write                   _write

/* ??? see V9 /usr/include/stdio.h */
#ifdef __sparcv9
#define fileno                  _fileno
#endif

#ifdef __sparc
/* libm, libsunmath */
#define fp_class                __fp_class
#define fp_classf               __fp_classf
#define sqrt                    __sqrt
#define sqrtf                   __sqrtf
#endif
```

```
**********************************************************
    1479 Sat May 10 12:09:27 2014
new/usr/src/lib/libm/common/m9x/feprec.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak fegetprec = __fegetprec
#pragma weak fesetprec = __fesetprec

#include "fenv_synonyms.h"
#include <fenv.h>
#include <ucontext.h>
#include <thread.h>
#include "fex_handler.h"

int fegetprec(void)
{
        unsigned long   fsr;

        __fenv_getfsr(&fsr);
        return __fenv_get_rp(fsr);
}

int fesetprec(int r)
{
        unsigned long   fsr;

        if (r != FE_FLTPREC && r != FE_DBLPREC && r != FE_LDBLPREC)
                return 0;
        __fenv_getfsr(&fsr);
        __fenv_set_rp(fsr, r);
        __fenv_setfsr(&fsr);
        return 1;
}
```

```
**********************************************************
    2006 Sat May 10 12:09:27 2014
new/usr/src/lib/libm/common/m9x/feround.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak fegetround = __fegetround
#pragma weak fesetround = __fesetround

#pragma weak fegetround96 = __fegetround
#pragma weak fesetround96 = __fesetround96

#include "fenv_synonyms.h"
#include <fenv.h>
#include <ucontext.h>
#include <thread.h>
#include "fex_handler.h"
#include "fenv_inlines.h"

#if defined(__i386) && !defined(__amd64)
#include <float.h>
#endif

int fegetround(void)
{
        unsigned long   fsr;

        __fenv_getfsr(&fsr);
        return (int)__fenv_get_rd(fsr);
}

int fesetround(int r)
{
        unsigned long   fsr;

        if (r & ~3)
                return -1;
        __fenv_getfsr(&fsr);
```



```
        __fenv_set_rd(fsr, r);
        __fenv_setfsr(&fsr);
#if defined(__i386) && !defined(__amd64)
        FLT_ROUNDS = (0x2D >> (r << 1)) & 3;    /* 0->1, 1->3, 2->2, 3->0 */
#endif
        return 0;
}

int fesetround96(int r)
{
        unsigned long   fsr;

        if (r & ~3)
                return 0;
        __fenv_getfsr(&fsr);
        __fenv_set_rd(fsr, r);
        __fenv_setfsr(&fsr);
#if defined(__i386) && !defined(__amd64)
        FLT_ROUNDS = (0x2D >> (r << 1)) & 3;    /* 0->1, 1->3, 2->2, 3->0 */
#endif
        return 1;
}
```

```
**********************************************************
    2456 Sat May 10 12:09:27 2014
new/usr/src/lib/libm/common/m9x/fex_handler.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

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 */

#pragma weak fex_get_handling = __fex_get_handling
#pragma weak fex_set_handling = __fex_set_handling
#pragma weak fex_getexcepthandler = __fex_getexcepthandler
#pragma weak fex_setexcepthandler = __fex_setexcepthandler

#include "fenv_synonyms.h"
#include <fenv.h>
#include <ucontext.h>
#include <thread.h>
#include "fex_handler.h"

int fex_get_handling(int e)
{
        struct fex_handler_data *thr_handlers;
        int                                             i;

        thr_handlers = __fex_get_thr_handlers();
        for (i = 0; i < FEX_NUM_EXC; i++)
                if (e & (1 << i))
                        return thr_handlers[i].__mode;
        return FEX_NOHANDLER;
}

int fex_set_handling(int e, int mode, void (*handler)())
{
        struct fex_handler_data *thr_handlers;
        int                                             i;

        if (e & ~((1 << FEX_NUM_EXC) - 1))
                return 0;
        thr_handlers = __fex_get_thr_handlers();
        for (i = 0; i < FEX_NUM_EXC; i++) {
```



```
                if (e & (1 << i)) {
                        thr_handlers[i].__mode = mode;
                        thr_handlers[i].__handler = handler;
                }
        }
        __fex_update_te();
        return 1;
}

void fex_getexcepthandler(fex_handler_t *buf, int e)
{
        struct fex_handler_data *thr_handlers;
        int                                             i;

        thr_handlers = __fex_get_thr_handlers();
        for (i = 0; i < FEX_NUM_EXC; i++)
                if (e & (1 << i))
                        (*buf)[i] = thr_handlers[i];
}

void fex_setexcepthandler(const fex_handler_t *buf, int e)
{
        struct fex_handler_data *thr_handlers;
        int                                             i;

        thr_handlers = __fex_get_thr_handlers();
        for (i = 0; i < FEX_NUM_EXC; i++)
                if (e & (1 << i))
                        thr_handlers[i] = (*buf)[i];
        __fex_update_te();
}
```

```
**********************************************************
    6089 Sat May 10 12:09:27 2014
new/usr/src/lib/libm/common/m9x/fex_handler.h
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/* the following enums must match the bit positions in fenv.h */
enum fex_exception {
        fex_inexact             = 0,
        fex_division    = 1,
        fex_underflow   = 2,
        fex_overflow    = 3,
        fex_inv_zdz             = 4,
        fex_inv_idi             = 5,
        fex_inv_isi             = 6,
        fex_inv_zmi             = 7,
        fex_inv_sqrt    = 8,
        fex_inv_snan    = 9,
        fex_inv_int             = 10,
        fex_inv_cmp             = 11
};


/* auxiliary functions in __fex_hdlr.c */
extern struct fex_handler_data *__fex_get_thr_handlers(void);
extern void __fex_update_te(void);

/* auxiliary functions in __fex_sym.c */
extern void __fex_sym_init(void);
extern char *__fex_sym(char *, char **);

/* auxiliary functions in fex_log.c */
extern void __fex_mklog(ucontext_t *, char *, int, enum fex_exception,
        int, void *);

/* system-dependent auxiliary functions */
extern enum fex_exception __fex_get_invalid_type(siginfo_t *, ucontext_t *);
```



```
extern void __fex_get_op(siginfo_t *, ucontext_t *, fex_info_t *);
extern void __fex_st_result(siginfo_t *, ucontext_t *, fex_info_t *);

/* inline templates and macros for accessing fp state */
extern void __fenv_getfsr(unsigned long *);
extern void __fenv_setfsr(const unsigned long *);

#if defined(__sparc)

#define __fenv_get_rd(X)        ((X>>30)&0x3)
#define __fenv_set_rd(X,Y)      X=(X&~0xc0000000ul)|((Y)<<30)

#define __fenv_get_te(X)        ((X>>23)&0x1f)
#define __fenv_set_te(X,Y)      X=(X&~0x0f800000ul)|((Y)<<23)

#define __fenv_get_ex(X)        ((X>>5)&0x1f)
#define __fenv_set_ex(X,Y)      X=(X&~0x000003e0ul)|((Y)<<5)

#elif defined(__x86)

extern void __fenv_getcwsw(unsigned int *);
extern void __fenv_setcwsw(const unsigned int *);

extern void __fenv_getmxcsr(unsigned int *);
extern void __fenv_setmxcsr(const unsigned int *);

#define __fenv_get_rd(X)        ((X>>26)&3)
#define __fenv_set_rd(X,Y)      X=(X&~0x0c000000)|((Y)<<26)

#define __fenv_get_rp(X)        ((X>>24)&3)
#define __fenv_set_rp(X,Y)      X=(X&~0x03000000)|((Y)<<24)

#define __fenv_get_te(X)        ((X>>16)&0x3d)
#define __fenv_set_te(X,Y)      X=(X&~0x003d0000)|((Y)<<16)

#define __fenv_get_ex(X)        (X&0x3d)
#define __fenv_set_ex(X,Y)      X=(X&~0x0000003d)|(Y)

/*
 * These macros define some useful distinctions between various
 * SSE instructions.  In some cases, distinctions are made for
 * the purpose of simplifying the decoding of instructions, while
 * in other cases, they are made for the purpose of simplying the
 * emulation.  Note that these values serve as bit flags within
 * the enum values in sseinst_t.
 */
#define DOUBLE          0x100
#define SIMD            0x080
#define INTREG          0x040

typedef union {
        double          d[2];
        long long       l[2];
        float           f[4];
        int             i[4];
} sseoperand_t;

/* structure to hold a decoded SSE instruction */
typedef struct {
        enum {
                /* single precision scalar instructions */
                cmpss           = 0,
                minss           = 1,
                maxss           = 2,
                addss           = 3,
                subss           = 4,
```

```
127                 mulss           = 5,
128                 divss           = 6,
129                 sqrtss          = 7,
130                 ucomiss         = 16,
131                 comiss          = 17,
132                 cvtss2sd        = 32,
133                 cvtsi2ss        = INTREG + 0,
134                 cvttss2si       = INTREG + 1,
135                 cvtss2si        = INTREG + 2,
136                 cvtsi2ssq       = INTREG + 8,
137                 cvttss2siq      = INTREG + 9,
138                 cvtss2siq       = INTREG + 10,

140                 /* single precision SIMD instructions */
141                 cmpps           = SIMD + 0,
142                 minps           = SIMD + 1,
143                 maxps           = SIMD + 2,
144                 addps           = SIMD + 3,
145                 subps           = SIMD + 4,
146                 mulps           = SIMD + 5,
147                 divps           = SIMD + 6,
148                 sqrtps          = SIMD + 7,
149                 cvtps2pd        = SIMD + 32,
150                 cvtdq2ps        = SIMD + 34,
151                 cvttps2dq       = SIMD + 35,
152                 cvtps2dq        = SIMD + 36,
153                 cvtpi2ps        = SIMD + INTREG + 0,
154                 cvttps2pi       = SIMD + INTREG + 1,
155                 cvtps2pi        = SIMD + INTREG + 2,

157                 /* double precision scalar instructions */
158                 cmpsd           = DOUBLE + 0,
159                 minsd           = DOUBLE + 1,
160                 maxsd           = DOUBLE + 2,
161                 addsd           = DOUBLE + 3,
162                 subsd           = DOUBLE + 4,
163                 mulsd           = DOUBLE + 5,
164                 divsd           = DOUBLE + 6,
165                 sqrtsd          = DOUBLE + 7,
166                 ucomisd         = DOUBLE + 16,
167                 comisd          = DOUBLE + 17,
168                 cvtsd2ss        = DOUBLE + 32,
169                 cvtsi2sd        = DOUBLE + INTREG + 0,
170                 cvttsd2si       = DOUBLE + INTREG + 1,
171                 cvtsd2si        = DOUBLE + INTREG + 2,
172                 cvtsi2sdq       = DOUBLE + INTREG + 8,
173                 cvttsd2siq      = DOUBLE + INTREG + 9,
174                 cvtsd2siq       = DOUBLE + INTREG + 10,

176                 /* double precision SIMD instructions */
177                 cmppd           = DOUBLE + SIMD + 0,
178                 minpd           = DOUBLE + SIMD + 1,
179                 maxpd           = DOUBLE + SIMD + 2,
180                 addpd           = DOUBLE + SIMD + 3,
181                 subpd           = DOUBLE + SIMD + 4,
182                 mulpd           = DOUBLE + SIMD + 5,
183                 divpd           = DOUBLE + SIMD + 6,
184                 sqrtpd          = DOUBLE + SIMD + 7,
185                 cvtpd2ps        = DOUBLE + SIMD + 32,
186                 cvtdq2pd        = DOUBLE + SIMD + 34,
187                 cvttpd2dq       = DOUBLE + SIMD + 35,
188                 cvtpd2dq        = DOUBLE + SIMD + 36,
189                 cvtpi2pd        = DOUBLE + SIMD + INTREG + 0,
190                 cvttpd2pi       = DOUBLE + SIMD + INTREG + 1,
191                 cvtpd2pi        = DOUBLE + SIMD + INTREG + 2,
192         } op;
```



```
193         int             imm;
194         sseoperand_t    *op1, *op2;
195 } sseinst_t;

197 /* x86-specific auxiliary functions */
198 extern int *__fex_accrued(void);
199 extern void __fex_get_x86_exc(siginfo_t *, ucontext_t *);
200 extern int __fex_parse_sse(ucontext_t *, sseinst_t *);
201 extern enum fex_exception __fex_get_sse_op(ucontext_t *, sseinst_t *,
202         fex_info_t *);
203 extern void __fex_get_simd_op(ucontext_t *, sseinst_t *,
204         enum fex_exception *, fex_info_t *);
205 extern void __fex_st_sse_result(ucontext_t *, sseinst_t *,
206         enum fex_exception, fex_info_t *);
207 extern void __fex_st_simd_result(ucontext_t *, sseinst_t *,
208         enum fex_exception *, fex_info_t *);

210 #else
211 #error Unknown architecture
212 #endif
```

```
**********************************************************
    9376 Sat May 10 12:09:27 2014
new/usr/src/lib/libm/common/m9x/fex_log.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#pragma weak fex_get_log = __fex_get_log
#pragma weak fex_set_log = __fex_set_log
#pragma weak fex_get_log_depth = __fex_get_log_depth
#pragma weak fex_set_log_depth = __fex_set_log_depth
#pragma weak fex_log_entry = __fex_log_entry

#include "fenv_synonyms.h"
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <string.h>
#include <signal.h>
#include <ucontext.h>
#include <sys/frame.h>
#include <fenv.h>
#include <sys/ieeefp.h>
#include <thread.h>
#include "fex_handler.h"

#if !defined(PC)
#if defined(REG_PC)
#define PC      REG_PC
#else
#error Neither PC nor REG_PC is defined!
#endif
#endif

static FILE *log_fp = NULL;
static mutex_t log_lock = DEFAULTMUTEX;
static int log_depth = 100;
```



```
FILE *fex_get_log(void)
{
        FILE    *fp;

        mutex_lock(&log_lock);
        fp = log_fp;
        mutex_unlock(&log_lock);
        return fp;
}

int fex_set_log(FILE *fp)
{
        mutex_lock(&log_lock);
        log_fp = fp;
        mutex_unlock(&log_lock);
        __fex_update_te();
        return 1;
}

int fex_get_log_depth(void)
{
        int     d;

        mutex_lock(&log_lock);
        d = log_depth;
        mutex_unlock(&log_lock);
        return d;
}

int fex_set_log_depth(int d)
{
        if (d < 0)
                return 0;
        mutex_lock(&log_lock);
        log_depth = d;
        mutex_unlock(&log_lock);
        return 1;
}

static struct exc_list {
        struct exc_list         *next;
        char                    *addr;
        unsigned long           code;
        int                     nstack;
        char                    *stack[1]; /* actual length is max(1,nstack) */
} *list = NULL;

#ifdef __sparcv9
#define FRAMEP(X)       (struct frame *)((char*)(X)+(((long)(X)&1)?2047:0))
#else
#define FRAMEP(X)       (struct frame *)(X)
#endif

#ifdef _LP64
#define PDIG            "16"
#else
#define PDIG            "8"
#endif

/* look for a matching exc_list; return 1 if one is found,
   otherwise add this one to the list and return 0 */
static int check_exc_list(char *addr, unsigned long code, char *stk,
    struct frame *fp)
{
        struct exc_list *l, *ll = NULL;
        struct frame    *f;
```

```
127         int             i, n;

129         if (list) {
130                 for (l = list; l; ll = l, l = l->next) {
131                         if (l->addr != addr || l->code != code)
132                                 continue;
133                         if (log_depth < 1 || l->nstack < 1)
134                                 return 1;
135                         if (l->stack[0] != stk)
136                                 continue;
137                         n = 1;
138                         for (i = 1, f = fp; i < log_depth && i < l->nstack &&
139                             f && f->fr_savpc; i++, f = FRAMEP(f->fr_savfp))
140                                 if (l->stack[i] != (char *)f->fr_savpc) {
141                                         n = 0;
142                                         break;
143                                 }
144                         if (n)
145                                 return 1;
146                 }
147         }

149         /* create a new exc_list structure and tack it on the list */
150         for (n = 1, f = fp; n < log_depth && f && f->fr_savpc;
151             n++, f = FRAMEP(f->fr_savfp)) ;
152         if ((l = (struct exc_list *)malloc(sizeof(struct exc_list) +
153             (n - 1) * sizeof(char *))) != NULL) {
154                 l->next = NULL;
155                 l->addr = addr;
156                 l->code = code;
157                 l->nstack = ((log_depth < 1)? 0 : n);
158                 l->stack[0] = stk;
159                 for (i = 1; i < n; i++) {
160                         l->stack[i] = (char *)fp->fr_savpc;
161                         fp = FRAMEP(fp->fr_savfp);
162                 }
163                 if (list)
164                         ll->next = l;
165                 else
166                         list = l;
167         }
168         return 0;
169 }

171 /*
172 * Warning: cleverness ahead
173 *
174 * In the following code, the use of sprintf+write rather than fprintf
175 * to send output to the log file is intentional.  The reason is that
176 * fprintf is not async-signal-safe.  "But," you protest, "SIGFPE is
177 * not an asynchronous signal!  It's always handled by the same thread
178 * that executed the fpop that provoked it."  That's true, but a prob-
179 * lem arises because (i) base conversion in fprintf can cause a fp
180 * exception and (ii) my signal handler acquires a mutex lock before
181 * sending output to the log file (so that outputs for entries from
182 * different threads aren't interspersed).  Therefore, if the code
183 * were to use fprintf, a deadlock could occur as follows:
184 *
185 *       Thread A                        Thread B
186 *
187 *       Incurs a fp exception,          Calls fprintf,
188 *       acquires log_lock               acquires file rmutex lock
189 *
190 *       Calls fprintf,                  Incurs a fp exception,
191 *       waits for file rmutex lock      waits for log_lock
192 *
```



```
193 * (I could just verify that fprintf doesn't hold the rmutex lock while
194 * it's doing the base conversion, but since efficiency is of little
195 * concern here, I opted for the safe and dumb route.)
196 */

198 static void print_stack(int fd, char *addr, struct frame *fp)
199 {
200         int     i;
201         char    *name, buf[30];

203         for (i = 0; i < log_depth && addr != NULL; i++) {
204                 if (__fex_sym(addr, &name) != NULL) {
205                         write(fd, buf, sprintf(buf, "  0x%0" PDIG "lx  ",
206                             (long)addr));
207                         write(fd, name, strlen(name));
208                         write(fd, "\n", 1);
209                         if (!strcmp(name, "main"))
210                                 break;
211                 } else {
212                         write(fd, buf, sprintf(buf, "  0x%0" PDIG "lx\n",
213                             (long)addr));
214                 }
215                 if (fp == NULL)
216                         break;
217                 addr = (char *)fp->fr_savpc;
218                 fp = FRAMEP(fp->fr_savfp);
219         }
220 }

222 void fex_log_entry(const char *msg)
223 {
224         ucontext_t      uc;
225         struct frame    *fp;
226         char            *stk;
227         int             fd;

229         /* if logging is disabled, just return */
230         mutex_lock(&log_lock);
231         if (log_fp == NULL) {
232                 mutex_unlock(&log_lock);
233                 return;
234         }

236         /* get the frame pointer from the current context and
237            pop our own frame */
238         getcontext(&uc);
239 #if defined(__sparc) || defined(__amd64)
240         fp = FRAMEP(uc.uc_mcontext.gregs[REG_SP]);
241 #elif defined(__i386)   /* !defined(__amd64) */
242         fp = FRAMEP(uc.uc_mcontext.gregs[EBP]);
243 #else
244 #error Unknown architecture
245 #endif
246         if (fp == NULL) {
247                 mutex_unlock(&log_lock);
248                 return;
249         }
250         stk = (char *)fp->fr_savpc;
251         fp = FRAMEP(fp->fr_savfp);

253         /* if we've already logged this message here, don't make an entry */
254         if (check_exc_list(stk, (unsigned long)msg, stk, fp)) {
255                 mutex_unlock(&log_lock);
256                 return;
257         }
```

```
259         /* make an entry */
260         fd = fileno(log_fp);
261         write(fd, "fex_log_entry: ", 15);
262         write(fd, msg, strlen(msg));
263         write(fd, "\n", 1);
264         __fex_sym_init();
265         print_stack(fd, stk, fp);
266         mutex_unlock(&log_lock);
267 }

269 static const char *exception[FEX_NUM_EXC] = {
270         "inexact result",
271         "division by zero",
272         "underflow",
273         "overflow",
274         "invalid operation (0/0)",
275         "invalid operation (inf/inf)",
276         "invalid operation (inf-inf)",
277         "invalid operation (0*inf)",
278         "invalid operation (sqrt)",
279         "invalid operation (snan)",
280         "invalid operation (int)",
281         "invalid operation (cmp)"
282 };

284 void
285 __fex_mklog(ucontext_t *uap, char *addr, int f, enum fex_exception e,
286     int m, void *p)
287 {
288         struct  frame   *fp;
289         char            *stk, *name, buf[30];
290         int             fd;

292         /* if logging is disabled, just return */
293         mutex_lock(&log_lock);
294         if (log_fp == NULL) {
295                 mutex_unlock(&log_lock);
296                 return;
297         }

299         /* get stack info */
300 #if defined(__sparc)
301         stk = (char*)uap->uc_mcontext.gregs[REG_PC];
302         fp = FRAMEP(uap->uc_mcontext.gregs[REG_SP]);
303 #elif defined(__amd64)
304         stk = (char*)uap->uc_mcontext.gregs[REG_PC];
305         fp = FRAMEP(uap->uc_mcontext.gregs[REG_RBP]);
306 #elif defined(__i386)   /* !defined(__amd64) */
307         stk = (char*)uap->uc_mcontext.gregs[PC];
308         fp = FRAMEP(uap->uc_mcontext.gregs[EBP]);
309 #else
310 #error Unknown architecture
311 #endif

313         /* if the handling mode is the default and this exception's
314            flag is already raised, don't make an entry */
315         if (m == FEX_NONSTOP) {
316                 switch (e) {
317                 case fex_inexact:
318                         if (f & FE_INEXACT) {
319                                 mutex_unlock(&log_lock);
320                                 return;
321                         }
322                         break;
323                 case fex_underflow:
324                         if (f & FE_UNDERFLOW) {
```



```
325                                 mutex_unlock(&log_lock);
326                                 return;
327                         }
328                         break;
329                 case fex_overflow:
330                         if (f & FE_OVERFLOW) {
331                                 mutex_unlock(&log_lock);
332                                 return;
333                         }
334                         break;
335                 case fex_division:
336                         if (f & FE_DIVBYZERO) {
337                                 mutex_unlock(&log_lock);
338                                 return;
339                         }
340                         break;
341                 default:
342                         if (f & FE_INVALID) {
343                                 mutex_unlock(&log_lock);
344                                 return;
345                         }
346                         break;
347                 }
348         }

350         /* if we've already logged this exception at this address,
351            don't make an entry */
352         if (check_exc_list(addr, (unsigned long)e, stk, fp)) {
353                 mutex_unlock(&log_lock);
354                 return;
355         }

357         /* make an entry */
358         fd = fileno(log_fp);
359         write(fd, "Floating point ", 15);
360         write(fd, exception[e], strlen(exception[e]));
361         write(fd, buf, sprintf(buf, " at 0x%0" PDIG "lx", (long)addr));
362         __fex_sym_init();
363         if (__fex_sym(addr, &name) != NULL) {
364                 write(fd, " ", 1);
365                 write(fd, name, strlen(name));
366         }
367         switch (m) {
368         case FEX_NONSTOP:
369                 write(fd, ", nonstop mode\n", 15);
370                 break;

372         case FEX_ABORT:
373                 write(fd, ", abort\n", 8);
374                 break;

376         case FEX_NOHANDLER:
377                 if (p == (void *)SIG_DFL) {
378                         write(fd, ", handler: SIG_DFL\n", 19);
379                         break;
380                 }
381                 else if (p == (void *)SIG_IGN) {
382                         write(fd, ", handler: SIG_IGN\n", 19);
383                         break;
384                 }
385                 /* fall through*/
386         default:
387                 write(fd, ", handler: ", 11);
388                 if (__fex_sym((char *)p, &name) != NULL) {
389                         write(fd, name, strlen(name));
390                         write(fd, "\n", 1);
```

```
391                 } else {
392                         write(fd, buf, sprintf(buf, "0x%0" PDIG "lx\n",
393                             (long)p));
394                 }
395                 break;
396         }
397         print_stack(fd, stk, fp);
398         mutex_unlock(&log_lock);
399 }
```

```
**********************************************************
   11316 Sat May 10 12:09:27 2014
new/usr/src/lib/libm/common/m9x/fma.c
minor changes
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

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 */
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 */

#if defined(ELFOBJ)
#pragma weak fma = __fma
#endif

#include "libm.h"
#include "fma.h"
#include "fenv_inlines.h"

#if defined(__sparc)

static const union {
        unsigned i[2];
        double d;
} C[] = {
        { 0x3fe00000u, 0 },
        { 0x40000000u, 0 },
        { 0x43300000u, 0 },
        { 0x41a00000u, 0 },
        { 0x3e500000u, 0 },
        { 0x3df00000u, 0 },
        { 0x3bf00000u, 0 },
        { 0x7fe00000u, 0 },
        { 0x00100000u, 0 },
        { 0x00100001u, 0 }
};

#define half    C[0].d
#define two     C[1].d
#define two52   C[2].d
#define two27   C[3].d
```



```
#define two26  C[4].d
#define twom32  C[5].d
#define twom64  C[6].d
#define huge    C[7].d
#define tiny    C[8].d
#define tiny2   C[9].d

static const unsigned int fsr_rm = 0xc0000000u;

/*
 * fma for SPARC: 64-bit double precision, big-endian
 */
double
__fma(double x, double y, double z) {
        union {
                unsigned i[2];
                double d;
        } xx, yy, zz;
        double xhi, yhi, xlo, ylo, t;
        unsigned int xy0, xy1, xy2, xy3, z0, z1, z2, z3, fsr, rm, sticky;
        int hx, hy, hz, ex, ey, ez, exy, sxy, sz, e, ibit;
        volatile double dummy;

        /* extract the high order words of the arguments */
        xx.d = x;
        yy.d = y;
        zz.d = z;
        hx = xx.i[0] & ~0x80000000;
        hy = yy.i[0] & ~0x80000000;
        hz = zz.i[0] & ~0x80000000;

        /* dispense with inf, nan, and zero cases */
        if (hx >= 0x7ff00000 || hy >= 0x7ff00000 || (hx | xx.i[1]) == 0 ||
                (hy | yy.i[1]) == 0)    /* x or y is inf, nan, or zero */
                return (x * y + z);

        if (hz >= 0x7ff00000)   /* z is inf or nan */
                return (x + z); /* avoid spurious under/overflow in x * y */

        if ((hz | zz.i[1]) == 0)        /* z is zero */
                /*
                 * x * y isn't zero but could underflow to zero,
                 * so don't add z, lest we perturb the sign
                 */
                return (x * y);

        /*
         * now x, y, and z are all finite and nonzero; save the fsr and
         * set round-to-negative-infinity mode (and clear nonstandard
         * mode before we try to scale subnormal operands)
         */
        __fenv_getfsr32(&fsr);
        __fenv_setfsr32(&fsr_rm);

        /* extract signs and exponents, and normalize subnormals */
        sxy = (xx.i[0] ^ yy.i[0]) & 0x80000000;
        sz = zz.i[0] & 0x80000000;
        ex = hx >> 20;
        if (!ex) {
                xx.d = x * two52;
                ex = ((xx.i[0] & ~0x80000000) >> 20) - 52;
        }
        ey = hy >> 20;
        if (!ey) {
                yy.d = y * two52;
                ey = ((yy.i[0] & ~0x80000000) >> 20) - 52;
```

```
126         }
127         ez = hz >> 20;
128         if (!ez) {
129                 zz.d = z * two52;
130                 ez = ((zz.i[0] & ~0x80000000) >> 20) - 52;
131         }

133         /* multiply x*y to 106 bits */
134         exy = ex + ey - 0x3ff;
135         xx.i[0] = (xx.i[0] & 0xfffff) | 0x3ff00000;
136         yy.i[0] = (yy.i[0] & 0xfffff) | 0x3ff00000;
137         x = xx.d;
138         y = yy.d;
139         xhi = ((x + twom26) + two27) - two27;
140         yhi = ((y + twom26) + two27) - two27;
141         xlo = x - xhi;
142         ylo = y - yhi;
143         x *= y;
144         y = ((xhi * yhi - x) + xhi * ylo + xlo * yhi) + xlo * ylo;
145         if (x >= two) {
146                 x *= half;
147                 y *= half;
148                 exy++;
149         }

151         /* extract the significands */
152         xx.d = x;
153         xy0 = (xx.i[0] & 0xfffff) | 0x100000;
154         xy1 = xx.i[1];
155         yy.d = t = y + twom32;
156         xy2 = yy.i[1];
157         yy.d = (y - (t - twom32)) + twom64;
158         xy3 = yy.i[1];
159         z0 = (zz.i[0] & 0xfffff) | 0x100000;
160         z1 = zz.i[1];
161         z2 = z3 = 0;

163         /*
164          * now x*y is represented by sxy, exy, and xy[0-3], and z is
165          * represented likewise; swap if need be so |xy| <= |z|
166          */
167         if (exy > ez || (exy == ez && (xy0 > z0 || (xy0 == z0 &&
168                 (xy1 > z1 || (xy1 == z1 && (xy2 | xy3) != 0)))))) {
169                 e = sxy; sxy = sz; sz = e;
170                 e = exy; exy = ez; ez = e;
171                 e = xy0; xy0 = z0; z0 = e;
172                 e = xy1; xy1 = z1; z1 = e;
173                 z2 = xy2; xy2 = 0;
174                 z3 = xy3; xy3 = 0;
175         }

177         /* shift the significand of xy keeping a sticky bit */
178         e = ez - exy;
179         if (e > 116) {
180                 xy0 = xy1 = xy2 = 0;
181                 xy3 = 1;
182         } else if (e >= 96) {
183                 sticky = xy3 | xy2 | xy1 | ((xy0 << 1) << (127 - e));
184                 xy3 = xy0 >> (e - 96);
185                 if (sticky)
186                         xy3 |= 1;
187                 xy0 = xy1 = xy2 = 0;
188         } else if (e >= 64) {
189                 sticky = xy3 | xy2 | ((xy1 << 1) << (95 - e));
190                 xy3 = (xy1 >> (e - 64)) | ((xy0 << 1) << (95 - e));
191                 if (sticky)
```



```
192                         xy3 |= 1;
193                 xy2 = xy0 >> (e - 64);
194                 xy0 = xy1 = 0;
195         } else if (e >= 32) {
196                 sticky = xy3 | ((xy2 << 1) << (63 - e));
197                 xy3 = (xy2 >> (e - 32)) | ((xy1 << 1) << (63 - e));
198                 if (sticky)
199                         xy3 |= 1;
200                 xy2 = (xy1 >> (e - 32)) | ((xy0 << 1) << (63 - e));
201                 xy1 = xy0 >> (e - 32);
202                 xy0 = 0;
203         } else if (e) {
204                 sticky = (xy3 << 1) << (31 - e);
205                 xy3 = (xy3 >> e) | ((xy2 << 1) << (31 - e));
206                 if (sticky)
207                         xy3 |= 1;
208                 xy2 = (xy2 >> e) | ((xy1 << 1) << (31 - e));
209                 xy1 = (xy1 >> e) | ((xy0 << 1) << (31 - e));
210                 xy0 >>= e;
211         }

213         /* if this is a magnitude subtract, negate the significand of xy */
214         if (sxy ^ sz) {
215                 xy0 = ~xy0;
216                 xy1 = ~xy1;
217                 xy2 = ~xy2;
218                 xy3 = -xy3;
219                 if (xy3 == 0)
220                         if (++xy2 == 0)
221                                 if (++xy1 == 0)
222                                         xy0++;
223         }

225         /* add, propagating carries */
226         z3 += xy3;
227         e = (z3 < xy3);
228         z2 += xy2;
229         if (e) {
230                 z2++;
231                 e = (z2 <= xy2);
232         } else
233                 e = (z2 < xy2);
234         z1 += xy1;
235         if (e) {
236                 z1++;
237                 e = (z1 <= xy1);
238         } else
239                 e = (z1 < xy1);
240         z0 += xy0;
241         if (e)
242                 z0++;

244         /* postnormalize and collect rounding information into z2 */
245         if (ez < 1) {
246                 /* result is tiny; shift right until exponent is within range */
247                 e = 1 - ez;
248                 if (e > 56) {
249                         z2 = 1; /* result can’t be exactly zero */
250                         z0 = z1 = 0;
251                 } else if (e >= 32) {
252                         sticky = z3 | z2 | ((z1 << 1) << (63 - e));
253                         z2 = (z1 >> (e - 32)) | ((z0 << 1) << (63 - e));
254                         if (sticky)
255                                 z2 |= 1;
256                         z1 = z0 >> (e - 32);
257                         z0 = 0;
```

```
258                 } else {
259                         sticky = z3 | (z2 << 1) << (31 - e);
260                         z2 = (z2 >> e) | ((z1 << 1) << (31 - e));
261                         if (sticky)
262                                 z2 |= 1;
263                         z1 = (z1 >> e) | ((z0 << 1) << (31 - e));
264                         z0 >>= e;
265                 }
266                 ez = 1;
267         } else if (z0 >= 0x200000) {
268                 /* carry out; shift right by one */
269                 sticky = (z2 & 1) | z3;
270                 z2 = (z2 >> 1) | (z1 << 31);
271                 if (sticky)
272                         z2 |= 1;
273                 z1 = (z1 >> 1) | (z0 << 31);
274                 z0 >>= 1;
275                 ez++;
276         } else {
277                 if (z0 < 0x100000 && (z0 | z1 | z2 | z3) != 0) {
278                         /*
279                          * borrow/cancellation; shift left as much as
280                          * exponent allows
281                          */
282                         while (!(z0 | (z1 & 0xffe00000)) && ez >= 33) {
283                                 z0 = z1;
284                                 z1 = z2;
285                                 z2 = z3;
286                                 z3 = 0;
287                                 ez -= 32;
288                         }
289                         while (z0 < 0x100000 && ez > 1) {
290                                 z0 = (z0 << 1) | (z1 >> 31);
291                                 z1 = (z1 << 1) | (z2 >> 31);
292                                 z2 = (z2 << 1) | (z3 >> 31);
293                                 z3 <<= 1;
294                                 ez--;
295                         }
296                 }
297                 if (z3)
298                         z2 |= 1;
299         }
301         /* get the rounding mode and clear current exceptions */
302         rm = fsr >> 30;
303         fsr &= ~FSR_CEXC;
305         /* strip off the integer bit, if there is one */
306         ibit = z0 & 0x100000;
307         if (ibit)
308                 z0 -= 0x100000;
309         else {
310                 ez = 0;
311                 if (!(z0 | z1 | z2)) { /* exact zero */
312                         zz.i[0] = rm == FSR_RM ? 0x80000000 : 0;
313                         zz.i[1] = 0;
314                         __fenv_setfsr32(&fsr);
315                         return (zz.d);
316                 }
317         }
319         /*
320          * flip the sense of directed roundings if the result is negative;
321          * the logic below applies to a positive result
322          */
323         if (sz)
```



```
324                 rm ^= rm >> 1;
326         /* round and raise exceptions */
327         if (z2) {
328                 fsr |= FSR_NXC;
330                 /* decide whether to round the fraction up */
331                 if (rm == FSR_RP || (rm == FSR_RN && (z2 > 0x80000000u ||
332                         (z2 == 0x80000000u && (z1 & 1))))) {
333                         /* round up and renormalize if necessary */
334                         if (++z1 == 0) {
335                                 if (++z0 == 0x100000) {
336                                         z0 = 0;
337                                         ez++;
338                                 }
339                         }
340                 }
341         }
343         /* check for under/overflow */
344         if (ez >= 0x7ff) {
345                 if (rm == FSR_RN || rm == FSR_RP) {
346                         zz.i[0] = sz | 0x7ff00000;
347                         zz.i[1] = 0;
348                 } else {
349                         zz.i[0] = sz | 0x7fefffff;
350                         zz.i[1] = 0xffffffff;
351                 }
352                 fsr |= FSR_OFC | FSR_NXC;
353         } else {
354                 zz.i[0] = sz | (ez << 20) | z0;
355                 zz.i[1] = z1;
357                 /*
358                  * !ibit => exact result was tiny before rounding,
359                  * z2 nonzero => result delivered is inexact
360                  */
361                 if (!ibit) {
362                         if (z2)
363                                 fsr |= FSR_UFC | FSR_NXC;
364                         else if (fsr & FSR_UFM)
365                                 fsr |= FSR_UFC;
366                 }
367         }
369         /* restore the fsr and emulate exceptions as needed */
370         if ((fsr & FSR_CEXC) & (fsr >> 23)) {
371                 __fenv_setfsr32(&fsr);
372                 if (fsr & FSR_OFC) {
373                         dummy = huge;
374                         dummy *= huge;
375                 } else if (fsr & FSR_UFC) {
376                         dummy = tiny;
377                         if (fsr & FSR_NXC)
378                                 dummy *= tiny;
379                         else
380                                 dummy -= tiny2;
381                 } else {
382                         dummy = huge;
383                         dummy += tiny;
384                 }
385         } else {
386                 fsr |= (fsr & 0x1f) << 5;
387                 __fenv_setfsr32(&fsr);
388         }
389         return (zz.d);
```

```
390 }

392 #elif defined(__x86)

394 #if defined(__amd64)
395 #define NI      4
396 #else
397 #define NI      3
398 #endif

400 /*
401  *  fma for x86: 64-bit double precision, little-endian
402  */
403 double
404 __fma(double x, double y, double z) {
405         union {
406                 unsigned i[NI];
407                 long double e;
408         } xx, yy, zz;
409         long double xe, ye, xhi, xlo, yhi, ylo;
410         int ex, ey, ez;
411         unsigned cwsw, oldcwsw, rm;

413         /* convert the operands to double extended */
414         xx.e = (long double) x;
415         yy.e = (long double) y;
416         zz.e = (long double) z;

418         /* extract the exponents of the arguments */
419         ex = xx.i[2] & 0x7fff;
420         ey = yy.i[2] & 0x7fff;
421         ez = zz.i[2] & 0x7fff;

423         /* dispense with inf, nan, and zero cases */
424         if (ex == 0x7fff || ey == 0x7fff || ex == 0 || ey == 0)
425                 /* x or y is inf, nan, or zero */
426                 return ((double) (xx.e * yy.e + zz.e));

428         if (ez >= 0x7fff) /* z is inf or nan */
429                 return ((double) (xx.e + zz.e));
430                                  /* avoid spurious inexact in x * y */

432         /*
433          * save the control and status words, mask all exceptions, and
434          * set rounding to 64-bit precision and to-nearest
435          */
436         __fenv_getcwsw(&oldcwsw);
437         cwsw = (oldcwsw & 0xf0c0ffff) | 0x033f0000;
438         __fenv_setcwsw(&cwsw);

440         /* multiply x*y to 106 bits */
441         xe = xx.e;
442         xx.i[0] = 0;
443         xhi = xx.e; /* hi 32 bits */
444         xlo = xe - xhi; /* lo 21 bits */
445         ye = yy.e;
446         yy.i[0] = 0;
447         yhi = yy.e;
448         ylo = ye - yhi;
449         xe = xe * ye;
450         ye = ((xhi * yhi - xe) + xhi * ylo + xlo * yhi) + xlo * ylo;

452         /* distill the sum of xe, ye, and z */
453         xhi = ye + zz.e;
454         yhi = xhi - ye;
455         xlo = (zz.e - yhi) + (ye - (xhi - yhi));
```



```
456                                                 /* now (xhi,xlo) = ye + z */

458         yhi = xe + xhi;
459         ye = yhi - xe;
460         ylo = (xhi - ye) + (xe - (yhi - ye));   /* now (yhi,ylo) = xe + xhi */

462         xhi = xlo + ylo;
463         xe = xhi - xlo;
464         xlo = (ylo - xe) + (xlo - (xhi - xe));  /* now (xhi,xlo) = xlo + ylo */

466         yy.e = yhi + xhi;
467         ylo = (yhi - yy.e) + xhi;               /* now (yy.e,ylo) = xhi + yhi */

469         if (yy.i[1] != 0) {     /* yy.e is nonzero */
470                 /* perturb yy.e if its least significant 10 bits are zero */
471                 if (!(yy.i[0] & 0x3ff)) {
472                         xx.e = ylo + xlo;
473                         if (xx.i[1] != 0) {
474                                 xx.i[2] = (xx.i[2] & 0x8000) |
475                                           ((yy.i[2] & 0x7fff) - 63);
476                                 xx.i[1] = 0x80000000;
477                                 xx.i[0] = 0;
478                                 yy.e += xx.e;
479                         }
480                 }
481         } else {
482                 /* set sign of zero result according to rounding direction */
483                 rm = oldcwsw & 0x0c000000;
484                 yy.i[2] = ((rm == FCW_RM)? 0x8000 : 0);
485         }

487         /*
488          * restore the control and status words and convert the result
489          * to double
490          */
491         __fenv_setcwsw(&oldcwsw);
492         return ((double) yy.e);
493 }

495 #else
496 #error Unknown architecture
497 #endif
```

```
**********************************************************
    2817 Sat May 10 12:09:27 2014
new/usr/src/lib/libm/common/m9x/fma.h
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#ifndef _FMA_H
#define _FMA_H

#ifdef __cplusplus
extern "C" {
#endif

#ifdef __sparc

/*
 * Common definitions for fma routines (SPARC)
 */

/* fsr fields */

/* current exception bits */
#define FSR_NXC         0x1
#define FSR_DZC         0x2
#define FSR_UFC         0x4
#define FSR_OFC         0x8
#define FSR_NVC         0x10
#define FSR_CEXC        0x1f    /* mask for all cexc bits */

/* accrued exception bits */
#define FSR_NXA         0x20
#define FSR_DZA         0x40
#define FSR_UFA         0x80
#define FSR_OFA         0x100
#define FSR_NVA         0x200

/* trap enable bits */
```



```
#define FSR_NXM         0x00800000
#define FSR_DZM         0x01000000
#define FSR_UFM         0x02000000
#define FSR_OFM         0x04000000
#define FSR_NVM         0x08000000

/* rounding directions (right-adjusted) */
#define FSR_RN          0
#define FSR_RZ          1
#define FSR_RP          2
#define FSR_RM          3

/* inline templates */
extern void __fenv_getfsr32(unsigned int *);
extern void __fenv_setfsr32(const unsigned int *);

#endif /* __sparc */


#if defined(__x86)

/*
 * Common definitions for fma routines (x86)
 */

/* control and status word fields */

/* exception flags */
#define FSW_NV          0x1
#define FSW_DN          0x2
#define FSW_DZ          0x4
#define FSW_OF          0x8
#define FSW_UF          0x10
#define FSW_NX          0x20

/* exception masks */
#define FCW_NVM         0x00010000
#define FCW_DNM         0x00020000
#define FCW_DZM         0x00040000
#define FCW_OFM         0x00080000
#define FCW_UFM         0x00100000
#define FCW_NXM         0x00200000
#define FCW_ALLM        0x003f0000

/* rounding directions */
#define FCW_RN          0x00000000
#define FCW_RM          0x04000000
#define FCW_RP          0x08000000
#define FCW_RZ          0x0c000000

/* rounding precisions */
#define FCW_P24         0x00000000
#define FCW_P53         0x02000000
#define FCW_P64         0x03000000

/* inline templates */
extern void __fenv_getcwsw(unsigned int *);
extern void __fenv_setcwsw(const unsigned int *);

#endif /* __x86 */

#ifdef __cplusplus
}
#endif

#endif  /* _FMA_H */
```

```
**********************************************************
    5663 Sat May 10 12:09:28 2014
new/usr/src/lib/libm/common/m9x/fmaf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
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/*
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 */

#if defined(ELFOBJ)
#pragma weak fmaf = __fmaf
#endif

#include "libm.h"
#include "fma.h"
#include "fenv_inlines.h"

#if defined(__sparc)

/*
 * fmaf for SPARC: 32-bit single precision, big-endian
 */
float
__fmaf(float x, float y, float z) {
        union {
                unsigned i[2];
                double d;
        } xy, zz;
        unsigned u, s;
        int exy, ez;

        /*
         * the following operations can only raise the invalid exception,
         * and then only if either x*y is of the form Inf*0 or one of x,
         * y, or z is a signaling NaN
         */
        xy.d = (double) x * y;
        zz.d = (double) z;

        /*
         * if the sum xy + z will be exact, just compute it and cast the
```



```
         * result to float
         */
        exy = (xy.i[0] >> 20) & 0x7ff;
        ez = (zz.i[0] >> 20) & 0x7ff;
        if ((ez - exy <= 4 && exy - ez <= 28) || exy == 0x7ff || exy == 0 ||
                ez == 0x7ff || ez == 0) {
                return ((float) (xy.d + zz.d));
        }

        /*
         * collapse the tail of the smaller summand into a "sticky bit"
         * so that the sum can be computed without error
         */
        if (ez > exy) {
                if (ez - exy < 31) {
                        u = xy.i[1];
                        s = 2 << (ez - exy);
                        if (u & (s - 1))
                                u |= s;
                        xy.i[1] = u & ~(s - 1);
                } else if (ez - exy < 51) {
                        u = xy.i[0];
                        s = 1 << (ez - exy - 31);
                        if ((u & (s - 1)) | xy.i[1])
                                u |= s;
                        xy.i[0] = u & ~(s - 1);
                        xy.i[1] = 0;
                } else {
                        /* collapse all of xy into a single bit */
                        xy.i[0] = (xy.i[0] & 0x80000000) | ((ez - 51) << 20);
                        xy.i[1] = 0;
                }
        } else {
                if (exy - ez < 31) {
                        u = zz.i[1];
                        s = 2 << (exy - ez);
                        if (u & (s - 1))
                                u |= s;
                        zz.i[1] = u & ~(s - 1);
                } else if (exy - ez < 51) {
                        u = zz.i[0];
                        s = 1 << (exy - ez - 31);
                        if ((u & (s - 1)) | zz.i[1])
                                u |= s;
                        zz.i[0] = u & ~(s - 1);
                        zz.i[1] = 0;
                } else {
                        /* collapse all of zz into a single bit */
                        zz.i[0] = (zz.i[0] & 0x80000000) | ((exy - 51) << 20);
                        zz.i[1] = 0;
                }
        }

        return ((float) (xy.d + zz.d));
}

#elif defined(__x86)

#if defined(__amd64)
#define NI      4
#else
#define NI      3
#endif

/*
 * fmaf for x86: 32-bit single precision, little-endian
```

```
 */
float
__fmaf(float x, float y, float z) {
        union {
                unsigned i[NI];
                long double e;
        } xy, zz;
        unsigned u, s, cwsw, oldcwsw;
        int exy, ez;

        /* set rounding precision to 64 bits */
        __fenv_getcwsw(&oldcwsw);
        cwsw = (oldcwsw & 0xfcffffff) | 0x03000000;
        __fenv_setcwsw(&cwsw);

        /*
         * the following operations can only raise the invalid exception,
         * and then only if either x*y is of the form Inf*0 or one of x,
         * y, or z is a signaling NaN
         */
        xy.e = (long double) x * y;
        zz.e = (long double) z;

        /*
         * if the sum xy + z will be exact, just compute it and cast the
         * result to float
         */
        exy = xy.i[2] & 0x7fff;
        ez = zz.i[2] & 0x7fff;
        if ((ez - exy <= 15 && exy - ez <= 39) || exy == 0x7fff || exy == 0 ||
                ez == 0x7fff || ez == 0) {
                goto cont;
        }

        /*
         * collapse the tail of the smaller summand into a "sticky bit"
         * so that the sum can be computed without error
         */
        if (ez > exy) {
                if (ez - exy < 31) {
                        u = xy.i[0];
                        s = 2 << (ez - exy);
                        if (u & (s - 1))
                                u |= s;
                        xy.i[0] = u & ~(s - 1);
                } else if (ez - exy < 62) {
                        u = xy.i[1];
                        s = 1 << (ez - exy - 31);
                        if ((u & (s - 1)) | xy.i[0])
                                u |= s;
                        xy.i[1] = u & ~(s - 1);
                        xy.i[0] = 0;
                } else {
                        /* collapse all of xy into a single bit */
                        xy.i[0] = 0;
                        xy.i[1] = 0x80000000;
                        xy.i[2] = (xy.i[2] & 0x8000) | (ez - 62);
                }
        } else {
                if (exy - ez < 62) {
                        u = zz.i[1];
                        s = 1 << (exy - ez - 31);
                        if ((u & (s - 1)) | zz.i[0])
                                u |= s;
                        zz.i[1] = u & ~(s - 1);
                        zz.i[0] = 0;
```



```
                } else {
                        /* collapse all of zz into a single bit */
                        zz.i[0] = 0;
                        zz.i[1] = 0x80000000;
                        zz.i[2] = (zz.i[2] & 0x8000) | (exy - 62);
                }
        }

cont:
        xy.e += zz.e;

        /* restore the rounding precision */
        __fenv_getcwsw(&cwsw);
        cwsw = (cwsw & 0xfcffffff) | (oldcwsw & 0x03000000);
        __fenv_setcwsw(&cwsw);

        return ((float) xy.e);
}

#if 0
/*
 * another fmaf for x86: assumes return value will be left in
 * long double (80-bit double extended) precision
 */
long double
__fmaf(float x, float y, float z) {
        /*
         * Note: This implementation assumes the rounding precision mode
         * is set to the default, rounding to 64 bit precision.  If this
         * routine must work in non-default rounding precision modes, do
         * the following instead:
         *
         *   long double t;
         *
         *   <set rp mode to round to 64 bit precision>
         *   t = x * y;
         *   <restore rp mode>
         *   return t + z;
         *
         * Note that the code to change rounding precision must not alter
         * the exception masks or flags, since the product x * y may raise
         * an invalid operation exception.
         */
        return ((long double) x * y + z);
}
#endif

#else
#error Unknown architecture
#endif
```

```
**********************************************************
   28135 Sat May 10 12:09:28 2014
new/usr/src/lib/libm/common/m9x/fmal.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak fmal = __fmal
#endif

#include "libm.h"
#include "fma.h"
#include "fenv_inlines.h"

#if defined(__sparc)

static const union {
        unsigned i[2];
        double d;
} C[] = {
        { 0x3fe00000u, 0 },
        { 0x40000000u, 0 },
        { 0x3ef00000u, 0 },
        { 0x3e700000u, 0 },
        { 0x41300000u, 0 },
        { 0x3e300000u, 0 },
        { 0x3b300000u, 0 },
        { 0x38300000u, 0 },
        { 0x42300000u, 0 },
        { 0x3df00000u, 0 },
        { 0x7fe00000u, 0 },
        { 0x00100000u, 0 },
        { 0x00100001u, 0 },
        { 0, 0 },
        { 0x7ff00000u, 0 },
        { 0x7ff00001u, 0 }
};
```



```
#define half    C[0].d
#define two     C[1].d
#define twom16  C[2].d
#define twom24  C[3].d
#define two20   C[4].d
#define twom28  C[5].d
#define twom76  C[6].d
#define twom124 C[7].d
#define two36   C[8].d
#define twom32  C[9].d
#define huge    C[10].d
#define tiny    C[11].d
#define tiny2   C[12].d
#define zero    C[13].d
#define inf     C[14].d
#define snan    C[15].d

static const unsigned int fsr_rm = 0xc0000000u;

/*
 * fmal for SPARC: 128-bit quad precision, big-endian
 */
long double
__fmal(long double x, long double y, long double z) {
        union {
                unsigned int i[4];
                long double q;
        } xx, yy, zz;
        union {
                unsigned int i[2];
                double d;
        } u;
        double dx[5], dy[5], dxy[9], c, s;
        unsigned int xy0, xy1, xy2, xy3, xy4, xy5, xy6, xy7;
        unsigned int z0, z1, z2, z3, z4, z5, z6, z7;
        unsigned int rm, sticky;
        unsigned int fsr;
        int hx, hy, hz, ex, ey, ez, exy, sxy, sz, e, ibit;
        int cx, cy, cz;
        volatile double dummy;

        /* extract the high order words of the arguments */
        xx.q = x;
        yy.q = y;
        zz.q = z;
        hx = xx.i[0] & ~0x80000000;
        hy = yy.i[0] & ~0x80000000;
        hz = zz.i[0] & ~0x80000000;

        /*
         * distinguish zero, finite nonzero, infinite, and quiet nan
         * arguments; raise invalid and return for signaling nans
         */
        if (hx >= 0x7fff0000) {
                if ((hx & 0xffff) | xx.i[1] | xx.i[2] | xx.i[3]) {
                        if (!(hx & 0x8000)) {
                                /* signaling nan, raise invalid */
                                dummy = snan;
                                dummy += snan;
                                xx.i[0] |= 0x8000;
                                return (xx.q);
                        }
                        cx = 3; /* quiet nan */
                } else
                        cx = 2; /* inf */
```

```
127         } else if (hx == 0) {
128                 cx = (xx.i[1] | xx.i[2] | xx.i[3]) ? 1 : 0;
129                                 /* subnormal or zero */
130         } else
131                 cx = 1;         /* finite nonzero */
132
133         if (hy >= 0x7fff0000) {
134                 if ((hy & 0xffff) | yy.i[1] | yy.i[2] | yy.i[3]) {
135                         if (!(hy & 0x8000)) {
136                                 dummy = snan;
137                                 dummy += snan;
138                                 yy.i[0] |= 0x8000;
139                                 return (yy.q);
140                         }
141                         cy = 3;
142                 } else
143                         cy = 2;
144         } else if (hy == 0) {
145                 cy = (yy.i[1] | yy.i[2] | yy.i[3]) ? 1 : 0;
146         } else
147                 cy = 1;
148
149         if (hz >= 0x7fff0000) {
150                 if ((hz & 0xffff) | zz.i[1] | zz.i[2] | zz.i[3]) {
151                         if (!(hz & 0x8000)) {
152                                 dummy = snan;
153                                 dummy += snan;
154                                 zz.i[0] |= 0x8000;
155                                 return (zz.q);
156                         }
157                         cz = 3;
158                 } else
159                         cz = 2;
160         } else if (hz == 0) {
161                 cz = (zz.i[1] | zz.i[2] | zz.i[3]) ? 1 : 0;
162         } else
163                 cz = 1;
164
165         /* get the fsr and clear current exceptions */
166         __fenv_getfsr32(&fsr);
167         fsr &= ~FSR_CEXC;
168
169         /* handle all other zero, inf, and nan cases */
170         if (cx != 1 || cy != 1 || cz != 1) {
171                 /* if x or y is a quiet nan, return it */
172                 if (cx == 3) {
173                         __fenv_setfsr32(&fsr);
174                         return (x);
175                 }
176                 if (cy == 3) {
177                         __fenv_setfsr32(&fsr);
178                         return (y);
179                 }
180
181                 /* if x*y is 0*inf, raise invalid and return the default nan */
182                 if ((cx == 0 && cy == 2) || (cx == 2 && cy == 0)) {
183                         dummy = zero;
184                         dummy *= inf;
185                         zz.i[0] = 0x7fffffff;
186                         zz.i[1] = zz.i[2] = zz.i[3] = 0xffffffff;
187                         return (zz.q);
188                 }
189
190                 /* if z is a quiet nan, return it */
191                 if (cz == 3) {
192                         __fenv_setfsr32(&fsr);
```



```
193                         return (z);
194                 }
195
196                 /*
197                  * now none of x, y, or z is nan; handle cases where x or y
198                  * is inf
199                  */
200                 if (cx == 2 || cy == 2) {
201                         /*
202                          * if z is also inf, either we have inf-inf or
203                          * the result is the same as z depending on signs
204                          */
205                         if (cz == 2) {
206                                 if ((int) ((xx.i[0] ^ yy.i[0]) ^ zz.i[0]) < 0) {
207                                         dummy = inf;
208                                         dummy -= inf;
209                                         zz.i[0] = 0x7fffffff;
210                                         zz.i[1] = zz.i[2] = zz.i[3] =
211                                                 0xffffffff;
212                                         return (zz.q);
213                                 }
214                                 __fenv_setfsr32(&fsr);
215                                 return (z);
216                         }
217
218                         /* otherwise the result is inf with appropriate sign */
219                         zz.i[0] = ((xx.i[0] ^ yy.i[0]) & 0x80000000) |
220                                 0x7fff0000;
221                         zz.i[1] = zz.i[2] = zz.i[3] = 0;
222                         __fenv_setfsr32(&fsr);
223                         return (zz.q);
224                 }
225
226                 /* if z is inf, return it */
227                 if (cz == 2) {
228                         __fenv_setfsr32(&fsr);
229                         return (z);
230                 }
231
232                 /*
233                  * now x, y, and z are all finite; handle cases where x or y
234                  * is zero
235                  */
236                 if (cx == 0 || cy == 0) {
237                         /* either we have 0-0 or the result is the same as z */
238                         if (cz == 0 && (int) ((xx.i[0] ^ yy.i[0]) ^ zz.i[0]) <
239                                 0) {
240                                 zz.i[0] = (fsr >> 30) == FSR_RM ? 0x80000000 :
241                                         0;
242                                 __fenv_setfsr32(&fsr);
243                                 return (zz.q);
244                         }
245                         __fenv_setfsr32(&fsr);
246                         return (z);
247                 }
248
249                 /* if we get here, x and y are nonzero finite, z must be zero */
250                 return (x * y);
251         }
252
253         /*
254          * now x, y, and z are all finite and nonzero; set round-to-
255          * negative-infinity mode
256          */
257         __fenv_setfsr32(&fsr_rm);
```

```
259         /*
260          * get the signs and exponents and normalize the significands
261          * of x and y
262          */
263         sxy = (xx.i[0] ^ yy.i[0]) & 0x80000000;
264         ex = hx >> 16;
265         hx &= 0xffff;
266         if (!ex) {
267                 if (hx | (xx.i[1] & 0xfffe0000)) {
268                         ex = 1;
269                 } else if (xx.i[1] | (xx.i[2] & 0xfffe0000)) {
270                         hx = xx.i[1];
271                         xx.i[1] = xx.i[2];
272                         xx.i[2] = xx.i[3];
273                         xx.i[3] = 0;
274                         ex = -31;
275                 } else if (xx.i[2] | (xx.i[3] & 0xfffe0000)) {
276                         hx = xx.i[2];
277                         xx.i[1] = xx.i[3];
278                         xx.i[2] = xx.i[3] = 0;
279                         ex = -63;
280                 } else {
281                         hx = xx.i[3];
282                         xx.i[1] = xx.i[2] = xx.i[3] = 0;
283                         ex = -95;
284                 }
285                 while ((hx & 0x10000) == 0) {
286                         hx = (hx << 1) | (xx.i[1] >> 31);
287                         xx.i[1] = (xx.i[1] << 1) | (xx.i[2] >> 31);
288                         xx.i[2] = (xx.i[2] << 1) | (xx.i[3] >> 31);
289                         xx.i[3] <<= 1;
290                         ex--;
291                 }
292         } else
293                 hx |= 0x10000;
294         ey = hy >> 16;
295         hy &= 0xffff;
296         if (!ey) {
297                 if (hy | (yy.i[1] & 0xfffe0000)) {
298                         ey = 1;
299                 } else if (yy.i[1] | (yy.i[2] & 0xfffe0000)) {
300                         hy = yy.i[1];
301                         yy.i[1] = yy.i[2];
302                         yy.i[2] = yy.i[3];
303                         yy.i[3] = 0;
304                         ey = -31;
305                 } else if (yy.i[2] | (yy.i[3] & 0xfffe0000)) {
306                         hy = yy.i[2];
307                         yy.i[1] = yy.i[3];
308                         yy.i[2] = yy.i[3] = 0;
309                         ey = -63;
310                 } else {
311                         hy = yy.i[3];
312                         yy.i[1] = yy.i[2] = yy.i[3] = 0;
313                         ey = -95;
314                 }
315                 while ((hy & 0x10000) == 0) {
316                         hy = (hy << 1) | (yy.i[1] >> 31);
317                         yy.i[1] = (yy.i[1] << 1) | (yy.i[2] >> 31);
318                         yy.i[2] = (yy.i[2] << 1) | (yy.i[3] >> 31);
319                         yy.i[3] <<= 1;
320                         ey--;
321                 }
322         } else
323                 hy |= 0x10000;
324         exy = ex + ey - 0x3fff;
```



```
326         /* convert the significands of x and y to doubles */
327         c = twom16;
328         dx[0] = (double) ((int) hx) * c;
329         dy[0] = (double) ((int) hy) * c;
330
331         c *= twom24;
332         dx[1] = (double) ((int) (xx.i[1] >> 8)) * c;
333         dy[1] = (double) ((int) (yy.i[1] >> 8)) * c;
334
335         c *= twom24;
336         dx[2] = (double) ((int) (((xx.i[1] << 16) | (xx.i[2] >> 16)) &
337             0xffffff)) * c;
338         dy[2] = (double) ((int) (((yy.i[1] << 16) | (yy.i[2] >> 16)) &
339             0xffffff)) * c;
340
341         c *= twom24;
342         dx[3] = (double) ((int) (((xx.i[2] << 8) | (xx.i[3] >> 24)) &
343             0xffffff)) * c;
344         dy[3] = (double) ((int) (((yy.i[2] << 8) | (yy.i[3] >> 24)) &
345             0xffffff)) * c;
346
347         c *= twom24;
348         dx[4] = (double) ((int) (xx.i[3] & 0xffffff)) * c;
349         dy[4] = (double) ((int) (yy.i[3] & 0xffffff)) * c;
350
351         /* form the "digits" of the product */
352         dxy[0] = dx[0] * dy[0];
353         dxy[1] = dx[0] * dy[1] + dx[1] * dy[0];
354         dxy[2] = dx[0] * dy[2] + dx[1] * dy[1] + dx[2] * dy[0];
355         dxy[3] = dx[0] * dy[3] + dx[1] * dy[2] + dx[2] * dy[1] +
356             dx[3] * dy[0];
357         dxy[4] = dx[0] * dy[4] + dx[1] * dy[3] + dx[2] * dy[2] +
358             dx[3] * dy[1] + dx[4] * dy[0];
359         dxy[5] = dx[1] * dy[4] + dx[2] * dy[3] + dx[3] * dy[2] +
360             dx[4] * dy[1];
361         dxy[6] = dx[2] * dy[4] + dx[3] * dy[3] + dx[4] * dy[2];
362         dxy[7] = dx[3] * dy[4] + dx[4] * dy[3];
363         dxy[8] = dx[4] * dy[4];
364
365         /* split odd-numbered terms and combine into even-numbered terms */
366         c = (dxy[1] + two20) - two20;
367         dxy[0] += c;
368         dxy[1] -= c;
369         c = (dxy[3] + twom28) - twom28;
370         dxy[2] += c + dxy[1];
371         dxy[3] -= c;
372         c = (dxy[5] + twom76) - twom76;
373         dxy[4] += c + dxy[3];
374         dxy[5] -= c;
375         c = (dxy[7] + twom124) - twom124;
376         dxy[6] += c + dxy[5];
377         dxy[8] += (dxy[7] - c);
378
379         /* propagate carries, adjusting the exponent if need be */
380         dxy[7] = dxy[6] + dxy[8];
381         dxy[5] = dxy[4] + dxy[7];
382         dxy[3] = dxy[2] + dxy[5];
383         dxy[1] = dxy[0] + dxy[3];
384         if (dxy[1] >= two) {
385                 dxy[0] *= half;
386                 dxy[1] *= half;
387                 dxy[2] *= half;
388                 dxy[3] *= half;
389                 dxy[4] *= half;
390                 dxy[5] *= half;
```

```
391                 dxy[6] *= half;
392                 dxy[7] *= half;
393                 dxy[8] *= half;
394                 exy++;
395         }

397         /* extract the significand of x*y */
398         s = two36;
399         u.d = c = dxy[1] + s;
400         xy0 = u.i[1];
401         c -= s;
402         dxy[1] -= c;
403         dxy[0] -= c;

405         s *= twom32;
406         u.d = c = dxy[1] + s;
407         xy1 = u.i[1];
408         c -= s;
409         dxy[2] += (dxy[0] - c);
410         dxy[3] = dxy[2] + dxy[5];

412         s *= twom32;
413         u.d = c = dxy[3] + s;
414         xy2 = u.i[1];
415         c -= s;
416         dxy[4] += (dxy[2] - c);
417         dxy[5] = dxy[4] + dxy[7];

419         s *= twom32;
420         u.d = c = dxy[5] + s;
421         xy3 = u.i[1];
422         c -= s;
423         dxy[4] -= c;
424         dxy[5] = dxy[4] + dxy[7];

426         s *= twom32;
427         u.d = c = dxy[5] + s;
428         xy4 = u.i[1];
429         c -= s;
430         dxy[6] += (dxy[4] - c);
431         dxy[7] = dxy[6] + dxy[8];

433         s *= twom32;
434         u.d = c = dxy[7] + s;
435         xy5 = u.i[1];
436         c -= s;
437         dxy[8] += (dxy[6] - c);

439         s *= twom32;
440         u.d = c = dxy[8] + s;
441         xy6 = u.i[1];
442         c -= s;
443         dxy[8] -= c;

445         s *= twom32;
446         u.d = c = dxy[8] + s;
447         xy7 = u.i[1];

449         /* extract the sign, exponent, and significand of z */
450         sz = zz.i[0] & 0x80000000;
451         ez = hz >> 16;
452         z0 = hz & 0xffff;
453         if (!ez) {
454                 if (z0 | (zz.i[1] & 0xfffe0000)) {
455                         z1 = zz.i[1];
456                         z2 = zz.i[2];
```



```
457                         z3 = zz.i[3];
458                         ez = 1;
459                 } else if (zz.i[1] | (zz.i[2] & 0xfffe0000)) {
460                         z0 = zz.i[1];
461                         z1 = zz.i[2];
462                         z2 = zz.i[3];
463                         z3 = 0;
464                         ez = -31;
465                 } else if (zz.i[2] | (zz.i[3] & 0xfffe0000)) {
466                         z0 = zz.i[2];
467                         z1 = zz.i[3];
468                         z2 = z3 = 0;
469                         ez = -63;
470                 } else {
471                         z0 = zz.i[3];
472                         z1 = z2 = z3 = 0;
473                         ez = -95;
474                 }
475                 while ((z0 & 0x10000) == 0) {
476                         z0 = (z0 << 1) | (z1 >> 31);
477                         z1 = (z1 << 1) | (z2 >> 31);
478                         z2 = (z2 << 1) | (z3 >> 31);
479                         z3 <<= 1;
480                         ez--;
481                 }
482         } else {
483                 z0 |= 0x10000;
484                 z1 = zz.i[1];
485                 z2 = zz.i[2];
486                 z3 = zz.i[3];
487         }
488         z4 = z5 = z6 = z7 = 0;

490         /*
491          * now x*y is represented by sxy, exy, and xy[0-7], and z is
492          * represented likewise; swap if need be so |xy| <= |z|
493          */
494         if (exy > ez || (exy == ez && (xy0 > z0 || (xy0 == z0 && (xy1 > z1 ||
495                 (xy1 == z1 && (xy2 > z2 || (xy2 == z2 && (xy3 > z3 ||
496                 (xy3 == z3 && (xy4 | xy5 | xy6 | xy7) != 0))))))))) {
497                 e = sxy; sxy = sz; sz = e;
498                 e = exy; exy = ez; ez = e;
499                 e = xy0; xy0 = z0; z0 = e;
500                 e = xy1; xy1 = z1; z1 = e;
501                 e = xy2; xy2 = z2; z2 = e;
502                 e = xy3; xy3 = z3; z3 = e;
503                 z4 = xy4; xy4 = 0;
504                 z5 = xy5; xy5 = 0;
505                 z6 = xy6; xy6 = 0;
506                 z7 = xy7; xy7 = 0;
507         }

509         /* shift the significand of xy keeping a sticky bit */
510         e = ez - exy;
511         if (e > 236) {
512                 xy0 = xy1 = xy2 = xy3 = xy4 = xy5 = xy6 = 0;
513                 xy7 = 1;
514         } else if (e >= 224) {
515                 sticky = xy7 | xy6 | xy5 | xy4 | xy3 | xy2 | xy1 |
516                         ((xy0 << 1) << (255 - e));
517                 xy7 = xy0 >> (e - 224);
518                 if (sticky)
519                         xy7 |= 1;
520                 xy0 = xy1 = xy2 = xy3 = xy4 = xy5 = xy6 = 0;
521         } else if (e >= 192) {
522                 sticky = xy7 | xy6 | xy5 | xy4 | xy3 | xy2 |
```

```
523                     ((xy1 << 1) << (223 - e));
524             xy7 = (xy1 >> (e - 192)) | ((xy0 << 1) << (223 - e));
525             if (sticky)
526                     xy7 |= 1;
527             xy6 = xy0 >> (e - 192);
528             xy0 = xy1 = xy2 = xy3 = xy4 = xy5 = 0;
529     } else if (e >= 160) {
530             sticky = xy7 | xy6 | xy5 | xy4 | xy3 |
531                     ((xy2 << 1) << (191 - e));
532             xy7 = (xy2 >> (e - 160)) | ((xy1 << 1) << (191 - e));
533             if (sticky)
534                     xy7 |= 1;
535             xy6 = (xy1 >> (e - 160)) | ((xy0 << 1) << (191 - e));
536             xy5 = xy0 >> (e - 160);
537             xy0 = xy1 = xy2 = xy3 = xy4 = 0;
538     } else if (e >= 128) {
539             sticky = xy7 | xy6 | xy5 | xy4 | ((xy3 << 1) << (159 - e));
540             xy7 = (xy3 >> (e - 128)) | ((xy2 << 1) << (159 - e));
541             if (sticky)
542                     xy7 |= 1;
543             xy6 = (xy2 >> (e - 128)) | ((xy1 << 1) << (159 - e));
544             xy5 = (xy1 >> (e - 128)) | ((xy0 << 1) << (159 - e));
545             xy4 = xy0 >> (e - 128);
546             xy0 = xy1 = xy2 = xy3 = 0;
547     } else if (e >= 96) {
548             sticky = xy7 | xy6 | xy5 | ((xy4 << 1) << (127 - e));
549             xy7 = (xy4 >> (e - 96)) | ((xy3 << 1) << (127 - e));
550             if (sticky)
551                     xy7 |= 1;
552             xy6 = (xy3 >> (e - 96)) | ((xy2 << 1) << (127 - e));
553             xy5 = (xy2 >> (e - 96)) | ((xy1 << 1) << (127 - e));
554             xy4 = (xy1 >> (e - 96)) | ((xy0 << 1) << (127 - e));
555             xy3 = xy0 >> (e - 96);
556             xy0 = xy1 = xy2 = 0;
557     } else if (e >= 64) {
558             sticky = xy7 | xy6 | ((xy5 << 1) << (95 - e));
559             xy7 = (xy5 >> (e - 64)) | ((xy4 << 1) << (95 - e));
560             if (sticky)
561                     xy7 |= 1;
562             xy6 = (xy4 >> (e - 64)) | ((xy3 << 1) << (95 - e));
563             xy5 = (xy3 >> (e - 64)) | ((xy2 << 1) << (95 - e));
564             xy4 = (xy2 >> (e - 64)) | ((xy1 << 1) << (95 - e));
565             xy3 = (xy1 >> (e - 64)) | ((xy0 << 1) << (95 - e));
566             xy2 = xy0 >> (e - 64);
567             xy0 = xy1 = 0;
568     } else if (e >= 32) {
569             sticky = xy7 | ((xy6 << 1) << (63 - e));
570             xy7 = (xy6 >> (e - 32)) | ((xy5 << 1) << (63 - e));
571             if (sticky)
572                     xy7 |= 1;
573             xy6 = (xy5 >> (e - 32)) | ((xy4 << 1) << (63 - e));
574             xy5 = (xy4 >> (e - 32)) | ((xy3 << 1) << (63 - e));
575             xy4 = (xy3 >> (e - 32)) | ((xy2 << 1) << (63 - e));
576             xy3 = (xy2 >> (e - 32)) | ((xy1 << 1) << (63 - e));
577             xy2 = (xy1 >> (e - 32)) | ((xy0 << 1) << (63 - e));
578             xy1 = xy0 >> (e - 32);
579             xy0 = 0;
580     } else if (e) {
581             sticky = (xy7 << 1) << (31 - e);
582             xy7 = (xy7 >> e) | ((xy6 << 1) << (31 - e));
583             if (sticky)
584                     xy7 |= 1;
585             xy6 = (xy6 >> e) | ((xy5 << 1) << (31 - e));
586             xy5 = (xy5 >> e) | ((xy4 << 1) << (31 - e));
587             xy4 = (xy4 >> e) | ((xy3 << 1) << (31 - e));
588             xy3 = (xy3 >> e) | ((xy2 << 1) << (31 - e));
```



```
589             xy2 = (xy2 >> e) | ((xy1 << 1) << (31 - e));
590             xy1 = (xy1 >> e) | ((xy0 << 1) << (31 - e));
591             xy0 >>= e;
592     }
593
594     /* if this is a magnitude subtract, negate the significand of xy */
595     if (sxy ^ sz) {
596             xy0 = ~xy0;
597             xy1 = ~xy1;
598             xy2 = ~xy2;
599             xy3 = ~xy3;
600             xy4 = ~xy4;
601             xy5 = ~xy5;
602             xy6 = ~xy6;
603             xy7 = -xy7;
604             if (xy7 == 0)
605                     if (++xy6 == 0)
606                             if (++xy5 == 0)
607                                     if (++xy4 == 0)
608                                             if (++xy3 == 0)
609                                                     if (++xy2 == 0)
610                                                             if (++xy1 == 0)
611                                                                     xy0++;
612     }
613
614     /* add, propagating carries */
615     z7 += xy7;
616     e = (z7 < xy7);
617     z6 += xy6;
618     if (e) {
619             z6++;
620             e = (z6 <= xy6);
621     } else
622             e = (z6 < xy6);
623     z5 += xy5;
624     if (e) {
625             z5++;
626             e = (z5 <= xy5);
627     } else
628             e = (z5 < xy5);
629     z4 += xy4;
630     if (e) {
631             z4++;
632             e = (z4 <= xy4);
633     } else
634             e = (z4 < xy4);
635     z3 += xy3;
636     if (e) {
637             z3++;
638             e = (z3 <= xy3);
639     } else
640             e = (z3 < xy3);
641     z2 += xy2;
642     if (e) {
643             z2++;
644             e = (z2 <= xy2);
645     } else
646             e = (z2 < xy2);
647     z1 += xy1;
648     if (e) {
649             z1++;
650             e = (z1 <= xy1);
651     } else
652             e = (z1 < xy1);
653     z0 += xy0;
654     if (e)
```

```
655                 z0++;

657         /* postnormalize and collect rounding information into z4 */
658         if (ez < 1) {
659                 /* result is tiny; shift right until exponent is within range */
660                 e = 1 - ez;
661                 if (e > 116) {
662                         z4 = 1; /* result can't be exactly zero */
663                         z0 = z1 = z2 = z3 = 0;
664                 } else if (e >= 96) {
665                         sticky = z7 | z6 | z5 | z4 | z3 | z2 |
666                                 ((z1 << 1) << (127 - e));
667                         z4 = (z1 >> (e - 96)) | ((z0 << 1) << (127 - e));
668                         if (sticky)
669                                 z4 |= 1;
670                         z3 = z0 >> (e - 96);
671                         z0 = z1 = z2 = 0;
672                 } else if (e >= 64) {
673                         sticky = z7 | z6 | z5 | z4 | z3 |
674                                 ((z2 << 1) << (95 - e));
675                         z4 = (z2 >> (e - 64)) | ((z1 << 1) << (95 - e));
676                         if (sticky)
677                                 z4 |= 1;
678                         z3 = (z1 >> (e - 64)) | ((z0 << 1) << (95 - e));
679                         z2 = z0 >> (e - 64);
680                         z0 = z1 = 0;
681                 } else if (e >= 32) {
682                         sticky = z7 | z6 | z5 | z4 | ((z3 << 1) << (63 - e));
683                         z4 = (z3 >> (e - 32)) | ((z2 << 1) << (63 - e));
684                         if (sticky)
685                                 z4 |= 1;
686                         z3 = (z2 >> (e - 32)) | ((z1 << 1) << (63 - e));
687                         z2 = (z1 >> (e - 32)) | ((z0 << 1) << (63 - e));
688                         z1 = z0 >> (e - 32);
689                         z0 = 0;
690                 } else {
691                         sticky = z7 | z6 | z5 | (z4 << 1) << (31 - e);
692                         z4 = (z4 >> e) | ((z3 << 1) << (31 - e));
693                         if (sticky)
694                                 z4 |= 1;
695                         z3 = (z3 >> e) | ((z2 << 1) << (31 - e));
696                         z2 = (z2 >> e) | ((z1 << 1) << (31 - e));
697                         z1 = (z1 >> e) | ((z0 << 1) << (31 - e));
698                         z0 >>= e;
699                 }
700                 ez = 1;
701         } else if (z0 >= 0x20000) {
702                 /* carry out; shift right by one */
703                 sticky = (z4 & 1) | z5 | z6 | z7;
704                 z4 = (z4 >> 1) | (z3 << 31);
705                 if (sticky)
706                         z4 |= 1;
707                 z3 = (z3 >> 1) | (z2 << 31);
708                 z2 = (z2 >> 1) | (z1 << 31);
709                 z1 = (z1 >> 1) | (z0 << 31);
710                 z0 >>= 1;
711                 ez++;
712         } else {
713                 if (z0 < 0x10000 && (z0 | z1 | z2 | z3 | z4 | z5 | z6 | z7)
714                         != 0) {
715                         /*
716                          * borrow/cancellation; shift left as much as
717                          * exponent allows
718                          */
719                         while (!(z0 | (z1 & 0xfffe0000)) && ez >= 33) {
720                                 z0 = z1;
```



```
721                                 z1 = z2;
722                                 z2 = z3;
723                                 z3 = z4;
724                                 z4 = z5;
725                                 z5 = z6;
726                                 z6 = z7;
727                                 z7 = 0;
728                                 ez -= 32;
729                         }
730                         while (z0 < 0x10000 && ez > 1) {
731                                 z0 = (z0 << 1) | (z1 >> 31);
732                                 z1 = (z1 << 1) | (z2 >> 31);
733                                 z2 = (z2 << 1) | (z3 >> 31);
734                                 z3 = (z3 << 1) | (z4 >> 31);
735                                 z4 = (z4 << 1) | (z5 >> 31);
736                                 z5 = (z5 << 1) | (z6 >> 31);
737                                 z6 = (z6 << 1) | (z7 >> 31);
738                                 z7 <<= 1;
739                                 ez--;
740                         }
741                 }
742                 if (z5 | z6 | z7)
743                         z4 |= 1;
744         }

746         /* get the rounding mode */
747         rm = fsr >> 30;

749         /* strip off the integer bit, if there is one */
750         ibit = z0 & 0x10000;
751         if (ibit)
752                 z0 -= 0x10000;
753         else {
754                 ez = 0;
755                 if (!(z0 | z1 | z2 | z3 | z4)) { /* exact zero */
756                         zz.i[0] = rm == FSR_RM ? 0x80000000 : 0;
757                         zz.i[1] = zz.i[2] = zz.i[3] = 0;
758                         __fenv_setfsr32(&fsr);
759                         return (zz.q);
760                 }
761         }

763         /*
764          * flip the sense of directed roundings if the result is negative;
765          * the logic below applies to a positive result
766          */
767         if (sz)
768                 rm ^= rm >> 1;

770         /* round and raise exceptions */
771         if (z4) {
772                 fsr |= FSR_NXC;

774                 /* decide whether to round the fraction up */
775                 if (rm == FSR_RP || (rm == FSR_RN && (z4 > 0x80000000u ||
776                         (z4 == 0x80000000u && (z3 & 1))))) {
777                         /* round up and renormalize if necessary */
778                         if (++z3 == 0)
779                                 if (++z2 == 0)
780                                         if (++z1 == 0)
781                                                 if (++z0 == 0x10000) {
782                                                         z0 = 0;
783                                                         ez++;
784                                                 }
785                 }
786         }
```

```
788         /* check for under/overflow */
789         if (ez >= 0x7fff) {
790                 if (rm == FSR_RN || rm == FSR_RP) {
791                         zz.i[0] = sz | 0x7fff0000;
792                         zz.i[1] = zz.i[2] = zz.i[3] = 0;
793                 } else {
794                         zz.i[0] = sz | 0x7ffeffff;
795                         zz.i[1] = zz.i[2] = zz.i[3] = 0xffffffff;
796                 }
797                 fsr |= FSR_OFC | FSR_NXC;
798         } else {
799                 zz.i[0] = sz | (ez << 16) | z0;
800                 zz.i[1] = z1;
801                 zz.i[2] = z2;
802                 zz.i[3] = z3;
803
804                 /*
805                  * !ibit => exact result was tiny before rounding,
806                  * z4 nonzero => result delivered is inexact
807                  */
808                 if (!ibit) {
809                         if (z4)
810                                 fsr |= FSR_UFC | FSR_NXC;
811                         else if (fsr & FSR_UFM)
812                                 fsr |= FSR_UFC;
813                 }
814         }
815
816         /* restore the fsr and emulate exceptions as needed */
817         if ((fsr & FSR_CEXC) & (fsr >> 23)) {
818                 __fenv_setfsr32(&fsr);
819                 if (fsr & FSR_OFC) {
820                         dummy = huge;
821                         dummy *= huge;
822                 } else if (fsr & FSR_UFC) {
823                         dummy = tiny;
824                         if (fsr & FSR_NXC)
825                                 dummy *= tiny;
826                         else
827                                 dummy -= tiny2;
828                 } else {
829                         dummy = huge;
830                         dummy += tiny;
831                 }
832         } else {
833                 fsr |= (fsr & 0x1f) << 5;
834                 __fenv_setfsr32(&fsr);
835         }
836         return (zz.q);
837 }
838
839 #elif defined(__x86)
840
841 static const union {
842         unsigned i[2];
843         double d;
844 } C[] = {
845         { 0, 0x3fe00000u },
846         { 0, 0x40000000u },
847         { 0, 0x3df00000u },
848         { 0, 0x3bf00000u },
849         { 0, 0x41f00000u },
850         { 0, 0x43e00000u },
851         { 0, 0x7fe00000u },
852         { 0, 0x00100000u },
```



```
853         { 0, 0x00100001u }
854 };
855
856 #define half    C[0].d
857 #define two     C[1].d
858 #define twom32  C[2].d
859 #define twom64  C[3].d
860 #define two32   C[4].d
861 #define two63   C[5].d
862 #define huge    C[6].d
863 #define tiny    C[7].d
864 #define tiny2   C[8].d
865
866 #if defined(__amd64)
867 #define NI      4
868 #else
869 #define NI      3
870 #endif
871
872 /*
873  * fmal for x86: 80-bit extended double precision, little-endian
874  */
875 long double
876 __fmal(long double x, long double y, long double z) {
877         union {
878                 unsigned i[NI];
879                 long double e;
880         } xx, yy, zz;
881         long double xhi, yhi, xlo, ylo, t;
882         unsigned xy0, xy1, xy2, xy3, xy4, z0, z1, z2, z3, z4;
883         unsigned oldcwsw, cwsw, rm, sticky, carry;
884         int ex, ey, ez, exy, sxy, sz, e, tinyafter;
885         volatile double dummy;
886
887         /* extract the exponents of the arguments */
888         xx.e = x;
889         yy.e = y;
890         zz.e = z;
891         ex = xx.i[2] & 0x7fff;
892         ey = yy.i[2] & 0x7fff;
893         ez = zz.i[2] & 0x7fff;
894
895         /* dispense with inf, nan, and zero cases */
896         if (ex == 0x7fff || ey == 0x7fff || (ex | xx.i[1] | xx.i[0]) == 0 ||
897                 (ey | yy.i[1] | yy.i[0]) == 0)  /* x or y is inf, nan, or 0 */
898                 return (x * y + z);
899
900         if (ez == 0x7fff)                       /* z is inf or nan */
901                 return (x + z); /* avoid spurious under/overflow in x * y */
902
903         if ((ez | zz.i[1] | zz.i[0]) == 0)      /* z is zero */
904                 /*
905                  * x * y isn't zero but could underflow to zero,
906                  * so don't add z, lest we perturb the sign
907                  */
908                 return (x * y);
909
910         /*
911          * now x, y, and z are all finite and nonzero; extract signs and
912          * normalize the significands (this will raise the denormal operand
913          * exception if need be)
914          */
915         sxy = (xx.i[2] ^ yy.i[2]) & 0x8000;
916         sz = zz.i[2] & 0x8000;
917         if (!ex) {
918                 xx.e = x * two63;
```

```
919                 ex = (xx.i[2] & 0x7fff) - 63;
920         }
921         if (!ey) {
922                 yy.e = y * two63;
923                 ey = (yy.i[2] & 0x7fff) - 63;
924         }
925         if (!ez) {
926                 zz.e = z * two63;
927                 ez = (zz.i[2] & 0x7fff) - 63;
928         }

930         /*
931          * save the control and status words, mask all exceptions, and
932          * set rounding to 64-bit precision and toward-zero
933          */
934         __fenv_getcwsw(&oldcwsw);
935         cwsw = (oldcwsw & 0xf0c0ffff) | 0x0f3f0000;
936         __fenv_setcwsw(&cwsw);

938         /* multiply x*y to 128 bits */
939         exy = ex + ey - 0x3fff;
940         xx.i[2] = 0x3fff;
941         yy.i[2] = 0x3fff;
942         x = xx.e;
943         y = yy.e;
944         xhi = ((x + twom32) + two32) - two32;
945         yhi = ((y + twom32) + two32) - two32;
946         xlo = x - xhi;
947         ylo = y - yhi;
948         x *= y;
949         y = ((xhi * yhi - x) + xhi * ylo + xlo * yhi) + xlo * ylo;
950         if (x >= two) {
951                 x *= half;
952                 y *= half;
953                 exy++;
954         }

956         /* extract the significands */
957         xx.e = x;
958         xy0 = xx.i[1];
959         xy1 = xx.i[0];
960         yy.e = t = y + twom32;
961         xy2 = yy.i[0];
962         yy.e = (y - (t - twom32)) + twom64;
963         xy3 = yy.i[0];
964         xy4 = 0;
965         z0 = zz.i[1];
966         z1 = zz.i[0];
967         z2 = z3 = z4 = 0;

969         /*
970          * now x*y is represented by sxy, exy, and xy[0-4], and z is
971          * represented likewise; swap if need be so |xy| <= |z|
972          */
973         if (exy > ez || (exy == ez && (xy0 > z0 || (xy0 == z0 &&
974                 (xy1 > z1 || (xy1 == z1 && (xy2 | xy3) != 0))))))) {
975                 e = sxy; sxy = sz; sz = e;
976                 e = exy; exy = ez; ez = e;
977                 e = xy0; xy0 = z0; z0 = e;
978                 e = xy1; xy1 = z1; z1 = e;
979                 z2 = xy2; xy2 = 0;
980                 z3 = xy3; xy3 = 0;
981         }

983         /* shift the significand of xy keeping a sticky bit */
984         e = ez - exy;
```



```
985         if (e > 130) {
986                 xy0 = xy1 = xy2 = xy3 = 0;
987                 xy4 = 1;
988         } else if (e >= 128) {
989                 sticky = xy3 | xy2 | xy1 | ((xy0 << 1) << (159 - e));
990                 xy4 = xy0 >> (e - 128);
991                 if (sticky)
992                         xy4 |= 1;
993                 xy0 = xy1 = xy2 = xy3 = 0;
994         } else if (e >= 96) {
995                 sticky = xy3 | xy2 | ((xy1 << 1) << (127 - e));
996                 xy4 = (xy1 >> (e - 96)) | ((xy0 << 1) << (127 - e));
997                 if (sticky)
998                         xy4 |= 1;
999                 xy3 = xy0 >> (e - 96);
1000                xy0 = xy1 = xy2 = 0;
1001        } else if (e >= 64) {
1002                sticky = xy3 | ((xy2 << 1) << (95 - e));
1003                xy4 = (xy2 >> (e - 64)) | ((xy1 << 1) << (95 - e));
1004                if (sticky)
1005                        xy4 |= 1;
1006                xy3 = (xy1 >> (e - 64)) | ((xy0 << 1) << (95 - e));
1007                xy2 = xy0 >> (e - 64);
1008                xy0 = xy1 = 0;
1009        } else if (e >= 32) {
1010                sticky = (xy3 << 1) << (63 - e);
1011                xy4 = (xy3 >> (e - 32)) | ((xy2 << 1) << (63 - e));
1012                if (sticky)
1013                        xy4 |= 1;
1014                xy3 = (xy2 >> (e - 32)) | ((xy1 << 1) << (63 - e));
1015                xy2 = (xy1 >> (e - 32)) | ((xy0 << 1) << (63 - e));
1016                xy1 = xy0 >> (e - 32);
1017                xy0 = 0;
1018        } else if (e) {
1019                xy4 = (xy3 << 1) << (31 - e);
1020                xy3 = (xy3 >> e) | ((xy2 << 1) << (31 - e));
1021                xy2 = (xy2 >> e) | ((xy1 << 1) << (31 - e));
1022                xy1 = (xy1 >> e) | ((xy0 << 1) << (31 - e));
1023                xy0 >>= e;
1024        }

1026        /* if this is a magnitude subtract, negate the significand of xy */
1027        if (sxy ^ sz) {
1028                xy0 = ~xy0;
1029                xy1 = ~xy1;
1030                xy2 = ~xy2;
1031                xy3 = ~xy3;
1032                xy4 = -xy4;
1033                if (xy4 == 0)
1034                        if (++xy3 == 0)
1035                                if (++xy2 == 0)
1036                                        if (++xy1 == 0)
1037                                                xy0++;
1038        }

1040        /* add, propagating carries */
1041        z4 += xy4;
1042        carry = (z4 < xy4);
1043        z3 += xy3;
1044        if (carry) {
1045                z3++;
1046                carry = (z3 <= xy3);
1047        } else
1048                carry = (z3 < xy3);
1049        z2 += xy2;
1050        if (carry) {
```

```
1051                    z2++;
1052                    carry = (z2 <= xy2);
1053            } else
1054                    carry = (z2 < xy2);
1055            z1 += xy1;
1056            if (carry) {
1057                    z1++;
1058                    carry = (z1 <= xy1);
1059            } else
1060                    carry = (z1 < xy1);
1061            z0 += xy0;
1062            if (carry) {
1063                    z0++;
1064                    carry = (z0 <= xy0);
1065            } else
1066                    carry = (z0 < xy0);

1068            /* for a magnitude subtract, ignore the last carry out */
1069            if (sxy ^ sz)
1070                    carry = 0;

1072            /* postnormalize and collect rounding information into z2 */
1073            if (ez < 1) {
1074                    /* result is tiny; shift right until exponent is within range */
1075                    e = 1 - ez;
1076                    if (e > 67) {
1077                            z2 = 1; /* result can't be exactly zero */
1078                            z0 = z1 = 0;
1079                    } else if (e >= 64) {
1080                            sticky = z4 | z3 | z2 | z1 | ((z0 << 1) << (95 - e));
1081                            z2 = (z0 >> (e - 64)) | ((carry << 1) << (95 - e));
1082                            if (sticky)
1083                                    z2 |= 1;
1084                            z1 = carry >> (e - 64);
1085                            z0 = 0;
1086                    } else if (e >= 32) {
1087                            sticky = z4 | z3 | z2 | ((z1 << 1) << (63 - e));
1088                            z2 = (z1 >> (e - 32)) | ((z0 << 1) << (63 - e));
1089                            if (sticky)
1090                                    z2 |= 1;
1091                            z1 = (z0 >> (e - 32)) | ((carry << 1) << (63 - e));
1092                            z0 = carry >> (e - 32);
1093                    } else {
1094                            sticky = z4 | z3 | (z2 << 1) << (31 - e);
1095                            z2 = (z2 >> e) | ((z1 << 1) << (31 - e));
1096                            if (sticky)
1097                                    z2 |= 1;
1098                            z1 = (z1 >> e) | ((z0 << 1) << (31 - e));
1099                            z0 = (z0 >> e) | ((carry << 1) << (31 - e));
1100                    }
1101                    ez = 1;
1102            } else if (carry) {
1103                    /* carry out; shift right by one */
1104                    sticky = (z2 & 1) | z3 | z4;
1105                    z2 = (z2 >> 1) | (z1 << 31);
1106                    if (sticky)
1107                            z2 |= 1;
1108                    z1 = (z1 >> 1) | (z0 << 31);
1109                    z0 = (z0 >> 1) | 0x80000000;
1110                    ez++;
1111            } else {
1112                    if (z0 < 0x80000000u && (z0 | z1 | z2 | z3 | z4) != 0) {
1113                            /*
1114                             * borrow/cancellation; shift left as much as
1115                             * exponent allows
1116                             */
```



```
1117                            while (!z0 && ez >= 33) {
1118                                    z0 = z1;
1119                                    z1 = z2;
1120                                    z2 = z3;
1121                                    z3 = z4;
1122                                    z4 = 0;
1123                                    ez -= 32;
1124                            }
1125                            while (z0 < 0x80000000u && ez > 1) {
1126                                    z0 = (z0 << 1) | (z1 >> 31);
1127                                    z1 = (z1 << 1) | (z2 >> 31);
1128                                    z2 = (z2 << 1) | (z3 >> 31);
1129                                    z3 = (z3 << 1) | (z4 >> 31);
1130                                    z4 <<= 1;
1131                                    ez--;
1132                            }
1133                    }
1134                    if (z3 | z4)
1135                            z2 |= 1;
1136            }

1138            /* get the rounding mode */
1139            rm = oldcwsw & 0x0c000000;

1141            /* adjust exponent if result is subnormal */
1142            tinyafter = 0;
1143            if (!(z0 & 0x80000000)) {
1144                    ez = 0;
1145                    tinyafter = 1;
1146                    if (!(z0 | z1 | z2)) { /* exact zero */
1147                            zz.i[2] = rm == FCW_RM ? 0x8000 : 0;
1148                            zz.i[1] = zz.i[0] = 0;
1149                            __fenv_setcwsw(&oldcwsw);
1150                            return (zz.e);
1151                    }
1152            }

1154            /*
1155             * flip the sense of directed roundings if the result is negative;
1156             * the logic below applies to a positive result
1157             */
1158            if (sz && (rm == FCW_RM || rm == FCW_RP))
1159                    rm = (FCW_RM + FCW_RP) - rm;

1161            /* round */
1162            if (z2) {
1163                    if (rm == FCW_RP || (rm == FCW_RN && (z2 > 0x80000000u ||
1164                            (z2 == 0x80000000u && (z1 & 1))))) {
1165                            /* round up and renormalize if necessary */
1166                            if (++z1 == 0) {
1167                                    if (++z0 == 0) {
1168                                            z0 = 0x80000000;
1169                                            ez++;
1170                                    } else if (z0 == 0x80000000) {
1171                                            /* rounded up to smallest normal */
1172                                            ez = 1;
1173                                            if ((rm == FCW_RP && z2 >
1174                                                    0x80000000u) || (rm == FCW_RN &&
1175                                                    z2 >= 0xc0000000u))
1176                                                    /*
1177                                                     * would have rounded up to
1178                                                     * smallest normal even with
1179                                                     * unbounded range
1180                                                     */
1181                                                    tinyafter = 0;
1182                                    }
```

```
1183                        }
1184                }
1185        }

1187        /* restore the control and status words, check for over/underflow */
1188        __fenv_setcwsw(&oldcwsw);
1189        if (ez >= 0x7fff) {
1190                if (rm == FCW_RN || rm == FCW_RP) {
1191                        zz.i[2] = sz | 0x7fff;
1192                        zz.i[1] = 0x80000000;
1193                        zz.i[0] = 0;
1194                } else {
1195                        zz.i[2] = sz | 0x7ffe;
1196                        zz.i[1] = 0xffffffff;
1197                        zz.i[0] = 0xffffffff;
1198                }
1199                dummy = huge;
1200                dummy *= huge;
1201        } else {
1202                zz.i[2] = sz | ez;
1203                zz.i[1] = z0;
1204                zz.i[0] = z1;

1206                /*
1207                 * tinyafter => result rounded w/ unbounded range would be tiny,
1208                 * z2 nonzero => result delivered is inexact
1209                 */
1210                if (tinyafter) {
1211                        dummy = tiny;
1212                        if (z2)
1213                                dummy *= tiny;
1214                        else
1215                                dummy -= tiny2;
1216                } else if (z2) {
1217                        dummy = huge;
1218                        dummy += tiny;
1219                }
1220        }

1222        return (zz.e);
1223 }

1225 #else
1226 #error Unknown architecture
1227 #endif
```

```
**********************************************************
    2009 Sat May 10 12:09:28 2014
new/usr/src/lib/libm/common/m9x/fmax.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak fmax = __fmax
#endif

/*
 * fmax(x,y) returns the larger of x and y.  If just one of the
 * arguments is NaN, fmax returns the other argument.  If both
 * arguments are NaN, fmax returns NaN.
 *
 * See fmaxf.c for a discussion of implementation trade-offs.
 */

#include "libm.h"       /* for isgreaterequal macro */
#include <fenv.h>

double
__fmax(double x, double y) {
        union {
                unsigned i[2];
                double d;
        } xx, yy;
        unsigned s;

        /* if y is nan, replace it by x */
        if (y != y)
                y = x;

        /* if x is nan, replace it by y */
        if (x != x)
                x = y;
```



```
        /* At this point, x and y are either both numeric, or both NaN */
        if (!isnan(x) && !isgreaterequal(x, y))
                x = y;

        /*
         * clear the sign of the result if either x or y has its sign clear
         */
        xx.d = x;
        yy.d = y;
#if defined(__sparc)
        s = ~(xx.i[0] & yy.i[0]) & 0x80000000;
        xx.i[0] &= ~s;
#elif defined(__x86)
        s = ~(xx.i[1] & yy.i[1]) & 0x80000000;
        xx.i[1] &= ~s;
#else
#error Unknown architecture
#endif

        return (xx.d);
}
```

```
**********************************************************
    4325 Sat May 10 12:09:28 2014
new/usr/src/lib/libm/common/m9x/fmaxf.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

#if defined(ELFOBJ)
#pragma weak fmaxf = __fmaxf
#endif

/*
 * fmax(x,y) returns the larger of x and y.  If just one of the
 * arguments is NaN, fmax returns the other argument.  If both
 * arguments are NaN, fmax returns NaN (ideally, one of the
 * argument NaNs).
 *
 * C99 does not require that fmax(-0,+0) = fmax(+0,-0) = +0, but
 * ideally fmax should satisfy this.
 *
 * C99 makes no mention of exceptions for fmax.  I suppose ideally
 * either fmax never raises any exceptions or else it raises the
 * invalid operation exception if and only if some argument is a
 * signaling NaN.  In the former case, fmax should always return
 * one of its arguments.  In the latter, fmax shouldn't return a
 * signaling NaN, although when both arguments are signaling NaNs,
 * this ideal is at odds with the stipulation that fmax should
 * always return one of its arguments.
 *
 * Commutativity of fmax follows from the properties listed above
 * except when both arguments are NaN.  In that case, fmax may be
 * declared commutative by fiat because there is no portable way
 * to tell different NaNs apart.  Ideally fmax would be truly com-
 * mutative for all arguments.
 *
 * On SPARC V8, fmax must involve tests and branches.  Ideally,
 * an implementation on SPARC V9 should avoid branching, using
 * conditional moves instead where necessary, and be as efficient
```



```
 * as possible in its use of other resources.
 *
 * It appears to be impossible to attain all of the aforementioned
 * ideals simultaneously.  The implementation below satisfies the
 * following (on SPARC):
 *
 * 1. fmax(x,y) returns the larger of x and y if neither x nor y
 *    is NaN and the non-NaN argument if just one of x or y is NaN.
 *    If both x and y are NaN, fmax(x,y) returns x unchanged.
 * 2. fmax(-0,+0) = fmax(+0,-0) = +0.
 * 3. If either argument is a signaling NaN, fmax raises the invalid
 *    operation exception.  Otherwise, it raises no exceptions.
 */

#include "libm.h"       /* for isgreaterequal macro */

float
__fmaxf(float x, float y) {
        /*
         * On SPARC v8plus/v9, this could be implemented as follows
         * (assuming %f0 = x, %f1 = y, return value left in %f0):
         *
         * fcmps        %fcc0,%f1,%f1
         * fmovsu       %fcc0,%f0,%f1
         * fcmps        %fcc0,%f0,%f1
         * fmovsul      %fcc0,%f1,%f0
         * st           %f0,[x]
         * st           %f1,[y]
         * ld           [x],%l0
         * ld           [y],%l1
         * and          %l0,%l1,%l2
         * sethi        %hi(0x80000000),%l3
         * andn         %l3,%l2,%l2
         * andn         %l0,%l2,%l0
         * st           %l0,[x]
         * ld           [x],%f0
         *
         * If VIS instructions are available, use this code instead:
         *
         * fcmps        %fcc0,%f1,%f1
         * fmovsu       %fcc0,%f0,%f1
         * fcmps        %fcc0,%f0,%f1
         * fmovsul      %fcc0,%f1,%f0
         * fands        %f0,%f1,%f2
         * fzeros       %f3
         * fnegs        %f3,%f3
         * fandnot2s %f3,%f2,%f2
         * fandnot2s %f0,%f2,%f0
         *
         * If VIS 3.0 instructions are available, use this:
         *
         * flcmps       %fcc0,%f0,%f1
         * fmovslg      %fcc0,%f1,%f0   ! move if %fcc0 is 1 or 2
         */

        union {
                unsigned i;
                float f;
        } xx, yy;
        unsigned s;

        /* if y is nan, replace it by x */
        if (y != y)
                y = x;

        /* if x is nan, replace it by y */
```

```
127         if (x != x)
128                 x = y;

130         /* At this point, x and y are either both numeric, or both NaN */
131         if (!isnan(x) && !isgreaterequal(x, y))
132                 x = y;

134         /*
135          * clear the sign of the result if either x or y has its sign clear
136          */
137         xx.f = x;
138         yy.f = y;
139         s = ~(xx.i & yy.i) & 0x80000000;
140         xx.i &= ~s;

142         return (xx.f);
143 }
```

```
**********************************************************
    1874 Sat May 10 12:09:28 2014
new/usr/src/lib/libm/common/m9x/fmaxl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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#if defined(ELFOBJ)
#pragma weak fmaxl = __fmaxl
#endif

#include "libm.h"       /* for isgreaterequal macro */

long double
__fmaxl(long double x, long double y) {
        union {
#if defined(__sparc)
                unsigned i[4];
#elif defined(__x86)
                unsigned i[3];
#else
#error Unknown architecture
#endif
                long double ld;
        } xx, yy;
        unsigned s;

        /* if y is nan, replace it by x */
        if (y != y)
                y = x;

        /* if x is nan, replace it by y */
        if (x != x)
                x = y;

        /* At this point, x and y are either both numeric, or both NaN */
        if (!isnan(x) && !isgreaterequal(x, y))
                x = y;
```



```
        /*
         * clear the sign of the result if either x or y has its sign clear
         */
        xx.ld = x;
        yy.ld = y;
#if defined(__sparc)
        s = ~(xx.i[0] & yy.i[0]) & 0x80000000;
        xx.i[0] &= ~s;
#elif defined(__x86)
        s = ~(xx.i[2] & yy.i[2]) & 0x8000;
        xx.i[2] &= ~s;
#else
#error Unknown architecture
#endif

        return (xx.ld);
}
```

```
**********************************************************
    2006 Sat May 10 12:09:28 2014
new/usr/src/lib/libm/common/m9x/fmin.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak fmin = __fmin
#endif

/*
 * fmin(x,y) returns the smaller of x and y.  If just one of the
 * arguments is NaN, fmin returns the other argument.  If both
 * arguments are NaN, fmin returns NaN.
 *
 * See fmaxf.c for a discussion of implementation trade-offs.
 */

#include "libm.h"       /* for islessequal macro */

#include "fenv_inlines.h"
#include <stdio.h>
#include <sys/isa_defs.h>

double
__fmin(double x, double y) {
        union {
                unsigned i[2];
                double d;
        } xx, yy;
        unsigned s;

        /* if y is nan, replace it by x */
        if (y != y)
                y = x;

        /* if x is nan, replace it by y */
```



```
        if (x != x)
                x = y;

        /* At this point, x and y are either both numeric, or both NaN */
        if (!isnan(x) && !islessequal(x, y))
                x = y;

        /*
         * set the sign of the result if either x or y has its sign set
         */
        xx.d = x;
        yy.d = y;
#if defined(_BIG_ENDIAN)
        s = (xx.i[0] | yy.i[0]) & 0x80000000;
        xx.i[0] |= s;
#else
        s = (xx.i[1] | yy.i[1]) & 0x80000000;
        xx.i[1] |= s;
#endif

        return (xx.d);
}
```

```
**********************************************************
    2413 Sat May 10 12:09:28 2014
new/usr/src/lib/libm/common/m9x/fminf.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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#if defined(ELFOBJ)
#pragma weak fminf = __fminf
#endif

#include "libm.h"       /* for islessequal macro */

float
__fminf(float x, float y) {
        /*
         * On SPARC v8plus/v9, this could be implemented as follows
         * (assuming %f0 = x, %f1 = y, return value left in %f0):
         *
         * fcmps        %fcc0,%f1,%f1
         * fmovsu       %fcc0,%f0,%f1
         * fcmps        %fcc0,%f0,%f1
         * fmovsug      %fcc0,%f1,%f0
         * st           %f0,[x]
         * st           %f1,[y]
         * ld           [x],%l0
         * ld           [y],%l1
         * or           %l0,%l1,%l2
         * sethi        %hi(0x80000000),%l3
         * and          %l3,%l2,%l2
         * or           %l0,%l2,%l0
         * st           %l0,[x]
         * ld           [x],%f0
         *
         * If VIS instructions are available, use this code instead:
         *
         * fcmps        %fcc0,%f1,%f1
         * fmovsu       %fcc0,%f0,%f1
```



```
         * fmovsug      %fcc0,%f1,%f0
         * fors         %f0,%f1,%f2
         * fzeros       %f3
         * fnegs        %f3,%f3
         * fands        %f3,%f2,%f2
         * fors         %f0,%f2,%f0
         *
         * If VIS 3.0 instructions are available, use this:
         *
         * flcmps       %fcc0,%f0,%f1
         * fmovsge      %fcc0,%f1,%f0   ! move if %fcc0 is 0 or 2
         */

        union {
                unsigned i;
                float f;
        } xx, yy;
        unsigned s;

        /* if y is nan, replace it by x */
        if (y != y)
                y = x;

        /* if x is nan, replace it by y */
        if (x != x)
                x = y;

        /* At this point, x and y are either both numeric, or both NaN */
        if (!isnan(x) && !islessequal(x, y))
                x = y;

        /*
         * set the sign of the result if either x or y has its sign set
         */
        xx.f = x;
        yy.f = y;
        s = (xx.i | yy.i) & 0x80000000;
        xx.i |= s;

        return (xx.f);
}
```

```
**********************************************************
    1860 Sat May 10 12:09:28 2014
new/usr/src/lib/libm/common/m9x/fminl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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#if defined(ELFOBJ)
#pragma weak fminl = __fminl
#endif

#include "libm.h"       /* for islessequal macro */

long double
__fminl(long double x, long double y) {
        union {
#if defined(__sparc)
                unsigned i[4];
#elif defined(__x86)
                unsigned i[3];
#else
#error Unknown architecture
#endif
                long double ld;
        } xx, yy;
        unsigned s;

        /* if y is nan, replace it by x */
        if (y != y)
                y = x;

        /* if x is nan, replace it by y */
        if (x != x)
                x = y;

        /* At this point, x and y are either both numeric, or both NaN */
        if (!isnan(x) && !islessequal(x, y))
                x = y;
```



```
        /*
         * set the sign of the result if either x or y has its sign set
         */
        xx.ld = x;
        yy.ld = y;
#if defined(__sparc)
        s = (xx.i[0] | yy.i[0]) & 0x80000000;
        xx.i[0] |= s;
#elif defined(__x86)
        s = (xx.i[2] | yy.i[2]) & 0x8000;
        xx.i[2] |= s;
#else
#error Unknown architecture
#endif

        return (xx.ld);
}
```

```
**********************************************************
    2826 Sat May 10 12:09:29 2014
new/usr/src/lib/libm/common/m9x/frexp.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak frexp = __frexp
#endif

/*
 * frexp(x, exp) returns the normalized significand of x and sets
 * *exp so that x = r*2^(*exp) where r is the return value.  If x
 * is finite and nonzero, 1/2 <= |r| < 1.
 *
 * If x is zero, infinite or NaN, frexp returns x and sets *exp = 0.
 * (The relevant standards do not specify *exp when x is infinite or
 * NaN, but this code sets it anyway.)
 *
 * If x is a signaling NaN, this code returns x without attempting
 * to raise the invalid operation exception.  If x is subnormal,
 * this code treats it as nonzero regardless of nonstandard mode.
 */

#include "libm.h"

double
__frexp(double x, int *exp) {
        union {
                unsigned i[2];
                double d;
        } xx, yy;
        double t;
        unsigned hx;
        int e;

        xx.d = x;
        hx = xx.i[HIWORD] & ~0x80000000;
```



```
        if (hx >= 0x7ff00000) { /* x is infinite or NaN */
                *exp = 0;
                return (x);
        }

        e = 0;
        if (hx < 0x00100000) { /* x is subnormal or zero */
                if ((hx | xx.i[LOWORD]) == 0) {
                        *exp = 0;
                        return (x);
                }

                /*
                 * normalize x by regarding it as an integer
                 *
                 * Here we use 32-bit integer arithmetic to avoid trapping
                 * or emulating 64-bit arithmetic.  If 64-bit arithmetic is
                 * available (e.g., in SPARC V9), do this instead:
                 *
                 *  long lx = ((long) hx << 32) | xx.i[LOWORD];
                 *  xx.d = (xx.i[HIWORD] < 0)? -lx : lx;
                 *
                 * If subnormal arithmetic doesn't trap, just multiply x by
                 * a power of two.
                 */
                yy.i[HIWORD] = 0x43300000 | hx;
                yy.i[LOWORD] = xx.i[LOWORD];
                t = yy.d;
                yy.i[HIWORD] = 0x43300000;
                yy.i[LOWORD] = 0;
                t -= yy.d; /* t = |x| scaled */
                xx.d = ((int)xx.i[HIWORD] < 0)? -t : t;
                hx = xx.i[HIWORD] & ~0x80000000;
                e = -1074;
        }

        /* now xx.d is normal */
        xx.i[HIWORD] = (xx.i[HIWORD] & ~0x7ff00000) | 0x3fe00000;
        *exp = e + (hx >> 20) - 0x3fe;
        return (xx.d);
}
```

```
**********************************************************
    1665 Sat May 10 12:09:29 2014
new/usr/src/lib/libm/common/m9x/frexpf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak frexpf = __frexpf
#endif

#include "libm.h"

float
__frexpf(float x, int *exp) {
        union {
                unsigned i;
                float f;
        } xx;
        unsigned hx;
        int e;

        xx.f = x;
        hx = xx.i & ~0x80000000;

        if (hx >= 0x7f800000) { /* x is infinite or NaN */
                *exp = 0;
                return (x);
        }

        e = 0;
        if (hx < 0x00800000) { /* x is subnormal or zero */
                if (hx == 0) {
                        *exp = 0;
                        return (x);
                }

                /* normalize x by regarding it as an integer */
                xx.f = (int) xx.i < 0 ? -(int) hx : (int) hx;
```



```
                hx = xx.i & ~0x80000000;
                e = -149;
        }

        /* now xx.f is normal */
        xx.i = (xx.i & ~0x7f800000) | 0x3f000000;
        *exp = e + (hx >> 23) - 0x7e;
        return (xx.f);
}
```

```
**********************************************************
    2650 Sat May 10 12:09:29 2014
new/usr/src/lib/libm/common/m9x/frexpl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak frexpl = __frexpl
#endif

#include "libm.h"

#if defined(__sparc)

long double
__frexpl(long double x, int *exp) {
        union {
                unsigned i[4];
                long double q;
        } xx;
        unsigned hx;
        int e, s;

        xx.q = x;
        hx = xx.i[0] & ~0x80000000;

        if (hx >= 0x7fff0000) { /* x is infinite or NaN */
                *exp = 0;
                return (x);
        }

        e = 0;
        if (hx < 0x00010000) {  /* x is subnormal or zero */
                if ((hx | xx.i[1] | xx.i[2] | xx.i[3]) == 0) {
                        *exp = 0;
                        return (x);
                }
                /* normalize x */
                s = xx.i[0] & 0x80000000;
                while ((hx | (xx.i[1] & 0xffff0000)) == 0) {
                        hx = xx.i[1];
                        xx.i[1] = xx.i[2];
                        xx.i[2] = xx.i[3];
                        xx.i[3] = 0;
                        e -= 32;
                }
                while (hx < 0x10000) {
                        hx = (hx << 1) | (xx.i[1] >> 31);
                        xx.i[1] = (xx.i[1] << 1) | (xx.i[2] >> 31);
                        xx.i[2] = (xx.i[2] << 1) | (xx.i[3] >> 31);
                        xx.i[3] <<= 1;
                        e--;
                }
                xx.i[0] = s | hx;
        }

        /* now xx.q is normal */
        xx.i[0] = (xx.i[0] & ~0x7fff0000) | 0x3ffe0000;
        *exp = e + (hx >> 16) - 0x3ffe;
        return (xx.q);
}

#elif defined(__x86)

long double
__frexpl(long double x, int *exp) {
        union {
                unsigned i[3];
                long double e;
        } xx;
        unsigned hx;
        int e;

        xx.e = x;
        hx = xx.i[2] & 0x7fff;

        if (hx >= 0x7fff) {     /* x is infinite or NaN */
                *exp = 0;
                return (x);
        }

        e = 0;
        if (hx < 0x0001) {      /* x is subnormal or zero */
                if ((xx.i[0] | xx.i[1]) == 0) {
                        *exp = 0;
                        return (x);
                }

                /* normalize x */
                xx.e *= 18446744073709551616.0L;        /* 2^64 */
                hx = xx.i[2] & 0x7fff;
                e = -64;
        }

        /* now xx.e is normal */
        xx.i[2] = (xx.i[2] & 0x8000) | 0x3ffe;
        *exp = e + hx - 0x3ffe;
        return (xx.e);
}

#else
#error Unknown architecture
#endif
```

```
**********************************************************
    1641 Sat May 10 12:09:29 2014
new/usr/src/lib/libm/common/m9x/ldexp.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak ldexp = __ldexp
#endif

#include "libm.h"
#include <errno.h>

double
ldexp(double x, int n) {
        int *px = (int *) &x, ix = px[HIWORD] & ~0x80000000;

        if (ix >= 0x7ff00000 || (px[LOWORD] | ix) == 0)
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return (ix >= 0x7ff80000 ? x : x + x);
                /* assumes sparc-like QNaN */
#else
                return (x + x);
#endif
        x = scalbn(x, n);
        ix = px[HIWORD] & ~0x80000000;
        /*
         * SVID3 requires both overflow and underflow cases to set errno
         * XPG3/XPG4/XPG4.2/SUSv2 requires overflow to set errno
         */
        if (ix >= 0x7ff00000 || (px[LOWORD] | ix) == 0)
                errno = ERANGE;
        return (x);
}
```

```
**********************************************************
    1133 Sat May 10 12:09:29 2014
new/usr/src/lib/libm/common/m9x/ldexpf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak ldexpf = __ldexpf
#endif

#include "libm.h"

float
ldexpf(float x, int n) {
        return (scalbnf(x, n));
}
```

```
**********************************************************
    1145 Sat May 10 12:09:29 2014
new/usr/src/lib/libm/common/m9x/ldexpl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak ldexpl = __ldexpl
#endif

#include "libm.h"

long double
ldexpl(long double x, int n) {
        return (scalbnl(x, n));
}
```

```
**********************************************************
    2311 Sat May 10 12:09:29 2014
new/usr/src/lib/libm/common/m9x/llrint.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */
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 */

#if defined(ELFOBJ)
#pragma weak llrint = __llrint
#if defined(__sparcv9) || defined(__amd64)
#pragma weak lrint = __llrint
#pragma weak __lrint = __llrint
#endif
#endif

/*
 * llrint(x) rounds its argument to the nearest integer according
 * to the current rounding direction and converts the result to a
 * 64 bit signed integer.
 *
 * If x is NaN, infinite, or so large that the nearest integer would
 * exceed 64 bits, the invalid operation exception is raised.  If x
 * is not an integer, the inexact exception is raised.
 */

#include "libm.h"

long long
llrint(double x) {
        /*
         * Note: The following code works on x86 (in the default rounding
         * precision mode), but one should just use the fistpll instruction
         * instead.
         */
        union {
                unsigned i[2];
                double d;
        } xx, yy;
        unsigned hx;
```



```
        xx.d = x;
        hx = xx.i[HIWORD] & ~0x80000000;

        if (hx < 0x43300000) { /* |x| < 2^52 */
                /* add and subtract a power of two to round x to an integer */
#if defined(__sparc) || defined(__amd64)
                yy.i[HIWORD] = (xx.i[HIWORD] & 0x80000000) | 0x43300000;
#elif defined(__i386)   /* !defined(__amd64) */
                yy.i[HIWORD] = (xx.i[HIWORD] & 0x80000000) | 0x43e00000;
#else
#error Unknown architecture
#endif
                yy.i[LOWORD] = 0;
                x = (x + yy.d) - yy.d;
        }

        /* now x is nan, inf, or integral */
        return ((long long) x);
}
```

```
**********************************************************
    2027 Sat May 10 12:09:29 2014
new/usr/src/lib/libm/common/m9x/llrintf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
/*
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 */

#if defined(ELFOBJ)
#pragma weak llrintf = __llrintf
#if defined(__sparcv9) || defined(__amd64)
#pragma weak lrintf = __llrintf
#pragma weak __lrintf = __llrintf
#endif
#endif

#include "libm.h"

long long
llrintf(float x) {
        /*
         * Note: The following code works on x86 (in the default rounding
         * precision mode), but one should just use the fistpll instruction
         * instead.
         */
        union {
                unsigned i;
                float f;
        } xx, yy;
        unsigned hx;

        xx.f = x;
        hx = xx.i & ~0x80000000;

        if (hx < 0x4b000000) { /* |x| < 2^23 */
                /* add and subtract a power of two to round x to an integer */
#if defined(__sparc) || defined(__amd64)
                yy.i = (xx.i & 0x80000000) | 0x4b000000;
#elif defined(__i386)
                /* assume 64-bit precision */
```



```
                yy.i = (xx.i & 0x80000000) | 0x5f000000;
#else
#error Unknown architecture
#endif
                x = (x + yy.f) - yy.f;

                /*
                 * on LP32 architectures, we can just convert x to a 32-bit
                 * integer and sign-extend it
                 */
                return ((long) x);
        }

        /* now x is nan, inf, or integral */
        return ((long long) x);
}
```

```
**********************************************************
    4344 Sat May 10 12:09:30 2014
new/usr/src/lib/libm/common/m9x/llrintl.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak llrintl = __llrintl
#if defined(__sparcv9) || defined(__amd64)
#pragma weak lrintl = __llrintl
#pragma weak __lrintl = __llrintl
#endif
#endif

#include "libm.h"

#if defined(__sparc)

#include "fma.h"
#include "fenv_inlines.h"

long long
llrintl(long double x) {
        union {
                unsigned i[4];
                long double q;
        } xx;
        union {
                unsigned i[2];
                long long l;
        } zz;
        union {
                unsigned i;
                float f;
        } tt;
        unsigned int hx, sx, frac, fsr;
        int rm, j;
```



```
        volatile float dummy;

        xx.q = x;
        sx = xx.i[0] & 0x80000000;
        hx = xx.i[0] & ~0x80000000;

        /* handle trivial cases */
        if (hx > 0x403e0000) { /* |x| > 2^63 + ... or x is nan */
                /* convert an out-of-range float */
                tt.i = sx | 0x7f000000;
                return ((long long) tt.f);
        } else if ((hx | xx.i[1] | xx.i[2] | xx.i[3]) == 0) /* x is zero */
                return (0LL);

        /* get the rounding mode */
        __fenv_getfsr32(&fsr);
        rm = fsr >> 30;

        /* flip the sense of directed roundings if x is negative */
        if (sx)
                rm ^= rm >> 1;

        /* handle |x| < 1 */
        if (hx < 0x3fff0000) {
                dummy = 1.0e30f; /* x is nonzero, so raise inexact */
                dummy += 1.0e-30f;
                if (rm == FSR_RP || (rm == FSR_RN && (hx >= 0x3ffe0000 &&
                        ((hx & 0xffff) | xx.i[1] | xx.i[2] | xx.i[3]))))
                        return (sx ? -1LL : 1LL);
                return (0LL);
        }

        /* extract the integer and fractional parts of x */
        j = 0x406f - (hx >> 16);
        xx.i[0] = 0x10000 | (xx.i[0] & 0xffff);
        if (j >= 96) {
                zz.i[0] = 0;
                zz.i[1] = xx.i[0] >> (j - 96);
                frac = ((xx.i[0] << 1) << (127 - j)) | (xx.i[1] >> (j - 96));
                if (((xx.i[1] << 1) << (127 - j)) | xx.i[2] | xx.i[3])
                        frac |= 1;
        } else if (j >= 64) {
                zz.i[0] = xx.i[0] >> (j - 64);
                zz.i[1] = ((xx.i[0] << 1) << (95 - j)) | (xx.i[1] >> (j - 64));
                frac = ((xx.i[1] << 1) << (95 - j)) | (xx.i[2] >> (j - 64));
                if (((xx.i[2] << 1) << (95 - j)) | xx.i[3])
                        frac |= 1;
        } else {
                zz.i[0] = ((xx.i[0] << 1) << (63 - j)) | (xx.i[1] >> (j - 32));
                zz.i[1] = ((xx.i[1] << 1) << (63 - j)) | (xx.i[2] >> (j - 32));
                frac = ((xx.i[2] << 1) << (63 - j)) | (xx.i[3] >> (j - 32));
                if ((xx.i[3] << 1) << (63 - j))
                        frac |= 1;
        }

        /* round */
        if (frac && (rm == FSR_RP || (rm == FSR_RN && (frac > 0x80000000u ||
                (frac == 0x80000000 && (zz.i[1] & 1)))))) {
                if (++zz.i[1] == 0)
                        zz.i[0]++;
        }

        /* check for result out of range (note that z is |x| at this point) */
        if (zz.i[0] > 0x80000000u || (zz.i[0] == 0x80000000 && (zz.i[1] ||
                !sx))) {
                tt.i = sx | 0x7f000000;
```

```
127                 return ((long long) tt.f);
128         }

130         /* raise inexact if need be */
131         if (frac) {
132                 dummy = 1.0e30F;
133                 dummy += 1.0e-30F;
134         }

136         /* negate result if need be */
137         if (sx) {
138                 zz.i[0] = ~zz.i[0];
139                 zz.i[1] = -zz.i[1];
140                 if (zz.i[1] == 0)
141                         zz.i[0]++;
142         }
143         return (zz.l);
144 }
145 #elif defined(__x86)
146 long long
147 llrintl(long double x) {
148         /*
149          * Note: The following code works on x86 (in the default rounding
150          * precision mode), but one ought to just use the fistpll instruction
151          * instead.
152          */
153         union {
154                 unsigned i[3];
155                 long double e;
156         } xx, yy;
157         int ex;

159         xx.e = x;
160         ex = xx.i[2] & 0x7fff;

162         if (ex < 0x403e) { /* |x| < 2^63 */
163                 /* add and subtract a power of two to round x to an integer */
164                 yy.i[2] = (xx.i[2] & 0x8000) | 0x403e;
165                 yy.i[1] = 0x80000000;
166                 yy.i[0] = 0;
167                 x = (x + yy.e) - yy.e;
168         }

170         /* now x is nan, inf, or integral */
171         return ((long long) x);
172 }
173 #else
174 #error Unknown architecture
175 #endif
```

```
**********************************************************
    2216 Sat May 10 12:09:30 2014
new/usr/src/lib/libm/common/m9x/llround.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#if defined(ELFOBJ)
#pragma weak llround = __llround
#if defined(__sparcv9) || defined(__amd64)
#pragma weak lround = __llround
#pragma weak __lround = __llround
#endif
#endif

/*
 * llround(x) rounds its argument to the nearest integer, rounding
 * ties away from zero, and converts the result to a 64 bit signed
 * integer.
 *
 * If x is NaN, infinite, or so large that the nearest integer
 * would exceed 64 bits, the invalid operation exception is raised.
 */

#include "libm.h"

long long
llround(double x) {
        union {
                unsigned i[2];
                double d;
        } xx;
        unsigned hx, sx, i;

        xx.d = x;
        hx = xx.i[HIWORD] & ~0x80000000;
        sx = xx.i[HIWORD] & 0x80000000;

        if (hx < 0x43300000) { /* |x| < 2^52 */
```



```
                /* handle |x| < 1 */
                if (hx < 0x3ff00000) {
                        if (hx >= 0x3fe00000)
                                return (sx ? -1LL : 1LL);
                        return (0LL);
                }

                /* round x at the integer bit */
                if (hx < 0x41300000) {
                        i = 1 << (0x412 - (hx >> 20));
                        xx.i[HIWORD] = (xx.i[HIWORD] + i) & ~(i | (i - 1));
                        xx.i[LOWORD] = 0;
                } else {
                        i = 1 << (0x432 - (hx >> 20));
                        xx.i[LOWORD] += i;
                        if (xx.i[LOWORD] < i)
                                xx.i[HIWORD]++;
                        xx.i[LOWORD] &= ~(i | (i - 1));
                }
        }

        /* now x is nan, inf, or integral */
        return ((long long) xx.d);
}
```

```
**********************************************************
    1826 Sat May 10 12:09:30 2014
new/usr/src/lib/libm/common/m9x/llroundf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak llroundf = __llroundf
#if defined(__sparcv9) || defined(__amd64)
#pragma weak lroundf = __llroundf
#pragma weak __lroundf = __llroundf
#endif
#endif

#include "libm.h"

long long
llroundf(float x) {
        union {
                unsigned i;
                float f;
        } xx;
        unsigned hx, sx, i;

        xx.f = x;
        hx = xx.i & ~0x80000000;
        sx = xx.i & 0x80000000;

        if (hx < 0x4b000000) { /* |x| < 2^23 */
                /* handle |x| < 1 */
                if (hx < 0x3f800000) {
                        if (hx >= 0x3f000000)
                                return (sx ? -1LL : 1LL);
                        return (0LL);
                }

                /* round x at the integer bit */
                i = 1 << (0x95 - (hx >> 23));
```



```
                xx.i = (xx.i + i) & ~((i << 1) - 1);

                /*
                 * on LP32 architectures, we can just convert x to a 32-bit
                 * integer and sign-extend it
                 */
                return ((long) xx.f);
        }

        /* now x is nan, inf, or integral */
        return ((long long) x);
}
```

```
**********************************************************
    3850 Sat May 10 12:09:30 2014
new/usr/src/lib/libm/common/m9x/llroundl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak llroundl = __llroundl
#if defined(__sparcv9) || defined(__amd64)
#pragma weak lroundl = __llroundl
#pragma weak __lroundl = __llroundl
#endif
#endif

#include "libm.h"

#if defined(__sparc)
long long
llroundl(long double x) {
        union {
                unsigned i[4];
                long double q;
        } xx;
        union {
                unsigned i[2];
                long long l;
        } zz;
        union {
                unsigned i;
                float f;
        } tt;
        unsigned hx, sx, frac;
        int j;

        xx.q = x;
        sx = xx.i[0] & 0x80000000;
        hx = xx.i[0] & ~0x80000000;
```



```
        /* handle trivial cases */
        if (hx > 0x403e0000) { /* |x| > 2^63 + ... or x is nan */
                /* convert an out-of-range float */
                tt.i = sx | 0x7f000000;
                return ((long long) tt.f);
        }

        /* handle |x| < 1 */
        if (hx < 0x3fff0000) {
                if (hx >= 0x3ffe0000)
                        return (sx ? -1LL : 1LL);
                return (0LL);
        }

        /* extract the integer and fractional parts of x */
        j = 0x406f - (hx >> 16);
        xx.i[0] = 0x10000 | (xx.i[0] & 0xffff);
        if (j >= 96) {
                zz.i[0] = 0;
                zz.i[1] = xx.i[0] >> (j - 96);
                frac = ((xx.i[0] << 1) << (127 - j)) | (xx.i[1] >> (j - 96));
                if (((xx.i[1] << 1) << (127 - j)) | xx.i[2] | xx.i[3])
                        frac |= 1;
        } else if (j >= 64) {
                zz.i[0] = xx.i[0] >> (j - 64);
                zz.i[1] = ((xx.i[0] << 1) << (95 - j)) | (xx.i[1] >> (j - 64));
                frac = ((xx.i[1] << 1) << (95 - j)) | (xx.i[2] >> (j - 64));
                if (((xx.i[2] << 1) << (95 - j)) | xx.i[3])
                        frac |= 1;
        } else {
                zz.i[0] = ((xx.i[0] << 1) << (63 - j)) | (xx.i[1] >> (j - 32));
                zz.i[1] = ((xx.i[1] << 1) << (63 - j)) | (xx.i[2] >> (j - 32));
                frac = ((xx.i[2] << 1) << (63 - j)) | (xx.i[3] >> (j - 32));
                if ((xx.i[3] << 1) << (63 - j))
                        frac |= 1;
        }

        /* round */
        if (frac >= 0x80000000u) {
                if (++zz.i[1] == 0)
                        zz.i[0]++;
        }

        /* check for result out of range (note that z is |x| at this point) */
        if (zz.i[0] > 0x80000000u || (zz.i[0] == 0x80000000 && (zz.i[1] ||
                !sx))) {
                tt.i = sx | 0x7f000000;
                return ((long long) tt.f);
        }

        /* negate result if need be */
        if (sx) {
                zz.i[0] = ~zz.i[0];
                zz.i[1] = -zz.i[1];
                if (zz.i[1] == 0)
                        zz.i[0]++;
        }

        return (zz.l);
}
#elif defined(__x86)
long long
llroundl(long double x) {
        union {
                unsigned i[3];
                long double e;
```

```
128         } xx;
129         int ex, sx, i;

131         xx.e = x;
132         ex = xx.i[2] & 0x7fff;
133         sx = xx.i[2] & 0x8000;

135         if (ex < 0x403e) { /* |x| < 2^63 */
136                 /* handle |x| < 1 */
137                 if (ex < 0x3fff) {
138                         if (ex >= 0x3ffe)
139                                 return (sx ? -1LL : 1LL);
140                         return (0LL);
141                 }

143                 /* round x at the integer bit */
144                 if (ex < 0x401e) {
145                         i = 1 << (0x401d - ex);
146                         xx.i[1] = (xx.i[1] + i) & ~(i | (i - 1));
147                         xx.i[0] = 0;
148                 } else {
149                         i = 1 << (0x403d - ex);
150                         xx.i[0] += i;
151                         if (xx.i[0] < i)
152                                 xx.i[1]++;
153                         xx.i[0] &= ~(i | (i - 1));
154                 }
155                 if (xx.i[1] == 0) {
156                         xx.i[2] = sx | ++ex;
157                         xx.i[1] = 0x80000000U;
158                 }
159         }

161         /* now x is nan, inf, or integral */
162         return ((long long) xx.e);
163 }
164 #else
165 #error Unknown architecture
166 #endif
```

```
**********************************************************
    2263 Sat May 10 12:09:30 2014
new/usr/src/lib/libm/common/m9x/lrint.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak lrint = __lrint
#endif

/*
 * lrint(x) rounds its argument to the nearest integer according
 * to the current rounding direction and converts the result to
 * a 32 bit signed integer.
 *
 * If x is NaN, infinite, or so large that the nearest integer
 * would exceed 32 bits, the invalid operation exception is raised.
 * If x is not an integer, the inexact exception is raised.
 */

#include <sys/isa_defs.h>       /* _ILP32 */
#include "libm.h"

#if defined(_ILP32)
long
lrint(double x) {
        /*
         * Note: The following code works on x86 (in the default rounding
         * precision mode), but one should just use the fistpl instruction
         * instead.
         */
        union {
                unsigned i[2];
                double d;
        } xx, yy;
        unsigned hx;
```



```
        xx.d = x;
        hx = xx.i[HIWORD] & ~0x80000000;
        if (hx < 0x43300000) { /* |x| < 2^52 */
                /* add and subtract a power of two to round x to an integer */
#if defined(__sparc)
                yy.i[HIWORD] = (xx.i[HIWORD] & 0x80000000) | 0x43300000;
#elif defined(__x86)
                yy.i[HIWORD] = (xx.i[HIWORD] & 0x80000000) | 0x43e00000;
#else
#error Unknown architecture
#endif
                yy.i[LOWORD] = 0;
                x = (x + yy.d) - yy.d;
        }

        /* now x is nan, inf, or integral */
        return ((long) x);
}
#else
#error Unsupported architecture
#endif  /* defined(_ILP32) */
```

```
**********************************************************
    1895 Sat May 10 12:09:30 2014
new/usr/src/lib/libm/common/m9x/lrintf.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#if defined(ELFOBJ)
#pragma weak lrintf = __lrintf
#endif

#include <sys/isa_defs.h>       /* _ILP32 */
#include "libm.h"

#if defined(_ILP32)
long
lrintf(float x) {
        /*
         * Note: The following code works on x86 (in the default rounding
         * precision mode), but one should just use the fistpl instruction
         * instead.
         */
        union {
                unsigned i;
                float f;
        } xx, yy;
        unsigned hx;

        xx.f = x;
        hx = xx.i & ~0x80000000;
        if (hx < 0x4b000000) {  /* |x| < 2^23 */
                /* add and subtract a power of two to round x to an integer */
#if defined(__sparc)
                yy.i = (xx.i & 0x80000000) | 0x4b000000;
#elif defined(__x86)
                /* assume 64-bit precision */
                yy.i = (xx.i & 0x80000000) | 0x5f000000;
#else
```



```
#error Unknown architecture
#endif
                x = (x + yy.f) - yy.f;
                return ((long) x);
        }

        /* now x is nan, inf, or integral */
        return ((long) x);
}
#else
#error Unsupported architecture
#endif  /* defined(_ILP32) */
```

```
**********************************************************
    3910 Sat May 10 12:09:30 2014
new/usr/src/lib/libm/common/m9x/lrintl.c
patch05 - fixed amd64 issues with LIBM
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#if defined(ELFOBJ)
#pragma weak lrintl = __lrintl
#endif

#include <sys/isa_defs.h>       /* _ILP32 */
#include "libm.h"

#if defined(_ILP32)
#if defined(__sparc)

#include "fma.h"
#include "fenv_inlines.h"

long
lrintl(long double x) {
        union {
                unsigned int i[4];
                long double q;
        } xx;
        union {
                unsigned int i;
                float f;
        } tt;
        unsigned int hx, sx, frac, l, fsr;
        int rm, j;
        volatile float dummy;

        xx.q = x;
        sx = xx.i[0] & 0x80000000;
        hx = xx.i[0] & ~0x80000000;
```



```
        /* handle trivial cases */
        if (hx > 0x401e0000) { /* |x| > 2^31 + ... or x is nan */
                /* convert an out-of-range float */
                tt.i = sx | 0x7f000000;
                return ((long) tt.f);
        } else if ((hx | xx.i[1] | xx.i[2] | xx.i[3]) == 0) /* x is zero */
                return (0L);

        /* get the rounding mode */
        __fenv_getfsr32(&fsr);
        rm = fsr >> 30;

        /* flip the sense of directed roundings if x is negative */
        if (sx)
                rm ^= rm >> 1;

        /* handle |x| < 1 */
        if (hx < 0x3fff0000) {
                dummy = 1.0e30F; /* x is nonzero, so raise inexact */
                dummy += 1.0e-30F;
                if (rm == FSR_RP || (rm == FSR_RN && (hx >= 0x3ffe0000 &&
                        ((hx & 0xffff) | xx.i[1] | xx.i[2] | xx.i[3]))))
                        return (sx ? -1L : 1L);
                return (0L);
        }

        /* extract the integer and fractional parts of x */
        j = 0x406f - (hx >> 16);                /* 91 <= j <= 112 */
        xx.i[0] = 0x10000 | (xx.i[0] & 0xffff);
        if (j >= 96) {                                  /* 96 <= j <= 112 */
                l = xx.i[0] >> (j - 96);
                frac = ((xx.i[0] << 1) << (127 - j)) | (xx.i[1] >> (j - 96));
                if (((xx.i[1] << 1) << (127 - j)) | xx.i[2] | xx.i[3])
                        frac |= 1;
        } else {                                        /* 91 <= j <= 95 */
                l = (xx.i[0] << (96 - j)) | (xx.i[1] >> (j - 64));
                frac = (xx.i[1] << (96 - j)) | (xx.i[2] >> (j - 64));
                if ((xx.i[2] << (96 - j)) | xx.i[3])
                        frac |= 1;
        }

        /* round */
        if (frac && (rm == FSR_RP || (rm == FSR_RN && (frac > 0x80000000U ||
                (frac == 0x80000000 && (l & 1))))))
                l++;

        /* check for result out of range (note that z is |x| at this point) */
        if (l > 0x80000000U || (l == 0x80000000U && !sx)) {
                tt.i = sx | 0x7f000000;
                return ((long) tt.f);
        }

        /* raise inexact if need be */
        if (frac) {
                dummy = 1.0e30F;
                dummy += 1.0e-30F;
        }

        /* negate result if need be */
        if (sx)
                l = -l;
        return ((long) l);
}
#elif defined(__x86)
long
```

```
126 lrintl(long double x) {
127         /*
128          * Note: The following code works on x86 (in the default rounding
129          * precision mode), but one ought to just use the fistpl instruction
130          * instead.
131          */
132         union {
133                 unsigned i[3];
134                 long double e;
135         } xx, yy;
136         int ex;

138         xx.e = x;
139         ex = xx.i[2] & 0x7fff;
140         if (ex < 0x403e) {      /* |x| < 2^63 */
141                 /* add and subtract a power of two to round x to an integer */
142                 yy.i[2] = (xx.i[2] & 0x8000) | 0x403e;
143                 yy.i[1] = 0x80000000;
144                 yy.i[0] = 0;
145                 x = (x + yy.e) - yy.e;
146         }

148         /* now x is nan, inf, or integral */
149         return ((long) x);
150 }
151 #else
152 #error Unknown architecture
153 #endif  /* defined(__sparc) || defined(__x86) */
154 #else
155 #error Unsupported architecture
156 #endif  /* defined(_ILP32) */
```

```
**********************************************************
    2196 Sat May 10 12:09:30 2014
new/usr/src/lib/libm/common/m9x/lround.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#if defined(ELFOBJ)
#pragma weak lround = __lround
#endif

/*
 * lround(x) rounds its argument to the nearest integer, rounding ties
 * away from zero, and converts the result to a 32 bit signed integer.
 *
 * If x is NaN, infinite, or so large that the nearest integer
 * would exceed 32 bits, the invalid operation exception is raised.
 */

#include <sys/isa_defs.h>       /* _ILP32 */
#include "libm.h"

#if defined(_ILP32)
long
lround(double x) {
        union {
                unsigned i[2];
                double d;
        } xx;
        unsigned hx, sx, i;

        xx.d = x;
        hx = xx.i[HIWORD] & ~0x80000000;
        sx = xx.i[HIWORD] & 0x80000000;
        if (hx < 0x43300000) {  /* |x| < 2^52 */
                if (hx < 0x3ff00000) {  /* |x| < 1 */
                        if (hx >= 0x3fe00000)
                                return (sx ? -1L : 1L);
                        return (0L);
```



```
                }

                /* round x at the integer bit */
                if (hx < 0x41300000) {
                        i = 1 << (0x412 - (hx >> 20));
                        xx.i[HIWORD] = (xx.i[HIWORD] + i) & ~(i | (i - 1));
                        xx.i[LOWORD] = 0;
                } else {
                        i = 1 << (0x432 - (hx >> 20));
                        xx.i[LOWORD] += i;
                        if (xx.i[LOWORD] < i)
                                xx.i[HIWORD]++;
                        xx.i[LOWORD] &= ~(i | (i - 1));
                }
        }

        /* now x is nan, inf, or integral */
        return ((long) xx.d);
}
#else
#error Unsupported architecture
#endif  /* defined(_ILP32) */
```

```
**********************************************************
    1702 Sat May 10 12:09:31 2014
new/usr/src/lib/libm/common/m9x/lroundf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak lroundf = __lroundf
#endif

#include <sys/isa_defs.h>       /* _ILP32 */
#include "libm.h"

#if defined(_ILP32)
long
lroundf(float x) {
        union {
                unsigned i;
                float f;
        } xx;
        unsigned hx, sx, i;

        xx.f = x;
        hx = xx.i & ~0x80000000;
        sx = xx.i & 0x80000000;
        if (hx < 0x4b000000) {          /* |x| < 2^23 */
                if (hx < 0x3f800000) {          /* |x| < 1 */
                        if (hx >= 0x3f000000)
                                return (sx ? -1L : 1L);
                        return (0L);
                }

                /* round x at the integer bit */
                i = 1 << (0x95 - (hx >> 23));
                xx.i = (xx.i + i) & ~((i << 1) - 1);
                return ((long) xx.f);
        }
```



```
        /* now x is nan, inf, or integral */
        return ((long) x);
}
#else
#error Unsupported architecture
#endif  /* defined(_ILP32) */
```

```
**********************************************************
    3399 Sat May 10 12:09:31 2014
new/usr/src/lib/libm/common/m9x/lroundl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak lroundl = __lroundl
#endif

#include <sys/isa_defs.h>       /* _ILP32 */
#include "libm.h"

#if defined(_ILP32)
#if defined(__sparc)
long
lroundl(long double x) {
        union {
                unsigned i[4];
                long double q;
        } xx;
        union {
                unsigned i;
                float f;
        } tt;
        unsigned hx, sx, frac, l;
        int j;

        xx.q = x;
        sx = xx.i[0] & 0x80000000;
        hx = xx.i[0] & ~0x80000000;

        /* handle trivial cases */
        if (hx > 0x401e0000) { /* |x| > 2^31 + ... or x is nan */
                /* convert an out-of-range float */
                tt.i = sx | 0x7f000000;
                return ((long) tt.f);
        }

        /* handle |x| < 1 */
        if (hx < 0x3fff0000) {
                if (hx >= 0x3ffe0000)
                        return (sx ? -1L : 1L);
                return (0L);
        }

        /* extract the integer and fractional parts of x */
        j = 0x406f - (hx >> 16);                /* 91 <= j <= 112 */
        xx.i[0] = 0x10000 | (xx.i[0] & 0xffff);
        if (j >= 96) {                                  /* 96 <= j <= 112 */
                l = xx.i[0] >> (j - 96);
                frac = ((xx.i[0] << 1) << (127 - j)) | (xx.i[1] >> (j - 96));
                if (((xx.i[1] << 1) << (127 - j)) | xx.i[2] | xx.i[3])
                        frac |= 1;
        } else {                                        /* 91 <= j <= 95 */
                l = (xx.i[0] << (96 - j)) | (xx.i[1] >> (j - 64));
                frac = (xx.i[1] << (96 - j)) | (xx.i[2] >> (j - 64));
                if ((xx.i[2] << (96 - j)) | xx.i[3])
                        frac |= 1;
        }

        /* round */
        if (frac >= 0x80000000U)
                l++;

        /* check for result out of range (note that z is |x| at this point) */
        if (l > 0x80000000U || (l == 0x80000000U && !sx)) {
                tt.i = sx | 0x7f000000;
                return ((long) tt.f);
        }

        /* negate result if need be */
        if (sx)
                l = -l;
        return ((long) l);
}
#elif defined(__x86)
long
lroundl(long double x) {
        union {
                unsigned i[3];
                long double e;
        } xx;
        int ex, sx, i;

        xx.e = x;
        ex = xx.i[2] & 0x7fff;
        sx = xx.i[2] & 0x8000;
        if (ex < 0x403e) {      /* |x| < 2^63 */
                if (ex < 0x3fff) {      /* |x| < 1 */
                        if (ex >= 0x3ffe)
                                return (sx ? -1L : 1L);
                        return (0L);
                }

                /* round x at the integer bit */
                if (ex < 0x401e) {
                        i = 1 << (0x401d - ex);
                        xx.i[1] = (xx.i[1] + i) & ~(i | (i - 1));
                        xx.i[0] = 0;
                } else {
                        i = 1 << (0x403d - ex);
                        xx.i[0] += i;
```

```
127                         if (xx.i[0] < i)
128                                 xx.i[1]++;
129                         xx.i[0] &= ~(i | (i - 1));
130                 }
131                 if (xx.i[1] == 0) {
132                         xx.i[2] = sx | ++ex;
133                         xx.i[1] = 0x80000000U;
134                 }
135         }

137         /* now x is nan, inf, or integral */
138         return ((long) xx.e);
139 }
140 #else
141 #error Unknown architecture
142 #endif  /* defined(__sparc) || defined(__x86) */
143 #else
144 #error Unsupported architecture
145 #endif  /* defined(_ILP32) */
```

```
**********************************************************
    2441 Sat May 10 12:09:31 2014
new/usr/src/lib/libm/common/m9x/modf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak modf = __modf
#pragma weak _modf = __modf
#endif

/*
 * modf(x, iptr) decomposes x into an integral part and a fractional
 * part both having the same sign as x.  It stores the integral part
 * in *iptr and returns the fractional part.
 *
 * If x is infinite, modf sets *iptr to x and returns copysign(0.0,x).
 * If x is NaN, modf sets *iptr to x and returns x.
 *
 * If x is a signaling NaN, this code does not attempt to raise the
 * invalid operation exception.
 */

#include "libm.h"

double
__modf(double x, double *iptr) {
        union {
                unsigned i[2];
                double d;
        } xx, yy;
        unsigned hx, s;

        xx.d = x;
        hx = xx.i[HIWORD] & ~0x80000000;

        if (hx >= 0x43300000) { /* x is NaN, infinite, or integral */
                *iptr = x;
```



```
                if (hx < 0x7ff00000 || (hx == 0x7ff00000 &&
                        xx.i[LOWORD] == 0)) {
                        xx.i[HIWORD] &= 0x80000000;
                        xx.i[LOWORD] = 0;
                }
                return (xx.d);
        }

        if (hx < 0x3ff00000) {  /* |x| < 1 */
                xx.i[HIWORD] &= 0x80000000;
                xx.i[LOWORD] = 0;
                *iptr = xx.d;
                return (x);
        }

        /* split x at the binary point */
        s = xx.i[HIWORD] & 0x80000000;
        if (hx < 0x41400000) {
                yy.i[HIWORD] = xx.i[HIWORD] & ~((1 << (0x413 - (hx >> 20))) -
                        1);
                yy.i[LOWORD] = 0;
        } else {
                yy.i[HIWORD] = xx.i[HIWORD];
                yy.i[LOWORD] = xx.i[LOWORD] & ~((1 << (0x433 - (hx >> 20))) -
                        1);
        }
        *iptr = yy.d;
        xx.d -= yy.d;
        xx.i[HIWORD] = (xx.i[HIWORD] & ~0x80000000) | s;
                                                        /* keep sign of x */
        return (xx.d);
}
```

```
**********************************************************
    1718 Sat May 10 12:09:31 2014
new/usr/src/lib/libm/common/m9x/modff.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak modff = __modff
#pragma weak _modff = __modff
#endif

#include "libm.h"

float
__modff(float x, float *iptr) {
        union {
                unsigned i;
                float f;
        } xx, yy;
        unsigned hx, s;

        xx.f = x;
        hx = xx.i & ~0x80000000;

        if (hx >= 0x4b000000) { /* x is NaN, infinite, or integral */
                *iptr = x;
                if (hx <= 0x7f800000)
                        xx.i &= 0x80000000;
                return (xx.f);
        }

        if (hx < 0x3f800000) {  /* |x| < 1 */
                xx.i &= 0x80000000;
                *iptr = xx.f;
                return (x);
        }

        /* split x at the binary point */
```



```
        s = xx.i & 0x80000000;
        yy.i = xx.i & ~((1 << (0x96 - (hx >> 23))) - 1);
        *iptr = yy.f;
        xx.f -= yy.f;
        xx.i = (xx.i & ~0x80000000) | s;
                                /* restore sign in case difference is 0 */
        return (xx.f);
}
```

```
**********************************************************
    3559 Sat May 10 12:09:31 2014
new/usr/src/lib/libm/common/m9x/modfl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak modfl = __modfl
#endif

#include "libm.h"

#if defined(__sparc)

long double
__modfl(long double x, long double *iptr) {
        union {
                unsigned i[4];
                long double q;
        } xx, yy;
        unsigned hx, s;

        xx.q = x;
        hx = xx.i[0] & ~0x80000000;

        if (hx >= 0x406f0000) { /* x is NaN, infinite, or integral */
                *iptr = x;
                if (hx < 0x7fff0000 || (hx == 0x7fff0000 &&
                        (xx.i[1] | xx.i[2] | xx.i[3]) == 0)) {
                        xx.i[0] &= 0x80000000;
                        xx.i[1] = xx.i[2] = xx.i[3] = 0;
                }
                return (xx.q);
        }

        if (hx < 0x3fff0000) {  /* |x| < 1 */
                xx.i[0] &= 0x80000000;
                xx.i[1] = xx.i[2] = xx.i[3] = 0;
```



```
                *iptr = xx.q;
                return (x);
        }

        /* split x at the binary point */
        s = xx.i[0] & 0x80000000;
        if (hx < 0x40100000) {
                yy.i[0] = xx.i[0] & ~((1 << (0x400f - (hx >> 16))) - 1);
                yy.i[1] = yy.i[2] = yy.i[3] = 0;
        } else if (hx < 0x40300000) {
                yy.i[0] = xx.i[0];
                yy.i[1] = xx.i[1] & ~((1 << (0x402f - (hx >> 16))) - 1);
                yy.i[2] = yy.i[3] = 0;
        } else if (hx < 0x40500000) {
                yy.i[0] = xx.i[0];
                yy.i[1] = xx.i[1];
                yy.i[2] = xx.i[2] & ~((1 << (0x404f - (hx >> 16))) - 1);
                yy.i[3] = 0;
        } else {
                yy.i[0] = xx.i[0];
                yy.i[1] = xx.i[1];
                yy.i[2] = xx.i[2];
                yy.i[3] = xx.i[3] & ~((1 << (0x406f - (hx >> 16))) - 1);
        }
        *iptr = yy.q;

        /*
         * we could implement the following more efficiently than by using
         * software emulation of fsubq, but we'll do it this way for now
         * (and hope hardware support becomes commonplace)
         */
        xx.q -= yy.q;
        xx.i[0] = (xx.i[0] & ~0x80000000) | s;  /* keep sign of x */
        return (xx.q);
}

#elif defined(__x86)

long double
__modfl(long double x, long double *iptr) {
        union {
                unsigned i[3];
                long double e;
        } xx, yy;
        unsigned hx, s;

        /*
         * It might be faster to use one of the x86 fpops instead of
         * the following.
         */
        xx.e = x;
        hx = xx.i[2] & 0x7fff;

        if (hx >= 0x403e) {     /* x is NaN, infinite, or integral */
                *iptr = x;
                if (hx < 0x7fff || (hx == 0x7fff &&
                        ((xx.i[1] << 1) | xx.i[0]) == 0)) {
                        xx.i[2] &= 0x8000;
                        xx.i[1] = xx.i[0] = 0;
                }
                return (xx.e);
        }

        if (hx < 0x3fff) {      /* |x| < 1 */
                xx.i[2] &= 0x8000;
                xx.i[1] = xx.i[0] = 0;
```

```
128                 *iptr = xx.e;
129                 return (x);
130         }

132         /* split x at the binary point */
133         s = xx.i[2] & 0x8000;
134         yy.i[2] = xx.i[2];
135         if (hx < 0x401f) {
136                 yy.i[1] = xx.i[1] & ~((1 << (0x401e - hx)) - 1);
137                 yy.i[0] = 0;
138         } else {
139                 yy.i[1] = xx.i[1];
140                 yy.i[0] = xx.i[0] & ~((1 << (0x403e - hx)) - 1);
141         }
142         *iptr = yy.e;
143         xx.e -= yy.e;
144         xx.i[2] = (xx.i[2] & ~0x8000) | s;      /* keep sign of x */
145         return (xx.e);
146 }

148 #else
149 #error Unknown architecture
150 #endif
```

```
**********************************************************
    1527 Sat May 10 12:09:31 2014
new/usr/src/lib/libm/common/m9x/nan.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak nan = __nan
#endif

/*
 *  nan(c) returns a NaN.  This implementation ignores c.
 */

#include "libm.h"
#include <sys/isa_defs.h>

#if defined(__sparc)

static const union {
        unsigned i[2];
        double d;
} __nan_union = { 0x7fffffff, 0xffffffff };

#elif defined(__i386) || defined(__amd64)

static const union {
        unsigned i[2];
        double d;
} __nan_union = { 0xffffffff, 0x7fffffff };

#else
#error Unknown architecture
#endif

/* ARGSUSED0 */
double
```



```
__nan(const char *c) {
        return (__nan_union.d);
}
```

```
**********************************************************
    1223 Sat May 10 12:09:31 2014
new/usr/src/lib/libm/common/m9x/nanf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#if defined(ELFOBJ)
#pragma weak nanf = __nanf
#endif

#include "libm.h"

static const union {
        unsigned i;
        float f;
} __nanf_union = { 0x7fffffff };

/* ARGSUSED0 */
float
__nanf(const char *c) {
        return (__nanf_union.f);
}
```

****
1470 Sat May 10 12:09:31 2014
new/usr/src/lib/libm/common/m9x/nanl.c
patch01 - 693 import Sun Devpro Math Library
****

```
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#if defined(ELFOBJ)
#pragma weak nanl = __nanl
#endif

#include "libm.h"

#if defined(__sparc)

static const union {
        unsigned i[4];
        long double ld;
} __nanl_union = { 0x7fffffff, 0xffffffff, 0xffffffff, 0xffffffff };

#elif defined(__x86)

static const union {
        unsigned i[3];
        long double ld;
} __nanl_union = { 0xffffffff, 0xffffffff, 0x7fff };

#else
#error Unknown architecture
#endif

/* ARGSUSED0 */
long double
__nanl(const char *c) {
        return (__nanl_union.ld);
}
```

```
**********************************************************
    5109 Sat May 10 12:09:32 2014
new/usr/src/lib/libm/common/m9x/nearbyint.c
minor changes
patch06 - libm: fixed compilation issues after updates
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak nearbyint = __nearbyint
#endif

/*
 * nearbyint(x) returns the nearest fp integer to x in the direction
 * corresponding to the current rounding direction without raising
 * the inexact exception.
 *
 * nearbyint(x) is x unchanged if x is +/-0 or +/-inf.  If x is NaN,
 * nearbyint(x) is also NaN.
 */

#include "libm.h"
#include "fenv_synonyms.h"
#include <fenv.h>

double
__nearbyint(double x) {
        union {
                unsigned i[2];
                double d;
        } xx;
        unsigned hx, sx, i, frac;
        int rm, j;

        xx.d = x;
        sx = xx.i[HIWORD] & 0x80000000;
        hx = xx.i[HIWORD] & ~0x80000000;
```



```
        /* handle trivial cases */
        if (hx >= 0x43300000) { /* x is nan, inf, or already integral */
                if (hx >= 0x7ff00000)   /* x is inf or nan */
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                        return (hx >= 0x7ff80000 ? x : x + x);
                        /* assumes sparc-like QNaN */
#else
                        return (x + x);
#endif
                return (x);
        } else if ((hx | xx.i[LOWORD]) == 0)    /* x is zero */
                return (x);

        /* get the rounding mode */
        rm = fegetround();

        /* flip the sense of directed roundings if x is negative */
        if (sx && (rm == FE_UPWARD || rm == FE_DOWNWARD))
                rm = (FE_UPWARD + FE_DOWNWARD) - rm;

        /* handle |x| < 1 */
        if (hx < 0x3ff00000) {
                if (rm == FE_UPWARD || (rm == FE_TONEAREST &&
                        (hx >= 0x3fe00000 && ((hx & 0xfffff) | xx.i[LOWORD])))
                        xx.i[HIWORD] = sx | 0x3ff00000;
                else
                        xx.i[HIWORD] = sx;
                xx.i[LOWORD] = 0;
                return (xx.d);
        }

        /* round x at the integer bit */
        j = 0x433 - (hx >> 20);
        if (j >= 32) {
                i = 1 << (j - 32);
                frac = ((xx.i[HIWORD] << 1) << (63 - j)) |
                        (xx.i[LOWORD] >> (j - 32));
                if (xx.i[LOWORD] & (i - 1))
                        frac |= 1;
                if (!frac)
                        return (x);
                xx.i[LOWORD] = 0;
                xx.i[HIWORD] &= ~(i - 1);
                if ((rm == FE_UPWARD) || ((rm == FE_TONEAREST) &&
                        ((frac > 0x80000000u) || ((frac == 0x80000000) &&
                        (xx.i[HIWORD] & i)))))
                        xx.i[HIWORD] += i;
        } else {
                i = 1 << j;
                frac = (xx.i[LOWORD] << 1) << (31 - j);
                if (!frac)
                        return (x);
                xx.i[LOWORD] &= ~(i - 1);
                if ((rm == FE_UPWARD) || ((rm == FE_TONEAREST) &&
                        (frac > 0x80000000u || ((frac == 0x80000000) &&
                        (xx.i[LOWORD] & i))))) {
                        xx.i[LOWORD] += i;
                        if (xx.i[LOWORD] == 0)
                                xx.i[HIWORD]++;
                }
        }
        return (xx.d);
}

#if 0
```

```
/*
 *  Alternate implementations for SPARC, x86, using fp ops.  These may
 *  be faster depending on how expensive saving and restoring the fp
 *  modes and status flags is.
 */

#include "libm.h"
#include "fma.h"

#if defined(__sparc)

double
__nearbyint(double x) {
        union {
                unsigned i[2];
                double d;
        } xx, yy;
        double z;
        unsigned hx, sx, fsr, oldfsr;
        int rm;

        xx.d = x;
        sx = xx.i[0] & 0x80000000;
        hx = xx.i[0] & ~0x80000000;

        /* handle trivial cases */
        if (hx >= 0x43300000)   /* x is nan, inf, or already integral */
                return (x + 0.0);
        else if ((hx | xx.i[1]) == 0)   /* x is zero */
                return (x);

        /* save the fsr */
        __fenv_getfsr(&oldfsr);

        /* handle |x| < 1 */
        if (hx < 0x3ff00000) {
                /* flip the sense of directed roundings if x is negative */
                rm = oldfsr >> 30;
                if (sx)
                        rm ^= rm >> 1;
                if (rm == FSR_RP || (rm == FSR_RN && (hx >= 0x3fe00000 &&
                        ((hx & 0xfffff) | xx.i[1]))))
                        xx.i[0] = sx | 0x3ff00000;
                else
                        xx.i[0] = sx;
                xx.i[1] = 0;
                return (xx.d);
        }

        /* clear the inexact trap */
        fsr = oldfsr & ~FSR_NXM;
        __fenv_setfsr(&fsr);

        /* round x at the integer bit */
        yy.i[0] = sx | 0x43300000;
        yy.i[1] = 0;
        z = (x + yy.d) - yy.d;

        /* restore the old fsr */
        __fenv_setfsr(&oldfsr);

        return (z);
}

#elif defined(__x86)
```



```
/* inline template */
extern long double frndint(long double);

double
__nearbyint(double x) {
        long double z;
        unsigned oldcwsw, cwsw;

        /* save the control and status words, mask the inexact exception */
        __fenv_getcwsw(&oldcwsw);
        cwsw = oldcwsw | 0x00200000;
        __fenv_setcwsw(&cwsw);

        z = frndint((long double) x);

        /*
         * restore the control and status words, preserving all but the
         * inexact flag
         */
        __fenv_getcwsw(&cwsw);
        oldcwsw |= (cwsw & 0x1f);
        __fenv_setcwsw(&oldcwsw);

        /* note: the value of z is representable in double precision */
        return (z);
}

#else
#error Unknown architecture
#endif

#endif
```

```
**********************************************************
    4024 Sat May 10 12:09:32 2014
new/usr/src/lib/libm/common/m9x/nearbyintf.c
patch06 - libm: fixed compilation issues after updates
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak nearbyintf = __nearbyintf
#endif

#include "libm.h"
#include "fenv_synonyms.h"
#include <fenv.h>

float
__nearbyintf(float x) {
        union {
                unsigned i;
                float f;
        } xx;
        unsigned hx, sx, i, frac;
        int rm;

        xx.f = x;
        sx = xx.i & 0x80000000;
        hx = xx.i & ~0x80000000;

        /* handle trivial cases */
        if (hx >= 0x4b000000) { /* x is nan, inf, or already integral */
                if (hx > 0x7f800000)    /* x is nan */
                        return (x * x);         /* + -> * for Cheetah */
                return (x);
        } else if (hx == 0)             /* x is zero */
                return (x);

        /* get the rounding mode */
```



```
        rm = fegetround();

        /* flip the sense of directed roundings if x is negative */
        if (sx && (rm == FE_UPWARD || rm == FE_DOWNWARD))
                rm = (FE_UPWARD + FE_DOWNWARD) - rm;

        /* handle |x| < 1 */
        if (hx < 0x3f800000) {
                if (rm == FE_UPWARD || (rm == FE_TONEAREST && hx > 0x3f000000))
                        xx.i = sx | 0x3f800000;
                else
                        xx.i = sx;
                return (xx.f);
        }

        /* round x at the integer bit */
        i = 1 << (0x96 - (hx >> 23));
        frac = hx & (i - 1);
        if (!frac)
                return (x);

        hx &= ~(i - 1);
        if (rm == FE_UPWARD || (rm == FE_TONEAREST && (frac > (i >> 1) ||
                ((frac == (i >> 1)) && (hx & i)))))
                xx.i = sx | (hx + i);
        else
                xx.i = sx | hx;
        return (xx.f);
}

#if 0

/*
 * Alternate implementations for SPARC, x86, using fp ops.  These may
 * be faster depending on how expensive saving and restoring the fp
 * modes and status flags is.
 */

#include "libm.h"
#include "fma.h"

#if defined(__sparc)

float
__nearbyintf(float x) {
        union {
                unsigned i;
                float f;
        } xx, yy;
        float z;
        unsigned hx, sx, fsr, oldfsr;
        int rm;

        xx.f = x;
        sx = xx.i & 0x80000000;
        hx = xx.i & ~0x80000000;

        /* handle trivial cases */
        if (hx >= 0x4b000000)   /* x is nan, inf, or already integral */
                return (x + 0.0f);
        else if (hx == 0)       /* x is zero */
                return (x);

        /* save the fsr */
        __fenv_getfsr(&oldfsr);
```

```
126         /* handle |x| < 1 */
127         if (hx < 0x3f800000) {
128                 /* flip the sense of directed roundings if x is negative */
129                 rm = oldfsr >> 30;
130                 if (sx)
131                         rm ^= rm >> 1;
132                 if (rm == FSR_RP || (rm == FSR_RN && hx > 0x3f000000))
133                         xx.i = sx | 0x3f800000;
134                 else
135                         xx.i = sx;
136                 return (xx.f);
137         }

139         /* clear the inexact trap */
140         fsr = oldfsr & ~FSR_NXM;
141         __fenv_setfsr(&fsr);

143         /* round x at the integer bit */
144         yy.i = sx | 0x4b000000;
145         z = (x + yy.f) - yy.f;

147         /* restore the old fsr */
148         __fenv_setfsr(&oldfsr);

150         return (z);
151 }

153 #elif defined(__x86)

155 /* inline template */
156 extern long double frndint(long double);

158 float
159 __nearbyintf(float x) {
160         long double z;
161         unsigned oldcwsw, cwsw;

163         /* save the control and status words, mask the inexact exception */
164         __fenv_getcwsw(&oldcwsw);
165         cwsw = oldcwsw | 0x00200000;
166         __fenv_setcwsw(&cwsw);

168         z = frndint((long double) x);

170         /*
171          * restore the control and status words, preserving all but the
172          * inexact flag
173          */
174         __fenv_getcwsw(&cwsw);
175         oldcwsw |= (cwsw & 0x1f);
176         __fenv_setcwsw(&oldcwsw);

178         /* note: the value of z is representable in single precision */
179         return (z);
180 }

182 #else
183 #error Unknown architecture
184 #endif

186 #endif
```

```
**********************************************************
    4435 Sat May 10 12:09:32 2014
new/usr/src/lib/libm/common/m9x/nearbyintl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak nearbyintl = __nearbyintl
#endif

#include "libm.h"
#include "fma.h"
#include "fenv_inlines.h"

#if defined(__sparc)

static union {
        unsigned i;
        float f;
} snan = { 0x7f800001 };

long double
__nearbyintl(long double x) {
        union {
                unsigned i[4];
                long double q;
        } xx;
        unsigned hx, sx, i, frac;
        unsigned int fsr;
        int rm, j;
        volatile float  dummy;

        xx.q = x;
        sx = xx.i[0] & 0x80000000;
        hx = xx.i[0] & ~0x80000000;

        /* handle trivial cases */
        if (hx >= 0x406f0000) { /* x is nan, inf, or already integral */
```



```
                /* check for signaling nan */
                if ((hx > 0x7fff0000 || (hx == 0x7fff0000 &&
                        (xx.i[1] | xx.i[2] | xx.i[3]))) && !(hx & 0x8000)) {
                        dummy = snan.f;
                        dummy += snan.f;
                        xx.i[0] = sx | hx | 0x8000;
                }
                return (xx.q);
        } else if ((hx | xx.i[1] | xx.i[2] | xx.i[3]) == 0)     /* x is zero */
                return (x);

        /* get the rounding mode */
        __fenv_getfsr32(&fsr);
        rm = fsr >> 30;

        /* flip the sense of directed roundings if x is negative */
        if (sx)
                rm ^= rm >> 1;

        /* handle |x| < 1 */
        if (hx < 0x3fff0000) {
                if (rm == FSR_RP || (rm == FSR_RN && (hx >= 0x3ffe0000 &&
                        ((hx & 0xffff) | xx.i[1] | xx.i[2] | xx.i[3]))))
                        xx.i[0] = sx | 0x3fff0000;
                else
                        xx.i[0] = sx;
                xx.i[1] = xx.i[2] = xx.i[3] = 0;
                return (xx.q);
        }

        /* round x at the integer bit */
        j = 0x406f - (hx >> 16);
        if (j >= 96) {
                i = 1 << (j - 96);
                frac = ((xx.i[0] << 1) << (127 - j)) | (xx.i[1] >> (j - 96));
                if ((xx.i[1] & (i - 1)) | xx.i[2] | xx.i[3])
                        frac |= 1;
                if (!frac)
                        return (x);
                xx.i[1] = xx.i[2] = xx.i[3] = 0;
                xx.i[0] &= ~(i - 1);
                if (rm == FSR_RP || (rm == FSR_RN && (frac > 0x80000000u ||
                        (frac == 0x80000000 && (xx.i[0] & i)))))
                        xx.i[0] += i;
        } else if (j >= 64) {
                i = 1 << (j - 64);
                frac = ((xx.i[1] << 1) << (95 - j)) | (xx.i[2] >> (j - 64));
                if ((xx.i[2] & (i - 1)) | xx.i[3])
                        frac |= 1;
                if (!frac)
                        return (x);
                xx.i[2] = xx.i[3] = 0;
                xx.i[1] &= ~(i - 1);
                if (rm == FSR_RP || (rm == FSR_RN && (frac > 0x80000000u ||
                        (frac == 0x80000000 && (xx.i[1] & i))))) {
                        xx.i[1] += i;
                        if (xx.i[1] == 0)
                                xx.i[0]++;
                }
        } else if (j >= 32) {
                i = 1 << (j - 32);
                frac = ((xx.i[2] << 1) << (63 - j)) | (xx.i[3] >> (j - 32));
                if (xx.i[3] & (i - 1))
                        frac |= 1;
                if (!frac)
                        return (x);
```

```
128                 xx.i[3] = 0;
129                 xx.i[2] &= ~(i - 1);
130                 if (rm == FSR_RP || (rm == FSR_RN && (frac > 0x80000000u ||
131                         (frac == 0x80000000 && (xx.i[2] & i))))) {
132                         xx.i[2] += i;
133                         if (xx.i[2] == 0)
134                                 if (++xx.i[1] == 0)
135                                         xx.i[0]++;
136                 }
137         } else {
138                 i = 1 << j;
139                 frac = (xx.i[3] << 1) << (31 - j);
140                 if (!frac)
141                         return (x);
142                 xx.i[3] &= ~(i - 1);
143                 if (rm == FSR_RP || (rm == FSR_RN && (frac > 0x80000000u ||
144                         (frac == 0x80000000 && (xx.i[3] & i))))) {
145                         xx.i[3] += i;
146                         if (xx.i[3] == 0)
147                                 if (++xx.i[2] == 0)
148                                         if (++xx.i[1] == 0)
149                                                 xx.i[0]++;
150                 }
151         }

153         return (xx.q);
154 }

156 #elif defined(__x86)

158 /* inline template */
159 extern long double frndint(long double);

161 long double
162 __nearbyintl(long double x) {
163         long double z;
164         unsigned oldcwsw, cwsw;

166         /* save the control and status words, mask the inexact exception */
167         __fenv_getcwsw(&oldcwsw);
168         cwsw = oldcwsw | 0x00200000;
169         __fenv_setcwsw(&cwsw);

171         z = frndint(x);

173         /*
174          * restore the control and status words, preserving all but the
175          * inexact flag
176          */
177         __fenv_getcwsw(&cwsw);
178         oldcwsw |= (cwsw & 0x1f);
179         __fenv_setcwsw(&oldcwsw);

181         return (z);
182 }

184 #else
185 #error Unknown architecture
186 #endif
```

```
**********************************************************
    4673 Sat May 10 12:09:32 2014
new/usr/src/lib/libm/common/m9x/nexttoward.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak nexttoward = __nexttoward
#endif

/*
 * nexttoward(x, y) delivers the next representable number after x
 * in the direction of y.  If x and y are both zero, the result is
 * zero with the same sign as y.  If either x or y is NaN, the result
 * is NaN.
 *
 * If x != y and the result is infinite, overflow is raised; if
 * x != y and the result is subnormal or zero, underflow is raised.
 * (This is wrong, but it's what C99 apparently wants.)
 */

#include "libm.h"

#if defined(__sparc)

static union {
        unsigned i[2];
        double d;
} C[] = {
        0x00100000, 0,
        0x7fe00000, 0,
        0x7fffffff, 0xffffffff
};

#define tiny    C[0].d
#define huge    C[1].d
#define qnan    C[2].d
```



```
enum fcc_type {
        fcc_equal = 0,
        fcc_less = 1,
        fcc_greater = 2,
        fcc_unordered = 3
};

#ifdef __sparcv9
#define _Q_cmp  _Qp_cmp
#endif

extern enum fcc_type _Q_cmp(const long double *, const long double *);

double
__nexttoward(double x, long double y) {
        union {
                unsigned i[2];
                double d;
        } xx;
        union {
                unsigned i[4];
                long double q;
        } yy;
        long double lx;
        unsigned hx;
        volatile double dummy;
        enum fcc_type rel;

        /*
         * It would be somewhat more efficient to check for NaN and
         * zero operands before converting x to long double and then
         * to code the comparison in line rather than calling _Q_cmp.
         * However, since this code probably won't get used much,
         * I'm opting in favor of simplicity instead.
         */
        lx = xx.d = x;
        hx = (xx.i[0] & ~0x80000000) | xx.i[1];

        /* check for each of four possible orderings */
        rel = _Q_cmp(&lx, &y);
        if (rel == fcc_unordered)
                return (qnan);

        if (rel == fcc_equal) {
                if (hx == 0) {  /* x is zero; return zero with y's sign */
                        yy.q = y;
                        xx.i[0] = yy.i[0];
                        return (xx.d);
                }
                return (x);
        }

        if (rel == fcc_less) {
                if (hx == 0) {  /* x is zero */
                        xx.i[0] = 0;
                        xx.i[1] = 0x00000001;
                } else if ((int)xx.i[0] >= 0) { /* x is positive */
                        if (++xx.i[1] == 0)
                                xx.i[0]++;
                } else {
                        if (xx.i[1]-- == 0)
                                xx.i[0]--;
                }
        } else {
                if (hx == 0) {  /* x is zero */
                        xx.i[0] = 0x80000000;
```

```
128                         xx.i[1] = 0x00000001;
129                 } else if ((int)xx.i[0] >= 0) { /* x is positive */
130                         if (xx.i[1]-- == 0)
131                                 xx.i[0]--;
132                 } else {
133                         if (++xx.i[1] == 0)
134                                 xx.i[0]++;
135                 }
136         }

138         /* raise exceptions as needed */
139         hx = xx.i[0] & ~0x80000000;
140         if (hx == 0x7ff00000) {
141                 dummy = huge;
142                 dummy *= huge;
143         } else if (hx < 0x00100000) {
144                 dummy = tiny;
145                 dummy *= tiny;
146         }

148         return (xx.d);
149 }

151 #elif defined(__x86)

153 static union {
154         unsigned i[2];
155         double d;
156 } C[] = {
157         0, 0x00100000,
158         0, 0x7fe00000,
159 };

161 #define tiny    C[0].d
162 #define huge    C[1].d

164 double
165 __nexttoward(double x, long double y) {
166         union {
167                 unsigned i[2];
168                 double d;
169         } xx;
170         unsigned hx;
171         long double lx;
172         volatile double dummy;

174         lx = xx.d = x;
175         hx = (xx.i[1] & ~0x80000000) | xx.i[0];

177         /* check for each of four possible orderings */
178         if (isunordered(lx, y))
179                 return ((double) (lx + y));

181         if (lx == y)
182                 return ((double) y);

184         if (lx < y) {
185                 if (hx == 0) {  /* x is zero */
186                         xx.i[0] = 0x00000001;
187                         xx.i[1] = 0;
188                 } else if ((int)xx.i[1] >= 0) { /* x is positive */
189                         if (++xx.i[0] == 0)
190                                 xx.i[1]++;
191                 } else {
192                         if (xx.i[0]-- == 0)
193                                 xx.i[1]--;
```



```
194                 }
195         } else {
196                 if (hx == 0) {  /* x is zero */
197                         xx.i[0] = 0x00000001;
198                         xx.i[1] = 0x80000000;
199                 } else if ((int)xx.i[1] >= 0) { /* x is positive */
200                         if (xx.i[0]-- == 0)
201                                 xx.i[1]--;
202                 } else {
203                         if (++xx.i[0] == 0)
204                                 xx.i[1]++;
205                 }
206         }

208         /* raise exceptions as needed */
209         hx = xx.i[1] & ~0x80000000;
210         if (hx == 0x7ff00000) {
211                 dummy = huge;
212                 dummy *= huge;
213         } else if (hx < 0x00100000) {
214                 dummy = tiny;
215                 dummy *= tiny;
216         }

218         return (xx.d);
219 }

221 #else
222 #error Unknown architecture
223 #endif
```

```
**********************************************************
    3683 Sat May 10 12:09:32 2014
new/usr/src/lib/libm/common/m9x/nexttowardf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak nexttowardf = __nexttowardf
#endif

#include "libm.h"

static union {
        unsigned i;
        float f;
} C[] = {
        0x00800000,
        0x7f000000,
        0x7fffffff
};

#define tiny    C[0].f
#define huge    C[1].f
#define qnan    C[2].f

#if defined(__sparc)

enum fcc_type {
        fcc_equal = 0,
        fcc_less = 1,
        fcc_greater = 2,
        fcc_unordered = 3
};

#ifdef __sparcv9
#define _Q_cmp  _Qp_cmp
#endif
```



```
extern enum fcc_type _Q_cmp(const long double *, const long double *);

float
__nexttowardf(float x, long double y) {
        union {
                unsigned i;
                float f;
        } xx;
        union {
                unsigned i[4];
                long double q;
        } yy;
        long double lx;
        unsigned hx;
        volatile float dummy;
        enum fcc_type rel;

        /*
         * It would be somewhat more efficient to check for NaN and
         * zero operands before converting x to long double and then
         * to code the comparison in line rather than calling _Q_cmp.
         * However, since this code probably won't get used much,
         * I'm opting in favor of simplicity instead.
         */
        lx = xx.f = x;
        hx = xx.i & ~0x80000000;

        /* check for each of four possible orderings */
        rel = _Q_cmp(&lx, &y);
        if (rel == fcc_unordered)
                return (qnan);

        if (rel == fcc_equal) {
                if (hx == 0) {  /* x is zero; return zero with y's sign */
                        yy.q = y;
                        xx.i = yy.i[0];
                        return (xx.f);
                }
                return (x);
        }

        if (rel == fcc_less) {
                if (hx == 0)    /* x is zero */
                        xx.i = 0x00000001;
                else if ((int) xx.i >= 0)       /* x is positive */
                        xx.i++;
                else
                        xx.i--;
        } else {
                if (hx == 0)    /* x is zero */
                        xx.i = 0x80000001;
                else if ((int) xx.i >= 0)       /* x is positive */
                        xx.i--;
                else
                        xx.i++;
        }

        /* raise exceptions as needed */
        hx = xx.i & ~0x80000000;
        if (hx == 0x7f800000) {
                dummy = huge;
                dummy *= huge;
        } else if (hx < 0x00800000) {
                dummy = tiny;
                dummy *= tiny;
        }
```

```
129         return (xx.f);
130 }

132 #elif defined(__x86)

134 float
135 __nexttowardf(float x, long double y) {
136         union {
137                 unsigned i;
138                 float f;
139         } xx;
140         unsigned hx;
141         long double lx;
142         volatile float dummy;

144         lx = xx.f = x;
145         hx = xx.i & ~0x80000000;

147         /* check for each of four possible orderings */
148         if (isunordered(lx, y))
149                 return ((float) (lx + y));

151         if (lx == y)
152                 return ((float) y);

154         if (lx < y) {
155                 if (hx == 0)    /* x is zero */
156                         xx.i = 0x00000001;
157                 else if ((int) xx.i >= 0)       /* x is positive */
158                         xx.i++;
159                 else
160                         xx.i--;
161         } else {
162                 if (hx == 0)    /* x is zero */
163                         xx.i = 0x80000001;
164                 else if ((int) xx.i >= 0)       /* x is positive */
165                         xx.i--;
166                 else
167                         xx.i++;
168         }

170         /* raise exceptions as needed */
171         hx = xx.i & ~0x80000000;
172         if (hx == 0x7f800000) {
173                 dummy = huge;
174                 dummy *= huge;
175         } else if (hx < 0x00800000) {
176                 dummy = tiny;
177                 dummy *= tiny;
178         }

180         return (xx.f);
181 }

183 #else
184 #error Unknown architecture
185 #endif
```

```
**********************************************************
    2762 Sat May 10 12:09:32 2014
new/usr/src/lib/libm/common/m9x/nexttowardl.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak nexttowardl = __nexttowardl
#endif

#include "libm.h"
#include <float.h>              /* LDBL_MAX, LDBL_MIN */

#if defined(__sparc)
#define n0      0
#define n1      1
#define n2      2
#define n3      3
#define X86PDNRM1(x)
#define INC(px) { \
                        if (++px[n3] == 0) \
                                if (++px[n2] == 0) \
                                        if (++px[n1] == 0) \
                                                ++px[n0]; \
                }
#define DEC(px) { \
                        if (--px[n3] == 0xffffffff) \
                                if (--px[n2] == 0xffffffff) \
                                        if (--px[n1] == 0xffffffff) \
                                                --px[n0]; \
                }
#elif defined(__x86)
#define n0      2
#define n1      1
#define n2      0
#define n3      0
/*
 * if pseudo-denormal, replace by the equivalent normal
```



```
 */
#define X86PDNRM1(x)    if (XBIASED_EXP(x) == 0 && (((int *) &x)[1] & \
                                0x80000000) != 0) \
                                ((int *) &x)[2] |= 1
#define INC(px) { \
                        if (++px[n2] == 0) \
                                if ((++px[n1] & ~0x80000000) == 0) \
                                        px[n1] = 0x80000000, ++px[n0]; \
                }
#define DEC(px) { \
                        if (--px[n2] == 0xffffffff) \
                                if (--px[n1] == 0x7fffffff) \
                                        if ((--px[n0] & 0x7fff) != 0) \
                                                px[n1] |= 0x80000000; \
                }
#endif

long double
nexttowardl(long double x, long double y) {
        int *px = (int *) &x;
        int *py = (int *) &y;

        if (x == y)
                return (y);             /* C99 requirement */
        if (x != x || y != y)
                return (x * y);

        if (ISZEROL(x)) {       /* x == 0.0 */
                px[n0] = py[n0] & XSGNMSK;
                px[n1] = px[n2] = 0;
                px[n3] = 1;
        } else {
                X86PDNRM1(x);
                if ((px[n0] & XSGNMSK) == 0) {  /* x > 0.0 */
                        if (x > y)      /* x > y */
                                DEC(px)
                        else
                                INC(px)
                } else {
                        if (x < y)      /* x < y */
                                DEC(px)
                        else
                                INC(px)
                }
        }
#ifndef lint
        {
                volatile long double dummy;
                int k = XBIASED_EXP(x);

                if (k == 0)
                        dummy = LDBL_MIN * copysignl(LDBL_MIN, x);
                else if (k == 0x7fff)
                        dummy = LDBL_MAX * copysignl(LDBL_MAX, x);
        }
#endif
        return (x);
}
```

```
**********************************************************
    5987 Sat May 10 12:09:32 2014
new/usr/src/lib/libm/common/m9x/remquo.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

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/*
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 */

#pragma weak remquo = __remquo

/* INDENT OFF */
/*
 * double remquo(double x, double y, int *quo) return remainder(x,y) and an
 * integer pointer quo such that *quo = N mod {2**31}, where N is the
 * exact integral part of x/y rounded to nearest even.
 *
 * remquo call internal fmodquo
 */
/* INDENT ON */

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"
#include <math.h>               /* fabs() */
#include <sys/isa_defs.h>

#if defined(_BIG_ENDIAN)
#define HIWORD  0
#define LOWORD  1
#else
#define HIWORD  1
#define LOWORD  0
#endif
#define __HI(x) ((int *) &x)[HIWORD]
#define __LO(x) ((int *) &x)[LOWORD]

static const double one = 1.0, Zero[] = {0.0, -0.0};

static double
fmodquo(double x, double y, int *quo) {
```



```
        int n, hx, hy, hz, ix, iy, sx, sq, i, m;
        unsigned lx, ly, lz;

        hx = __HI(x);           /* high word of x */
        lx = __LO(x);           /* low  word of x */
        hy = __HI(y);           /* high word of y */
        ly = __LO(y);           /* low  word of y */
        sx = hx & 0x80000000;   /* sign of x */
        sq = (hx ^ hy) & 0x80000000;    /* sign of x/y */
        hx ^= sx;               /* |x| */
        hy &= 0x7fffffff;       /* |y| */

        /* purge off exception values */
        *quo = 0;
        if ((hy | ly) == 0 || hx >= 0x7ff00000 ||       /* y=0, or x !finite */
            (hy | ((ly | -ly) >> 31)) > 0x7ff00000)     /* or y is NaN */
                return ((x * y) / (x * y));
        if (hx <= hy) {
                if (hx < hy || lx < ly)
                        return (x);     /* |x|<|y| return x */
                if (lx == ly) {
                        *quo = 1 + (sq >> 30);
                        /* |x|=|y| return x*0 */
                        return (Zero[(unsigned) sx >> 31]);
                }
        }

        /* determine ix = ilogb(x) */
        if (hx < 0x00100000) {  /* subnormal x */
                if (hx == 0) {
                        for (ix = -1043, i = lx; i > 0; i <<= 1)
                                ix -= 1;
                } else {
                        for (ix = -1022, i = (hx << 11); i > 0; i <<= 1)
                                ix -= 1;
                }
        } else
                ix = (hx >> 20) - 1023;

        /* determine iy = ilogb(y) */
        if (hy < 0x00100000) {  /* subnormal y */
                if (hy == 0) {
                        for (iy = -1043, i = ly; i > 0; i <<= 1)
                                iy -= 1;
                } else {
                        for (iy = -1022, i = (hy << 11); i > 0; i <<= 1)
                                iy -= 1;
                }
        } else
                iy = (hy >> 20) - 1023;

        /* set up {hx,lx}, {hy,ly} and align y to x */
        if (ix >= -1022)
                hx = 0x00100000 | (0x000fffff & hx);
        else {                  /* subnormal x, shift x to normal */
                n = -1022 - ix;
                if (n <= 31) {
                        hx = (hx << n) | (lx >> (32 - n));
                        lx <<= n;
                } else {
                        hx = lx << (n - 32);
                        lx = 0;
                }
        }
        if (iy >= -1022)
                hy = 0x00100000 | (0x000fffff & hy);
```

```
128         else {                  /* subnormal y, shift y to normal */
129                 n = -1022 - iy;
130                 if (n <= 31) {
131                         hy = (hy << n) | (ly >> (32 - n));
132                         ly <<= n;
133                 } else {
134                         hy = ly << (n - 32);
135                         ly = 0;
136                 }
137         }
138
139         /* fix point fmod */
140         n = ix - iy;
141         m = 0;
142         while (n--) {
143                 hz = hx - hy;
144                 lz = lx - ly;
145                 if (lx < ly)
146                         hz -= 1;
147                 if (hz < 0) {
148                         hx = hx + hx + (lx >> 31);
149                         lx = lx + lx;
150                 } else {
151                         m += 1;
152                         if ((hz | lz) == 0) {   /* return sign(x)*0 */
153                                 if (n < 31)
154                                         m <<= 1 + n;
155                                 else
156                                         m = 0;
157                                 m &= 0x7fffffff;
158                                 *quo = sq >= 0 ? m : -m;
159                                 return (Zero[(unsigned) sx >> 31]);
160                         }
161                         hx = hz + hz + (lz >> 31);
162                         lx = lz + lz;
163                 }
164                 m += m;
165         }
166         hz = hx - hy;
167         lz = lx - ly;
168         if (lx < ly)
169                 hz -= 1;
170         if (hz >= 0) {
171                 hx = hz;
172                 lx = lz;
173                 m += 1;
174         }
175         m &= 0x7fffffff;
176         *quo = sq >= 0 ? m : -m;
177
178         /* convert back to floating value and restore the sign */
179         if ((hx | lx) == 0) {   /* return sign(x)*0 */
180                 return (Zero[(unsigned) sx >> 31]);
181         }
182         while (hx < 0x00100000) {       /* normalize x */
183                 hx = hx + hx + (lx >> 31);
184                 lx = lx + lx;
185                 iy -= 1;
186         }
187         if (iy >= -1022) {      /* normalize output */
188                 hx = (hx - 0x00100000) | ((iy + 1023) << 20);
189                 __HI(x) = hx | sx;
190                 __LO(x) = lx;
191         } else {                        /* subnormal output */
192                 n = -1022 - iy;
193                 if (n <= 20) {
```



```
194                         lx = (lx >> n) | ((unsigned) hx << (32 - n));
195                         hx >>= n;
196                 } else if (n <= 31) {
197                         lx = (hx << (32 - n)) | (lx >> n);
198                         hx = sx;
199                 } else {
200                         lx = hx >> (n - 32);
201                         hx = sx;
202                 }
203                 __HI(x) = hx | sx;
204                 __LO(x) = lx;
205                 x *= one;       /* create necessary signal */
206         }
207         return (x);             /* exact output */
208 }
209
210 #define zero    Zero[0]
211
212 double
213 remquo(double x, double y, int *quo) {
214         int hx, hy, sx, sq;
215         double v;
216         unsigned ly;
217
218         hx = __HI(x);           /* high word of x */
219         hy = __HI(y);           /* high word of y */
220         ly = __LO(y);           /* low  word of y */
221         sx = hx & 0x80000000;   /* sign of x */
222         sq = (hx ^ hy) & 0x80000000;    /* sign of x/y */
223         hx ^= sx;               /* |x| */
224         hy &= 0x7fffffff;       /* |y| */
225
226         /* purge off exception values */
227         *quo = 0;
228         if ((hy | ly) == 0 || hx >= 0x7ff00000 ||       /* y=0, or x !finite */
229             (hy | ((ly | -ly) >> 31)) > 0x7ff00000)     /* or y is NaN */
230                 return ((x * y) / (x * y));
231
232         y = fabs(y);
233         x = fabs(x);
234         if (hy <= 0x7fdfffff) {
235                 x = fmodquo(x, y + y, quo);
236                 *quo = ((*quo) & 0x3fffffff) << 1;
237         }
238         if (hy < 0x00200000) {
239                 if (x + x > y) {
240                         *quo += 1;
241                         if (x == y)
242                                 x = zero;
243                         else
244                                 x -= y;
245                         if (x + x >= y) {
246                                 x -= y;
247                                 *quo += 1;
248                         }
249                 }
250         } else {
251                 v = 0.5 * y;
252                 if (x > v) {
253                         *quo += 1;
254                         if (x == y)
255                                 x = zero;
256                         else
257                                 x -= y;
258                         if (x >= v) {
259                                 x -= y;
```

```
260                                 *quo += 1;
261                         }
262                 }
263         }
264         if (sq != 0)
265                 *quo = -(*quo);
266         return (sx == 0 ? x : -x);
267 }
```

```
**********************************************************
    5193 Sat May 10 12:09:32 2014
new/usr/src/lib/libm/common/m9x/remquof.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
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 */

#pragma weak remquof = __remquof

/* INDENT OFF */
/*
 * float remquof(float x, float y, int *quo) return remainderf(x,y) and an
 * integer pointer quo such that *quo = N mod (2**31),  where N is the
 * exact integeral part of x/y rounded to nearest even.
 *
 * remquof call internal fmodquof
 */

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"
#include <math.h>
extern float fabsf(float);

static const int
        is = (int) 0x80000000,
        im = 0x007fffff,
        ii = 0x7f800000,
        iu = 0x00800000;

static const float zero = 0.0F, half = 0.5F;
/* INDENT ON */

static float
fmodquof(float x, float y, int *quo) {
        float w;
        int hx, ix, iy, iz, k, ny, nd, m, sq;

        hx = *(int *) &x;
```



```
        ix = hx & 0x7fffffff;
        iy = *(int *) &y;
        sq = (iy ^ hx) & is;    /* sign of x/y */
        iy &= 0x7fffffff;

        /* purge off exception values */
        *quo = 0;
        if (ix >= ii || iy > ii || iy == 0) {
                w = x * y;
                w = w / w;
        } else if (ix <= iy) {
                if (ix < iy)
                        w = x;  /* return x if |x|<|y| */
                else {
                        *quo = 1 + (sq >> 30);
                        w = zero * x;   /* return sign(x)*0.0  */
                }
        } else {
                /* INDENT OFF */
                /*
                 * scale x,y to "normal" with
                 *      ny = exponent of y
                 *      nd = exponent of x minus exponent of y
                 */
                /* INDENT ON */
                ny = iy >> 23;
                k = ix >> 23;

                /* special case for subnormal y or x */
                if (ny == 0) {
                        ny = 1;
                        while (iy < iu) {
                                ny -= 1;
                                iy += iy;
                        }
                        nd = k - ny;
                        if (k == 0) {
                                nd += 1;
                                while (ix < iu) {
                                        nd -= 1;
                                        ix += ix;
                                }
                        } else
                                ix = iu | (ix & im);
                } else {
                        nd = k - ny;
                        ix = iu | (ix & im);
                        iy = iu | (iy & im);
                }
                /* INDENT OFF */
                /* fix point fmod for normalized ix and iy */
                /*
                 * while (nd--) {
                 *      iz = ix - iy;
                 *      if (iz < 0)
                 *              ix = ix + ix;
                 *      else if (iz == 0) {
                 *              *(int *) &w = is & hx;
                 *              return w;
                 *      } else
                 *              ix = iz + iz;
                 * }
                 */
                /* INDENT ON */
                /* unroll the above loop 4 times to gain performance */
                m = 0;
```

```
128                 k = nd >> 2;
129                 nd -= (k << 2);
130                 while (k--) {
131                         iz = ix - iy;
132                         if (iz >= 0) {
133                                 m += 1;
134                                 ix = iz + iz;
135                         } else
136                                 ix += ix;
137                         m += m;
138                         iz = ix - iy;
139                         if (iz >= 0) {
140                                 m += 1;
141                                 ix = iz + iz;
142                         } else
143                                 ix += ix;
144                         m += m;
145                         iz = ix - iy;
146                         if (iz >= 0) {
147                                 m += 1;
148                                 ix = iz + iz;
149                         } else
150                                 ix += ix;
151                         m += m;
152                         iz = ix - iy;
153                         if (iz >= 0) {
154                                 m += 1;
155                                 ix = iz + iz;
156                         } else
157                                 ix += ix;
158                         m += m;
159                         if (iz == 0) {
160                                 iz = (k << 2) + nd;
161                                 if (iz < 32)
162                                         m <<= iz;
163                                 else
164                                         m = 0;
165                                 m &= 0x7fffffff;
166                                 *quo = sq >= 0 ? m : -m;
167                                 *(int *) &w = is & hx;
168                                 return (w);
169                         }
170                 }
171                 while (nd--) {
172                         iz = ix - iy;
173                         if (iz >= 0) {
174                                 m += 1;
175                                 ix = iz + iz;
176                         } else
177                                 ix += ix;
178                         m += m;
179                 }
180                 /* end of unrolling */

182                 iz = ix - iy;
183                 if (iz >= 0) {
184                         m += 1;
185                         ix = iz;
186                 }
187                 m &= 0x7fffffff;
188                 *quo = sq >= 0 ? m : -m;

190                 /* convert back to floating value and restore the sign */
191                 if (ix == 0) {
192                         *(int *) &w = is & hx;
193                         return (w);
```



```
194                 }
195                 while (ix < iu) {
196                         ix += ix;
197                         ny -= 1;
198                 }
199                 while (ix > (iu + iu)) {
200                         ny += 1;
201                         ix >>= 1;
202                 }
203                 if (ny > 0)
204                         *(int *) &w = (is & hx) | (ix & im) | (ny << 23);
205                 else {          /* subnormal output */
206                         k = -ny + 1;
207                         ix >>= k;
208                         *(int *) &w = (is & hx) | ix;
209                 }
210         }
211         return (w);
212 }

214 float
215 remquof(float x, float y, int *quo) {
216         int hx, hy, sx, sq;
217         float v;

219         hx = *(int *) &x;       /* high word of x */
220         hy = *(int *) &y;       /* high word of y */
221         sx = hx & is;           /* sign of x */
222         sq = (hx ^ hy) & is;    /* sign of x/y */
223         hx ^= sx;               /* |x| */
224         hy &= 0x7fffffff;       /* |y| */

226         /* purge off exception values: y is 0 or NaN, x is Inf or NaN */
227         *quo = 0;
228         if (hx >= ii || hy > ii || hy == 0) {
229                 v = x * y;
230                 return (v / v);
231         }

233         y = fabsf(y);
234         x = fabsf(x);
235         if (hy <= 0x7f7fffff) {
236                 x = fmodquof(x, y + y, quo);
237                 *quo = ((*quo) & 0x3fffffff) << 1;
238         }
239         if (hy < 0x01000000) {
240                 if (x + x > y) {
241                         *quo += 1;
242                         if (x == y)
243                                 x = zero;
244                         else
245                                 x -= y;
246                         if (x + x >= y) {
247                                 x -= y;
248                                 *quo += 1;
249                         }
250                 }
251         } else {
252                 v = half * y;
253                 if (x > v) {
254                         *quo += 1;
255                         if (x == y)
256                                 x = zero;
257                         else
258                                 x -= y;
259                         if (x >= v) {
```

```
260                                 x -= y;
261                                 *quo += 1;
262                         }
263                 }
264         }
265         if (sq != 0)
266                 *quo = -(*quo);
267         return (sx == 0 ? x : -x);
268 }
```

```
**********************************************************
    6872 Sat May 10 12:09:33 2014
new/usr/src/lib/libm/common/m9x/remquol.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak remquol = __remquol

#include "libm.h"
#include "libm_synonyms.h"
#if defined(__SUNPRO_C)
#include <sunmath.h>                    /* fabsl */
#endif
/* INDENT OFF */
static const int
        is = -0x7fffffff - 1,
        im = 0x0000ffff,
        iu = 0x00010000;

static const long double zero = 0.0L, one = 1.0L;
/* INDENT ON */

#if defined(__sparc)
#define __H0(x) ((int *) &x)[0]
#define __H1(x) ((int *) &x)[1]
#define __H2(x) ((int *) &x)[2]
#define __H3(x) ((int *) &x)[3]
#else
#error Unsupported architecture
#endif

/*
 * On entrance: *quo is initialized to 0, x finite and y non-zero & ordered
 */
static long double
fmodquol(long double x, long double y, int *quo) {
        long double a, b;
        int n, ix, iy, k, sx, sq, m;
```



```
        int hx;
        int x0, y0, z0, carry;
        unsigned x1, x2, x3, y1, y2, y3, z1, z2, z3;

        hx = __H0(x);
        x1 = __H1(x);
        x2 = __H2(x);
        x3 = __H3(x);
        y0 = __H0(y);
        y1 = __H1(y);
        y2 = __H2(y);
        y3 = __H3(y);

        sx = hx & is;
        sq = (hx ^ y0) & is;
        x0 = hx ^ sx;
        y0 &= ~0x80000000;

        a = fabsl(x);
        b = fabsl(y);
        if (a <= b) {
                if (a < b)
                        return (x);
                else {
                        *quo = 1 + (sq >> 30);
                        return (zero * x);
                }
        }
        /* determine ix = ilogbl(x) */
        if (x0 < iu) {          /* subnormal x */
                ix = 0;
                ix = -16382;
                while (x0 == 0) {
                        ix -= 16;
                        x0 = x1 >> 16;
                        x1 = (x1 << 16) | (x2 >> 16);
                        x2 = (x2 << 16) | (x3 >> 16);
                        x3 = (x3 << 16);
                }
                while (x0 < iu) {
                        ix -= 1;
                        x0 = (x0 << 1) | (x1 >> 31);
                        x1 = (x1 << 1) | (x2 >> 31);
                        x2 = (x2 << 1) | (x3 >> 31);
                        x3 <<= 1;
                }
        } else {
                ix = (x0 >> 16) - 16383;
                x0 = iu | (x0 & im);
        }

        /* determine iy = ilogbl(y) */
        if (y0 < iu) {          /* subnormal y */
                iy = -16382;
                while (y0 == 0) {
                        iy -= 16;
                        y0 = y1 >> 16;
                        y1 = (y1 << 16) | (y2 >> 16);
                        y2 = (y2 << 16) | (y3 >> 16);
                        y3 = (y3 << 16);
                }
                while (y0 < iu) {
                        iy -= 1;
                        y0 = (y0 << 1) | (y1 >> 31);
                        y1 = (y1 << 1) | (y2 >> 31);
                        y2 = (y2 << 1) | (y3 >> 31);
```

```
128                         y3 <<= 1;
129                 }
130         } else {
131                 iy = (y0 >> 16) - 16383;
132                 y0 = iu | (y0 & im);
133         }


136         /* fix point fmod */
137         n = ix - iy;
138         m = 0;
139         while (n--) {
140                 while (x0 == 0 && n >= 16) {
141                         m <<= 16;
142                         n -= 16;
143                         x0 = x1 >> 16;
144                         x1 = (x1 << 16) | (x2 >> 16);
145                         x2 = (x2 << 16) | (x3 >> 16);
146                         x3 = (x3 << 16);
147                 }
148                 while (x0 < iu && n >= 1) {
149                         m += m;
150                         n -= 1;
151                         x0 = (x0 << 1) | (x1 >> 31);
152                         x1 = (x1 << 1) | (x2 >> 31);
153                         x2 = (x2 << 1) | (x3 >> 31);
154                         x3 = (x3 << 1);
155                 }
156                 carry = 0;
157                 z3 = x3 - y3;
158                 carry = z3 > x3;
159                 if (carry == 0) {
160                         z2 = x2 - y2;
161                         carry = z2 > x2;
162                 } else {
163                         z2 = x2 - y2 - 1;
164                         carry = z2 >= x2;
165                 }
166                 if (carry == 0) {
167                         z1 = x1 - y1;
168                         carry = z1 > x1;
169                 } else {
170                         z1 = x1 - y1 - 1;
171                         carry = z1 >= x1;
172                 }
173                 z0 = x0 - y0 - carry;
174                 if (z0 < 0) {   /* double x */
175                         x0 = x0 + x0 + ((x1 & is) != 0);
176                         x1 = x1 + x1 + ((x2 & is) != 0);
177                         x2 = x2 + x2 + ((x3 & is) != 0);
178                         x3 = x3 + x3;
179                         m += m;
180                 } else {
181                         m += 1;
182                         if (z0 == 0) {
183                                 if ((z1 | z2 | z3) == 0) {
184                                         /* 0: we are done */
185                                         if (n < 31)
186                                                 m <<= (1 + n);
187                                         else
188                                                 m = 0;
189                                         m &= ~0x80000000;
190                                         *quo = sq >= 0 ? m : -m;
191                                         __H0(a) = hx & is;
192                                         __H1(a) = __H2(a) = __H3(a) = 0;
193                                         return (a);
```



```
194                                 }
195                         }
196                         /* x = z << 1 */
197                         z0 = z0 + z0 + ((z1 & is) != 0);
198                         z1 = z1 + z1 + ((z2 & is) != 0);
199                         z2 = z2 + z2 + ((z3 & is) != 0);
200                         z3 = z3 + z3;
201                         x0 = z0;
202                         x1 = z1;
203                         x2 = z2;
204                         x3 = z3;
205                         m += m;
206                 }
207         }
208         carry = 0;
209         z3 = x3 - y3;
210         carry = z3 > x3;
211         if (carry == 0) {
212                 z2 = x2 - y2;
213                 carry = z2 > x2;
214         } else {
215                 z2 = x2 - y2 - 1;
216                 carry = z2 >= x2;
217         }
218         if (carry == 0) {
219                 z1 = x1 - y1;
220                 carry = z1 > x1;
221         } else {
222                 z1 = x1 - y1 - 1;
223                 carry = z1 >= x1;
224         }
225         z0 = x0 - y0 - carry;
226         if (z0 >= 0) {
227                 x0 = z0;
228                 x1 = z1;
229                 x2 = z2;
230                 x3 = z3;
231                 m += 1;
232         }
233         m &= ~0x80000000;
234         *quo = sq >= 0 ? m : -m;

236         /* convert back to floating value and restore the sign */
237         if ((x0 | x1 | x2 | x3) == 0) {
238                 __H0(a) = hx & is;
239                 __H1(a) = __H2(a) = __H3(a) = 0;
240                 return (a);
241         }
242         while (x0 < iu) {
243                 if (x0 == 0) {
244                         iy -= 16;
245                         x0 = x1 >> 16;
246                         x1 = (x1 << 16) | (x2 >> 16);
247                         x2 = (x2 << 16) | (x3 >> 16);
248                         x3 = (x3 << 16);
249                 } else {
250                         x0 = x0 + x0 + ((x1 & is) != 0);
251                         x1 = x1 + x1 + ((x2 & is) != 0);
252                         x2 = x2 + x2 + ((x3 & is) != 0);
253                         x3 = x3 + x3;
254                         iy -= 1;
255                 }
256         }

258         /* normalize output */
259         if (iy >= -16382) {
```

```
260                 __H0(a) = sx | (x0 - iu) | ((iy + 16383) << 16);
261                 __H1(a) = x1;
262                 __H2(a) = x2;
263                 __H3(a) = x3;
264         } else {                /* subnormal output */
265                 n = -16382 - iy;
266                 k = n & 31;
267                 if (k <= 16) {
268                         x3 = (x2 << (32 - k)) | (x3 >> k);
269                         x2 = (x1 << (32 - k)) | (x2 >> k);
270                         x1 = (x0 << (32 - k)) | (x1 >> k);
271                         x0 >>= k;
272                 } else {
273                         x3 = (x2 << (32 - k)) | (x3 >> k);
274                         x2 = (x1 << (32 - k)) | (x2 >> k);
275                         x1 = (x0 << (32 - k)) | (x1 >> k);
276                         x0 = 0;
277                 }
278                 while (n >= 32) {
279                         n -= 32;
280                         x3 = x2;
281                         x2 = x1;
282                         x1 = x0;
283                         x0 = 0;
284                 }
285                 __H0(a) = x0 | sx;
286                 __H1(a) = x1;
287                 __H2(a) = x2;
288                 __H3(a) = x3;
289                 a *= one;
290         }
291         return (a);
292 }

294 long double
295 remquol(long double x, long double y, int *quo) {
296         int hx, hy, sx, sq;
297         long double v;

299         hx = __H0(x);           /* high word of x */
300         hy = __H0(y);           /* high word of y */
301         sx = hx & is;           /* sign of x */
302         sq = (hx ^ hy) & is;    /* sign of x/y */
303         hx ^= sx;               /* |x| */
304         hy &= ~0x80000000;

306         /* purge off exception values */
307         *quo = 0;
308         /* y=0, y is NaN, x is NaN or inf */
309         if (y == 0.0L || y != y || hx >= 0x7fff0000)
310                 return ((x * y) / (x * y));

312         y = fabsl(y);
313         x = fabsl(x);
314         if (hy <= 0x7ffdffff) {
315                 x = fmodquol(x, y + y, quo);
316                 *quo = ((*quo) & 0x3fffffff) << 1;
317         }
318         if (hy < 0x00020000) {
319                 if (x + x > y) {
320                         *quo += 1;
321                         if (x == y)
322                                 x = zero;
323                         else
324                                 x -= y;
325                         if (x + x >= y) {
```



```
326                                 x -= y;
327                                 *quo += 1;
328                         }
329                 }
330         } else {
331                 v = 0.5L * y;
332                 if (x > v) {
333                         *quo += 1;
334                         if (x == y)
335                                 x = zero;
336                         else
337                                 x -= y;
338                         if (x >= v) {
339                                 x -= y;
340                                 *quo += 1;
341                         }
342                 }
343         }
344         if (sq != 0)
345                 *quo = -(*quo);
346         return (sx == 0 ? x : -x);
347 }
```

```
**********************************************************
    1948 Sat May 10 12:09:33 2014
new/usr/src/lib/libm/common/m9x/round.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak round = __round
#endif

#include "libm.h"

double
round(double x) {
        union {
                unsigned i[2];
                double d;
        } xx;
        unsigned hx, sx, i;

        xx.d = x;
        hx = xx.i[HIWORD] & ~0x80000000;
        sx = xx.i[HIWORD] & 0x80000000;
        if (hx < 0x43300000) {  /* |x| < 2^52 */
                if (hx < 0x3ff00000) {  /* |x| < 1 */
                        if (hx >= 0x3fe00000)
                                return (sx ? -1.0 : 1.0);
                        return (sx ? -0.0 : 0.0);
                }

                /* round x at the integer bit */
                if (hx < 0x41300000) {
                        i = 1 << (0x412 - (hx >> 20));
                        xx.i[HIWORD] = (xx.i[HIWORD] + i) & ~(i | (i - 1));
                        xx.i[LOWORD] = 0;
                } else {
                        i = 1 << (0x432 - (hx >> 20));
                        xx.i[LOWORD] += i;
```



```
                        if (xx.i[LOWORD] < i)
                                xx.i[HIWORD]++;
                        xx.i[LOWORD] &= ~(i | (i - 1));
                }
                return (xx.d);
        } else if (hx < 0x7ff00000)
                return (x);
        else
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return (hx >= 0x7ff80000 ? x : x + x);
                /* assumes sparc-like QNaN */
#else
                return (x + x);
#endif
}
```

```
**********************************************************
    1713 Sat May 10 12:09:33 2014
new/usr/src/lib/libm/common/m9x/roundf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak roundf = __roundf
#endif

#include "libm.h"

float
roundf(float x) {
        union {
                unsigned i;
                float f;
        } xx;
        unsigned hx, sx, i;

        xx.f = x;
        hx = xx.i & ~0x80000000;
        sx = xx.i & 0x80000000;
        if (hx < 0x4b000000) {          /* |x| < 2^23 */
                if (hx < 0x3f800000) {          /* |x| < 1 */
                        if (hx >= 0x3f000000)
                                return (sx ? -1.0F : 1.0F);
                        return (sx ? -0.0F : 0.0F);
                }

                /* round x at the integer bit */
                i = 1 << (0x95 - (hx >> 23));
                xx.i = (xx.i + i) & ~((i << 1) - 1);
                return (xx.f);
        } else if (hx < 0x7f800000)     /* |x| is integral */
                return (x);
        else
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
```



```
                return (hx > 0x7f800000 ? x * x : x + x);
#else
                return (x + x);
#endif
}
```

```
**********************************************************
    3685 Sat May 10 12:09:33 2014
new/usr/src/lib/libm/common/m9x/roundl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak roundl = __roundl
#endif

#include "libm.h"

#if defined(__sparc)
long double
roundl(long double x) {
        union {
                unsigned i[4];
                long double q;
        } xx;
        unsigned hx, sx, v;
        int j;

        xx.q = x;
        sx = xx.i[0] & 0x80000000;
        hx = xx.i[0] & ~0x80000000;

        /* handle trivial cases */
        if (hx >= 0x406f0000) /* |x| >= 2^112 + ... or x is nan */
                return (hx >= 0x7fff0000 ? x + x : x);

        /* handle |x| < 1 */
        if (hx < 0x3fff0000) {
                if (hx >= 0x3ffe0000)
                        return (sx ? -1.0L : 1.0L);
                return (sx ? -0.0L : 0.0L);
        }
```



```
        xx.i[0] = hx;
        j = 0x406f - (hx >> 16);                /* 1 <= j <= 112 */
        if (j >= 96) {                          /* 96 <= j <= 112 */
                v = (1U << (j - 96)) >> 1;
                if (v) {
                        if (xx.i[0] & v)
                                xx.i[0] += v;
                        xx.i[0] &= ~(v - 1);
                } else if (xx.i[1] & 0x80000000)
                        ++xx.i[0];
                xx.i[1] = xx.i[2] = xx.i[3] = 0;
        } else if (j >= 64) {                   /* 64 <= j <= 95 */
                v = (1U << (j - 64)) >> 1;
                if (v) {
                        if (xx.i[1] & v) {
                                xx.i[1] += v;
                                if (xx.i[1] < v)
                                        ++xx.i[0];
                        }
                        xx.i[1] &= ~(v - 1);
                } else if (xx.i[2] & 0x80000000) {
                        if (++xx.i[1] == 0)
                                ++xx.i[0];
                }
                xx.i[2] = xx.i[3] = 0;
        } else if (j >= 32) {                   /* 32 <= j <= 63 */
                v = (1U << (j - 32)) >> 1;
                if (v) {
                        if (xx.i[2] & v) {
                                xx.i[2] += v;
                                if (xx.i[2] < v) {
                                        if (++xx.i[1] == 0)
                                                ++xx.i[0];
                                }
                        }
                        xx.i[2] &= ~(v - 1);
                } else if (xx.i[3] & 0x80000000) {
                        if (++xx.i[2] == 0) {
                                if (++xx.i[1] == 0)
                                        ++xx.i[0];
                        }
                }
                xx.i[3] = 0;
        } else {                                /* 1 <= j <= 31 */
                v = 1U << (j - 1);
                if (xx.i[3] & v) {
                        xx.i[3] += v;
                        if (xx.i[3] < v) {
                                if (++xx.i[2] == 0) {
                                        if (++xx.i[1] == 0)
                                                ++xx.i[0];
                                }
                        }
                }
                xx.i[3] &= ~(v - 1);
        }

        /* negate result if need be */
        if (sx)
                xx.i[0] |= 0x80000000;
        return (xx.q);
}
#elif defined(__x86)
long double
roundl(long double x) {
        union {
```

```
127                 unsigned i[3];
128                 long double e;
129         } xx;
130         int ex, sx, i;

132         xx.e = x;
133         ex = xx.i[2] & 0x7fff;
134         sx = xx.i[2] & 0x8000;
135         if (ex < 0x403e) {      /* |x| < 2^63 */
136                 if (ex < 0x3fff) {      /* |x| < 1 */
137                         if (ex >= 0x3ffe)
138                                 return (sx ? -1.0L : 1.0L);
139                         return (sx ? -0.0L : 0.0L);
140                 }

142                 /* round x at the integer bit */
143                 if (ex < 0x401e) {
144                         i = 1 << (0x401d - ex);
145                         xx.i[1] = (xx.i[1] + i) & ~(i | (i - 1));
146                         xx.i[0] = 0;
147                 } else {
148                         i = 1 << (0x403d - ex);
149                         xx.i[0] += i;
150                         if (xx.i[0] < i)
151                                 xx.i[1]++;
152                         xx.i[0] &= ~(i | (i - 1));
153                 }
154                 if (xx.i[1] == 0) {
155                         xx.i[2] = sx | ++ex;
156                         xx.i[1] = 0x80000000U;
157                 }
158                 return (xx.e);
159         } else if (ex < 0x7fff) /* x is integral */
160                 return (x);
161         else                    /* inf or nan */
162                 return (x + x);
163 }
164 #else
165 #error Unknown architecture
166 #endif  /* defined(__sparc) || defined(__x86) */
```

```
**********************************************************
    2740 Sat May 10 12:09:33 2014
new/usr/src/lib/libm/common/m9x/scalbln.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#if defined(ELFOBJ)
#pragma weak scalbln = __scalbln
#endif

#include "libm.h"
#include <float.h>              /* DBL_MAX, DBL_MIN */

static const double twom54 = 5.551115123125782702118158340454101562 5e-17;
#if defined(USE_FPSCALE) || defined(__x86)
static const double two52 = 4503599627370496.0;
#else
/*
 * Normalize non-zero subnormal x and return biased exponent of x in [-51,0]
 */
static int
ilogb_biased(unsigned *px) {
        int s = 52;
        unsigned v = px[HIWORD] & ~0x80000000, w = px[LOWORD], t = v;

        if (t)
                s -= 32;
        else
                t = w;
        if (t & 0xffff0000)
                s -= 16, t >>= 16;
        if (t & 0xff00)
                s -= 8, t >>= 8;
        if (t & 0xf0)
                s -= 4, t >>= 4;
        t <<= 1;
        s -= (0xffffaa50 >> t) & 0x3;
        if (s < 32) {
```



```
                v = (v << s) | w >> (32 - s);
                w <<= s;
        } else {
                v = w << (s - 32);
                w = 0;
        }
        px[HIWORD] = (px[HIWORD] & 0x80000000) | v;
        px[LOWORD] = w;
        return (1 - s);
}
#endif  /* defined(USE_FPSCALE) */

double
scalbln(double x, long n) {
        int *px = (int *) &x, ix, k;

        ix = px[HIWORD] & ~0x80000000;
        k = ix >> 20;
        if (k == 0x7ff)
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return ((px[HIWORD] & 0x80000) != 0 ? x : x + x);
                /* assumes sparc-like QNaN */
#else
                return (x + x);
#endif
        if ((px[LOWORD] | ix) == 0 || n == 0)
                return (x);
        if (k == 0) {
#if defined(USE_FPSCALE) || defined(__x86)
                x *= two52;
                k = ((px[HIWORD] & ~0x80000000) >> 20) - 52;
#else
                k = ilogb_biased((unsigned *) px);
#endif
        }
        k += (int) n;
        if (n > 5000 || k > 0x7fe)
                return (DBL_MAX * copysign(DBL_MAX, x));
        if (n < -5000 || k <= -54)
                return (DBL_MIN * copysign(DBL_MIN, x));
        if (k > 0) {
                px[HIWORD] = (px[HIWORD] & ~0x7ff00000) | (k << 20);
                return (x);
        }
        k += 54;
        px[HIWORD] = (px[HIWORD] & ~0x7ff00000) | (k << 20);
        return (x * twom54);
}
```

```
**********************************************************
    2354 Sat May 10 12:09:33 2014
new/usr/src/lib/libm/common/m9x/scalblnf.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak scalblnf = __scalblnf
#endif

#include "libm.h"
#include <float.h>              /* FLT_MAX, FLT_MIN */

static const float twom25f = 2.98023223876953125e-8F;
#if defined(USE_FPSCALE) || defined(__x86)
static const float two23f = 8388608.0F;
#else
/*
 * v: a non-zero subnormal |x|; returns [-22, 0]
 */
static int
ilogbf_biased(unsigned v) {
        int r = -22;

        if (v & 0xffff0000)
                r += 16, v >>= 16;
        if (v & 0xff00)
                r += 8, v >>= 8;
        if (v & 0xf0)
                r += 4, v >>= 4;
        v <<= 1;
        return (r + ((0xffffaa50 >> v) & 0x3));
}
#endif  /* defined(USE_FPSCALE) */

float
scalblnf(float x, long n) {
```



```
        int *px = (int *) &x, ix, k;

        ix = *px & ~0x80000000;
        k = ix >> 23;
        if (k == 0xff)
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return (ix > 0x7f800000 ? x * x : x);
#else
                return (x + x);
#endif
        if (ix == 0 || n == 0)
                return (x);
        if (k == 0) {
#if defined(USE_FPSCALE) || defined(__x86)
                x *= two23f;
                k = ((*px & ~0x80000000) >> 23) - 23;
#else
                k = ilogbf_biased(ix);
                *px = (*px & 0x80000000) | (ix << (-k + 1));
#endif
        }
        k += (int) n;
        if (n > 5000 || k > 0xfe)
                return (FLT_MAX * copysignf(FLT_MAX, x));
        if (n < -5000 || k <= -25)
                return (FLT_MIN * copysignf(FLT_MIN, x));
        if (k > 0) {
                *px = (*px & ~0x7f800000) | (k << 23);
                return (x);
        }
        k += 25;
        *px = (*px & ~0x7f800000) | (k << 23);
        return (x * twom25f);
}
```

```
**********************************************************
    2430 Sat May 10 12:09:33 2014
new/usr/src/lib/libm/common/m9x/scalblnl.c
rollback ISINFNANL in libm/common/m9x/scalblnl.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak scalblnl = __scalblnl
#endif

#include "libm.h"
#include <float.h>              /* LDBL_MAX, LDBL_MIN */

#if defined(__sparc)
#define XSET_EXP(k, x)  ((int *) &x)[0] = (((int *) &x)[0] & ~0x7fff0000) | \
                        (k << 16)
#define ISINFNANL(k, x) (k == 0x7fff)
#define XTWOT_OFFSET    113
static const long double xtwot = 10384593717069655257060992658440192.0L,
                                                                /* 2^113 */
        twomtm1 = 4.81482486096808963263994485646231829 6E-35L;  /* 2^-114 */
#elif defined(__x86)
#define XSET_EXP(k, x)  ((int *) &x)[2] = (((int *) &x)[2] & ~0x7fff) | k
#if defined(HANDLE_UNSUPPORTED)
#define      ISINFNANL(k, x) (k == 0x7fff || k != 0 && \
                        (((int *) &x)[1] & 0x80000000) == 0)
#else
#define ISINFNANL(k, x) (k == 0x7fff)
#endif
#define XTWOT_OFFSET    64
static const long double xtwot = 18446744073709551616.0L,       /* 2^64 */
        twomtm1 = 2.71050543121376108501 86E-20L;               /* 2^-65 */
#endif

long double
scalblnl(long double x, long n) {
```



```
        int k = XBIASED_EXP(x);

        if (ISINFNANL(k, x))
                return (x + x);
        if (ISZEROL(x) || n == 0)
                return (x);
        if (k == 0) {
                x *= xtwot;
                k = XBIASED_EXP(x) - XTWOT_OFFSET;
        }
        k += (int) n;
        if (n > 50000 || k > 0x7ffe)
                return (LDBL_MAX * copysignl(LDBL_MAX, x));
        if (n < -50000 || k <= -XTWOT_OFFSET - 1)
                return (LDBL_MIN * copysignl(LDBL_MIN, x));
        if (k > 0) {
                XSET_EXP(k, x);
                return (x);
        }
        k += XTWOT_OFFSET + 1;
        XSET_EXP(k, x);
        return (x * twomtm1);
}
```

```
**********************************************************
   68985 Sat May 10 12:09:33 2014
new/usr/src/lib/libm/common/m9x/tgamma.c
comment in tgamma*.c
libm/common/m9x/tgamma.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#if defined(ELFOBJ)
#pragma weak tgamma = __tgamma
#endif

/* INDENT OFF */
/*
 * True gamma function
 * double tgamma(double x)
 *
 * Error:
 * ------
 *      Less that one ulp for both positive and negative arguments.
 *
 * Algorithm:
 * ---------
 *      A: For negative argument
 *              (1) gamma(-n or -inf) is NaN
 *              (2) Underflow Threshold
 *              (3) Reduction to gamma(1+x)
 *      B: For x between 1 and 2
 *      C: For x between 0 and 1
 *      D: For x between 2 and 8
 *      E: Overflow thresold {see over.c}
 *      F: For overflow_threshold >= x >= 8
 *
 * Implementation details
 * ----------------------
 *                                                          -pi
 * (A) For negative argument, use gamma(-x) = ------------------------.
```



```
 *                                          (sin(pi*x)*gamma(1+x))
 *
 *   (1) gamma(-n or -inf) is NaN with invalid signal by SUSv3 spec.
 *       (Ideally, gamma(-n) = 1/sinpi(n) = (-1)**(n+1) * inf.)
 *
 *   (2) Underflow Threshold. For each precision, there is a value T
 *       such that when x>T and when x is not an integer, gamma(-x) will
 *        always underflow. A table of the underflow threshold value is given
 *       below. For proof, see file "under.c".
 *
 *       Precision       underflow threshold T =
 *       ------------------------------------------------------------------------
 *       single  41.000041962                                    = 41  + 11 ULP
 *               (machine format) 4224000B
 *       double  183.00000000000312639                           = 183 + 11 ULP
 *               (machine format) 4066E000 0000000B
 *       quad    1774.00000000000000000000000000017749370      = 1774 + 9 ULP
 *               (machine format) 4009BB8000000000000000000000009
 *       ------------------------------------------------------------------------
 *
 *   (3) Reduction to gamma(1+x).
 *       Because of (1) and (2), we need only consider non-integral x
 *       such that 0<x<T. Let k = [x] and z = x-[x]. Define
 *                    sin(x*pi)                  cos(x*pi)
 *       kpsin(x) = --------- and kpcos(x) = --------- . Then
 *                      pi                         pi
 *                                  1
 *              gamma(-x) = --------------------.
 *                          -kpsin(x)*gamma(1+x)
 *       Since x = k+z,
 *                                                  k+1
 *              -sin(x*pi) = -sin(k*pi+z*pi) = (-1)   *sin(z*pi),
 *                                 k+1
 *       we have -kpsin(x) = (-1)   * kpsin(z).  We can further
 *       reduce z to t by
 *          (I)   t = z       when 0.00000     <= z < 0.31830...
 *          (II)  t = 0.5-z   when 0.31830...  <= z < 0.681690...
 *          (III) t = 1-z     when 0.681690... <= z < 1.00000
 *       and correspondingly
 *          (I)   kpsin(z) = kpsin(t)    ... 0<= z < 0.3184
 *          (II)  kpsin(z) = kpcos(t)    ... |t|   < 0.182
 *          (III) kpsin(z) = kpsin(t)    ... 0<= t < 0.3184
 *
 *       Using a special Remez algorithm, we obtain the following polynomial
 *       approximation for kpsin(t) for 0<=t<0.3184:
 *
 *       Computation note: in simulating higher precision arithmetic, kcpsin
 *       return head = t and tail = ks[0]*t^3 + (...) to maintain extra bits.
 *
 *       Quad precision, remez error <= 2**(-129.74)
 *                                    3                   5                  27
 *           kpsin(t) = t + ks[0] * t  + ks[1] * t  + ... + ks[12] * t
 *
 *        ks[ 0] =  -1.64493406684822643647241516664602518705158902870e+0000
 *        ks[ 1] =   8.11742425283353643637002772405874238094995726160e-0001
 *        ks[ 2] =  -1.90751824122084213696472111835337366232282723933e-0001
 *        ks[ 3] =   2.61478478176548005046532613563241288115395517084e-0002
 *        ks[ 4] =  -2.34608103545582363750893072647117829448016479971e-0003
 *        ks[ 5] =   1.48428793031071003684606647212534027556262040158e-0004
 *        ks[ 6] =  -6.97587366165638046518462722252768122615952898698e-0006
 *        ks[ 7] =   2.53121740413702536928659271747187500934840057929e-0007
 *        ks[ 8] =  -7.30471182221385990397683641695766121301933621956e-0009
 *        ks[ 9] =   1.71653847451163495739958249695549313987973589884e-0010
 *        ks[10] =  -3.34813314714560776122245796929054813458341420565e-0012
 *        ks[11] =   5.50724992262622033449487808306969135431411753047e-0014
 *        ks[12] =  -7.67678132753577998601234393215802221104236979928e-0016
```

```
125  *
126  *      Double precision, Remez error <= 2**(-62.9)
127  *                                3           5                 15
128  *          kpsin(t) = t + ks[0] * t  + ks[1] * t  + ... + ks[6] * t
129  *
130  *       ks[0] =  -1.64493406684822640606569 1   (0x3ffa51a6 625307d3)
131  *       ks[1] =   8.11742425283341655883668741874008920850698590621e-0001
132  *       ks[2] =  -1.90751824120862873825597279118304943994042258291e-0001
133  *       ks[3] =   2.61478477632554278317289628332654539353521911570e-0002
134  *       ks[4] =  -2.34607978510202710377617190278735525354347705866e-0003
135  *       ks[5] =   1.48413292290051695897242899977121846763824221705e-0004
136  *       ks[6] =  -6.87730769637543488108688726777687262485357072242e-0006
137  *
138  *      Single precision, Remez error <= 2**(-34.09)
139  *                                3           5                 9
140  *          kpsin(t) = t + ks[0] * t  + ks[1] * t  + ... + ks[3] * t
141  *
142  *       ks[0] =  -1.64493404985645811354476665052005342839447790544e+0000
143  *       ks[1] =   8.11740794458351064092797249069438269367389272270e-0001
144  *       ks[2] =  -1.90703144603551216933075809162889536878854055202e-0001
145  *       ks[3] =   2.55742333994264563281155312271481108635575331201e-0002
146  *
147  *      Computation note: in simulating higher precision arithmetic, kcpsin
148  *      return head = t and tail = kc[0]*t^3 + (...) to maintain extra bits
149  *      precision.
150  *
151  *      And for kpcos(t) for |t|< 0.183:
152  *
153  *      Quad precision, remez <= 2**(-122.48)
154  *                                2           4                   22
155  *          kpcos(t) = 1/pi +  pi/2 * t  + kc[2] * t + ... + kc[11] * t
156  *
157  *       kc[2] =   1.29192819501249250731151312779548918765320728489e+0000
158  *       kc[3] =  -4.25027339979557573976029596929319207009444090366e-0001
159  *       kc[4] =   7.49080661650990096109672954618317623888421628613e-0002
160  *       kc[5] =  -8.21458866111282287985539464173976555436050215120e-0003
161  *       kc[6] =   6.14202578809529228503205255165761204750211603402e-0004
162  *       kc[7] =  -3.33073432691149607007217330302595267179545908740e-0005
163  *       kc[8] =   1.36970959047832085796809745461530865597993680204e-0006
164  *       kc[9] =  -4.41780774262583514450246512727201806217271097336e-0008
165  *       kc[10]=   1.14741409212381858820016567664488123478660705759e-0009
166  *       kc[11]=  -2.44261236114707374558437500654381006300502749632e-0011
167  *
168  *      Double precision, remez < 2**(61.91)
169  *                                2           4                   12
170  *          kpcos(t) = 1/pi + pi/2 *t +  kc[2] * t  + ... + kc[6] * t
171  *
172  *       kc[2] =   1.29192819501230224953283586722575766189551966008e+0000
173  *       kc[3] =  -4.25027339940149518500158850753393173519732149213e-0001
174  *       kc[4] =   7.49080625187015312373925142219429422375556727752e-0002
175  *       kc[5] =  -8.21442040906099210866977352284054849051348692715e-0003
176  *       kc[6] =   6.10411356829515414575566564733632532333904115968e-0004
177  *
178  *      Single precision, remez < 2**(-30.13)
179  *                                2           6
180  *          kpcos(t) = kc[0] +  kc[1] * t  + ... + kc[3] * t
181  *
182  *       kc[0] =   3.18309886183790671537767526745028724068919291480e-0001
183  *       kc[1] =  -1.57079581447762568199467875065854538626594937791e+0000
184  *       kc[2] =   1.29183528092558692844073004029568674027807393862e+0000
185  *       kc[3] =  -4.20232949771307685981015914425195471602739075537e-0001
186  *
187  *      Computation note: in simulating higher precision arithmetic, kcpcos
188  *      return head = 1/pi chopped, and tail = pi/2 *t^2 + (tail part of 1/pi
189  *      + ...) to maintain extra bits precision. In particular, pi/2 * t^2
190  *      is calculated with great care.
```



```
191  *
192  *      Thus, the computation of gamma(-x), x>0, is:
193  *      Let k = int(x), z = x-k.
194  *      For z in (I)
195  *                                      k+1
196  *                                  (-1)
197  *              gamma(-x) = ------------------- ;
198  *                          kpsin(z)*gamma(1+x)
199  *
200  *      otherwise, for z in (II),
201  *                                      k+1
202  *                                  (-1)
203  *              gamma(-x) = ---------------------- ;
204  *                          kpcos(0.5-z)*gamma(1+x)
205  *
206  *      otherwise, for z in (III),
207  *                                      k+1
208  *                                  (-1)
209  *              gamma(-x) = -------------------- .
210  *                          kpsin(1-z)*gamma(1+x)
211  *
212  *      Thus, the computation of gamma(-x) reduced to the computation of
213  *      gamma(1+x) and kpsin(), kpcos().
214  *
215  * (B) For x between 1 and 2.  We break [1,2] into three parts:
216  *      GT1 = [1.0000, 1.2845]
217  *      GT2 = [1.2844, 1.6374]
218  *      GT3 = [1.6373, 2.0000]
219  *
220  *    For x in GTi, i=1,2,3, let
221  *      z1  =  1.134861805732790769689793935774652917006
222  *      gz1 = gamma(z1)  =   0.938204627909682449409753561580326957698 8
223  *      tz1 = gamma'(z1) =  -0.351721435785293579101562500000000000000 0
224  *
225  *      z2  =  1.461632144968362341262659542325721328468e+0000
226  *      gz2 = gamma(z2)  = 0.885603194410888700278815900582588733208 0
227  *      tz2 = gamma'(z2) = 0.00
228  *
229  *      z3  =  1.819773101100500601787868704921606996312e+0000
230  *      gz3 = gamma(z3)  = 0.936781411463652321618846897080837849742 6
231  *      tz3 = gamma'(z3) = 0.280530631542205810546875000000000000000 0
232  *
233  *    and
234  *      y = x-zi        ... for extra precision, write y = y.h + y.l
235  *    Then
236  *      gamma(x) = gzi + tzi*(y.h+y.l) + y*y*Ri(y),
237  *               = gzi.h + (tzi*y.h + ((tzi*y.l+gzi.l) +  y*y*Ri(y)))
238  *               = gy.h + gy.l
239  *    where
240  *      (I) For double precision
241  *
242  *              Ri(y) = Pi(y)/Qi(y), i=1,2,3;
243  *
244  *              P1(y) = p1[0] + p1[1]*y + ... + p1[4]*y^4
245  *              Q1(y) = q1[0] + q1[1]*y + ... + q1[5]*y^5
246  *
247  *              P2(y) = p2[0] + p2[1]*y + ... + p2[3]*y^3
248  *              Q2(y) = q2[0] + q2[1]*y + ... + q2[6]*y^6
249  *
250  *              P3(y) = p3[0] + p3[1]*y + ... + p3[4]*y^4
251  *              Q3(y) = q3[0] + q3[1]*y + ... + q3[5]*y^5
252  *
253  *              Remez precision of Ri(y):
254  *              |gamma(x)-(gzi+tzi*y) - y*y*Ri(y)|  <= 2**-62.3 ... for i = 1
255  *                                                  <= 2**-59.4 ... for i = 2
256  *                                                  <= 2**-62.1 ... for i = 3
```

```
257  *
258  *      (II) For quad precision
259  *
260  *              Ri(y) = Pi(y)/Qi(y), i=1,2,3;
261  *
262  *              P1(y) = p1[0] + p1[1]*y + ... + p1[9]*y^9
263  *              Q1(y) = q1[0] + q1[1]*y + ... + q1[8]*y^8
264  *
265  *              P2(y) = p2[0] + p2[1]*y + ... + p2[9]*y^9
266  *              Q2(y) = q2[0] + q2[1]*y + ... + q2[9]*y^9
267  *
268  *              P3(y) = p3[0] + p3[1]*y + ... + p3[9]*y^9
269  *              Q3(y) = q3[0] + q3[1]*y + ... + q3[9]*y^9
270  *
271  *              Remez precision of Ri(y):
272  *              |gamma(x)-(gzi+tzi*y) - y*y*Ri(y)|  <= 2**-118.2 ... for i = 1
273  *                                                  <= 2**-126.8 ... for i = 2
274  *                                                  <= 2**-119.5 ... for i = 3
275  *
276  *      (III) For single precision
277  *
278  *              Ri(y) = Pi(y), i=1,2,3;
279  *
280  *              P1(y) = p1[0] + p1[1]*y + ... + p1[5]*y^5
281  *
282  *              P2(y) = p2[0] + p2[1]*y + ... + p2[5]*y^5
283  *
284  *              P3(y) = p3[0] + p3[1]*y + ... + p3[4]*y^4
285  *
286  *              Remez precision of Ri(y):
287  *              |gamma(x)-(gzi+tzi*y) - y*y*Ri(y)|  <= 2**-30.8 ... for i = 1
288  *                                                  <= 2**-31.6 ... for i = 2
289  *                                                  <= 2**-29.5 ... for i = 3
290  *
291  *    Notes. (1) GTi and zi are choosen to balance the interval width and
292  *              minimize the distant between gamma(x) and the tangent line at
293  *              zi. In particular, we have
294  *              |gamma(x)-(gzi+tzi*(x-zi))|  <=   0.01436... for x in [1,z2]
295  *                                           <=   0.01265... for x in [z2,2]
296  *
297  *           (2) zi are slightly adjusted so that tzi=gamma'(zi) is very
298  *              close to a single precision value.
299  *
300  *    Coefficents: Single precision
301  *      i= 1:
302  *       P1[0] =   7.0908725343508836027145161339801928007756127944 3e-0001
303  *       P1[1] =  -5.1722956078865210854514197823870179010524176108 9e-0001
304  *       P1[2] =   5.2340339452815078940582522232377064716233764327 e-0001
305  *       P1[3] =  -4.5458630717075010784041566069480411732634814899 e-0001
306  *       P1[4] =   4.2059649091523908545996459055925691349819095523 3e-0001
307  *      P1[5] =  -3.5730758971237752097833218583824145864214218578 9e-0001
308  *
309  *      i = 2:
310  *       p2[0] =   4.2848698398029519816605611922398428443426434457 8e-0001
311  *       p2[1] =  -1.3070453948770913852868012162789973538665010391 4e-0001
312  *       p2[2] =   1.6085628503805195507286121935265585154295543087 1e-0001
313  *       p2[3] =  -9.2228516134601058377445880206737118215893794350 7e-0002
314  *       p2[4] =   7.1924051176722526074089029260507059556062617935 7e-0002
315  *       p2[5] =  -4.8815826559335509370311223853448463619326045957 4e-0002
316  *
317  *      i = 3
318  *       p3[0] =   3.8240953111880775908112147978609213481480888728 0e-0001
319  *       p3[1] =   2.6530988818018864795640040301349575936516785342 6e-0002
320  *       p3[2] =   8.0681510977507917192356116941537030937629673983 5e-0002
321  *       p3[3] =  -1.5482159166613761392884089083517435167400776479 9e-0002
322  *       p3[4] =   1.7630823924271726853049831341689918815716518340 5e-0002
```



```
323  *
324  *    Coefficents: Double precision
325  *      i = 1:
326  *       p1[0]   =   0.7090868361997779700800492719281464815139770507812 5000
327  *       p1[1]   =   1.7198706139304855808957951338435644166835172006 1e-0001
328  *       p1[2]   =  -3.1927334579199097029332031612281396052770545067 1e-0002
329  *       p1[3]   =   8.3617264541911003626716960039054997356353447698 9e-0003
330  *       p1[4]   =   1.1374533664857283833315221347427797124462975810 1e-0003
331  *       q1[0]   =   1.0
332  *       q1[1]   =   9.7198021782603293752646073177847238979132196808 2e-0001
333  *       q1[2]   =  -7.4357674332675617659408413725604265349708766603 0e-0002
334  *       q1[3]   =  -1.1934594493226555976971947051510201224699525537 2e-0001
335  *       q1[4]   =   1.5991344575142500262093512047078138221505028476 2e-0002
336  *       q1[5]   =   1.1260113685337498456657269130640232191154755078 3e-0003
337  *      i = 2:
338  *       p2[0]   =   0.4284868158555860118141822567849885672330856323242 1875
339  *       p2[1]   =   6.5359676266897081602371884510566741848312210362 9e-0002
340  *       p2[2]   =  -6.9728082963121293132105077092512826422727689367 31e-0003
341  *       p2[3]   =   6.4634235902198171894720860567481326016611663289 9e-0003
342  *       q2[0]   =   1.0
343  *       q2[1]   =   4.5757262056050604706255395745406201232751931393 6e-0001
344  *       q2[2]   =  -2.5218259488607545285965500340779610308342257203 6e-0001
345  *       q2[3]   =  -1.8297094540777859468134816604010319717871155282 7e-0002
346  *       q2[4]   =   2.4357472699316956647522764212883014130495384050 2e-0002
347  *       q2[5]   =  -5.2039040646694252535864595756489741125866708550 1e-0003
348  *       q2[6]   =   4.7952025138327983763555243198802325603195113388 5e-0004
349  *      i = 3:
350  *       p3[0]   =   0.3824094797345674590083319799305172637104988098144531 25
351  *       p3[1]   =   1.4287604869766816159906981404344930157292803414 0e-0001
352  *       p3[2]   =   3.4215757105225053681792386601356176078574889907 1e-0003
353  *       p3[3]   =  -5.0154262171006752140508788785699170098770927293 7e-0004
354  *       p3[4]   =   8.8928581486674091012383468816383828761833212267 0e-0004
355  *       q3[0]   =   1.0
356  *       q3[1]   =   3.0425308662944420100221564094895789790629963316 8e-0001
357  *       q3[2]   =  -2.2316240737999947728255567283488121387318552000 6e-0001
358  *       q3[3]   =  -1.0506086774195206592180981193367013142755290363 6e-0002
359  *       q3[4]   =   1.7051176391618698247330186198085635200592666932 0e-0002
360  *       q3[5]   =  -2.1295020168360918792789941670009463076418247746 4e-0003
361  *
362  *    Note that all pi0 are exact in double, which is obtained by a
363  *    special Remez Algorithm.
364  *
365  *    Coefficents: Quad precision
366  *      i = 1:
367  *       p1[0] =   0.7090868361997779190371857415076101246115137205 57
368  *       p1[1] =   4.4575478120648903582791596936735483566739160695 1e-0001
369  *       p1[2] =   3.2104929873583238231166227388263221006291815385 2e-0002
370  *       p1[3] =  -5.7129679634210661765176524585828919736968886435 0e-0003
371  *       p1[4] =   6.0466689289199897708161917496985583160696535277 3e-0003
372  *       p1[5] =   8.9910618699688871193962781217476525882265864516 8e-0004
373  *       p1[6] =  -6.9649684614440774143120700852701844181017556894 9e-0005
374  *       p1[7] =   1.5259704611898402081422540930013144507021388242 9e-0005
375  *       p1[8] =   5.6852107616849567384471146540743218919068154154 7e-0007
376  *       p1[9] =   3.3074967351963489522058206252028656561041895297 9e-0008
377  *       q1[0] =   1.0+0000
378  *       q1[1] =   1.3580651172167107040857085353725707957940650668 e+0000
379  *       q1[2] =   2.9756781015342955340532714009606308699407295296 1e-0001
380  *       q1[3] =  -1.5295683598258857150295437282168185168111809787 0e-0001
381  *       q1[4] =  -2.8824851956142010976878161528908205359795452121 8e-0002
382  *       q1[5] =   1.0347531171993740521978994845631393630237839595 5e-0002
383  *       q1[6] =   4.1231020324389122236896536012439129737482274231 3e-0004
384  *       q1[7] =  -3.1265370815229086724893192512038072951833250738 8e-0004
385  *       q1[8] =   2.3667217085040974523735810566775776052701433245 8e-0005
386  *
387  *      i = 2:
388  *       p2[0] =   0.4284868158555854297302099078106506167377566974 77
```

```
 389  *       p2[1] =   2.6362212406788522291919265115158154194336261735 2e-0001
 390  *       p2[2] =   3.8552068367002886573187727674139042174497144685 5e-0002
 391  *       p2[3] =   3.0506597827812854995889713319029532525802352586 2e-0003
 392  *       p2[4] =   2.4823293495172312889208041505408433915245044508 1e-0003
 393  *       p2[5] =   3.6709277706563236069331376222141154774155010540 7e-0004
 394  *       p2[6] =   3.8122804561608578967453090256314525053219451894 6e-0006
 395  *       p2[7] =   4.6167722586708755405953145513383917582253761767 7e-0006
 396  *       p2[8] =   2.1820905238570320043823920099120191660936487299 3e-0007
 397  *       p2[9] =   1.0049053898524584646000624406562475442102254245 4e-0008
 398  *       q2[0] =   1.0
 399  *       q2[1] =   9.2027635020763929056778372527312854422457077505 6e-0001
 400  *       q2[2] =  -4.7953368365416510744802051573388378113894777149 5e-0003
 401  *       q2[3] =  -1.2453833758589930049444460024868790194768429168 3e-0001
 402  *       q2[4] =   4.4986605076347235854752470843171911420453549141 2e-0003
 403  *       q2[5] =   7.2071545569792056062163832535629264060407859190 7e-0003
 404  *       q2[6] =  -8.6851316902912678028079833709198278059822809611 6e-0004
 405  *       q2[7] =  -1.2510443162940118152502709822274554480997422987 4e-0004
 406  *       q2[8] =   3.1055834483900003848919130455099804752125343746 4e-0005
 407  *       q2[9] =  -1.7682922785285217601853713957360943365250676571 2e-0006
 408  *
 409  *      i = 3
 410  *       p3[0] =   0.382409479734567504850274766107535564007043938 8902
 411  *       p3[1] =   3.4219809307661849541585490633590842715983337777 4e-0001
 412  *       p3[2] =   9.6382818950058556830396140686315323744070275485 8e-0002
 413  *       p3[3] =   8.7606942104269638485246204418852025215684676866 7e-0003
 414  *       p3[4] =   1.8647789038916149122487201414930901526189753748 8e-0003
 415  *       p3[5] =   8.1687135454030989587997474285370131154128694419 1e-0004
 416  *       p3[6] =   6.8378438367460032251869509086465938165012562521 6e-0005
 417  *       p3[7] =  -1.1016826971926157470856593517271920927219082845 6e-0006
 418  *       p3[8] =   9.6624322850838042015923485327890671706562972101 6e-0007
 419  *       p3[9] =   2.3185888557917725054116382067112166497433472814 2e-0008
 420  *       q3[0] =   1.0
 421  *       q3[1] =   8.2547982116881363463243743009037625251279306733 9e-0001
 422  *       q3[2] =  -1.6225136307393776973963962366929511034601557632 0e-0002
 423  *       q3[3] =  -1.1062128690591673275874513062942655969118757985 2e-0001
 424  *       q3[4] =   3.4830969397098561264444641578923001551536529145 9e-0003
 425  *       q3[5] =   6.7355373748748833303243126113128967234704340132 8e-0003
 426  *       q3[6] =  -7.6322200839337263016274358781100461305024512805 1e-0004
 427  *       q3[7] =  -1.3579267066919063147678476896195371173073251336 e-0004
 428  *       q3[8] =   3.1961015095422358700622073006560815646020569061 8e-0005
 429  *       q3[9] =  -1.8209655386282234661010952201512958569335434832 2e-0006
 430  *
 431  * (C) For x between 0 and 1.
 432  *     Let P stand for the number of significant bits in the working precision.
 433  *                                -P                                  1
 434  *    (1)For 0 <= x <= 2   , gamma(x) is computed by --- rounded to nearest.
 435  *                                                    x
 436  *       The error is bound by 0.739 ulp(gamma(x)) in IEEE double precision.
 437  *      Proof.
 438  *                 1                          2
 439  *      Since  --------  ~  x + 0.577...*x  - ...,  we have, for small x,
 440  *             gamma(x)
 441  *           1                    1
 442  *      ----------- < gamma(x) < --- and
 443  *      x(1+0.578x)               x
 444  *             1                  1          1
 445  *        0 <  --- - gamma(x) <= ---  -  ----------- < 0.578
 446  *             x                  x      x(1+0.578x)
 447  *                                  1       1                          -P
 448  *      The error is thus bounded by --- ulp(---) + 0.578. Since x <= 2   ,
 449  *                                  2       x
 450  *       1      P       1           P                                     1
 451  *      --- >= 2 , ulp(---) >= ulp(2  ) >= 2. Thus 0.578=0.289*2<=0.289ulp(-)
 452  *       x             x                                                 x
 453  *       Thus
 454  *                              1                                     1
```



```
 455  *                | gamma(x) - [---] rounded | <= (0.5+0.289)*ulp(---).
 456  *                                  x                                 x
 457  *                             -P                                    1
 458  *      Note that for x<= 2  , it is easy to see that ulp(---)=ulp(gamma(x))
 459  *                                                                    x
 460  *                               n                                   1
 461  *      except only when x = 2 , (n<= -53). In such cases, --- is exact
 462  *                                                                    x
 463  *      and therefore the error is bounded by
 464  *                                1
 465  *              0.298*ulp(---) = 0.298*2*ulp(gamma(x)) = 0.578ulp(gamma(x)).
 466  *                               x
 467  *      Thus we conclude that the error in gamma is less than 0.739 ulp.
 468  *
 469  *    (2)Otherwise, for x in GTi-1 (see B), let y = x-(zi-1). From (B) we obtain
 470  *                                                                  gamma(1+x)
 471  *      gamma(1+x) = gy.h + gy.l,  then compute gamma(x) by -----------.
 472  *                                                                    x
 473  *                                                                  gy.h
 474  *      Implementaion note. Write x = x.h+x.l, and Let th = ----- chopped to
 475  *                                                                   x
 476  *      20 bits, then
 477  *                                  gy.h+gy.l
 478  *              gamma(x) = th + (----------  - th )
 479  *                                     x
 480  *                                   1
 481  *                        = th + ---*(gy.h-th*x.h+gy.l-th*x.l)
 482  *                                   x
 483  *
 484  * (D) For x between 2 and 8. Let n = 1+x chopped to an integer. Then
 485  *
 486  *                gamma(x)=(x-1)*(x-2)*...*(x-n)*gamma(x-n)
 487  *
 488  *     Since x-n is between 1 and 2, we can apply (B) to compute gamma(x).
 489  *
 490  *     Implementation detail. The computation of (x-1)(x-2)...(x-n) in simulated
 491  *     higher precision arithmetic can be somewhat optimized.  For example, in
 492  *     computing (x-1)*(x-2)*(x-3)*(x-4), if we compute (x-1)*(x-4) = z.h+z.l,
 493  *     then (x-2)(x-3) = z.h+2+z.l readily. In below, we list the expression
 494  *     of the formula to compute gamma(x).
 495  *
 496  *     Assume x-n is in GTi (i=1,2, or 3, see B for detail). Let y = x - n - zi.
 497  *     By (B) we have gamma(x-n) = gy.h+gy.l. If x = x.h+x.l, then we have
 498  *      n=1 (x in [2,3]):
 499  *       gamma(x) = (x-1)*gamma(x-1) = (x-1)*(gy.h+gy.l)
 500  *                = [(x.h-1)+x.l]*(gy.h+gy.l)
 501  *      n=2 (x in [3,4]):
 502  *        gamma(x) = (x-1)(x-2)*gamma(x-2) = (x-1)*(x-2)*(gy.h+gy.l)
 503  *                 = ((x.h-2)+x.l)*((x.h-1)+x.l)*(gy.h+gy.l)
 504  *                 = [x.h*(x.h-3)+2+x.l*(x+(x.h-3))]*(gy.h+gy.l)
 505  *      n=3 (x in [4,5])
 506  *       gamma(x) = (x-1)(x-2)(x-3)*(gy.h+gy.l)
 507  *                = (x.h*(x.h-3)+2+x.l*(x+(x.h-3)))*[((x.h-3)+x.l)(gy.h+gy.l)]
 508  *      n=4 (x in [5,6])
 509  *       gamma(x) = [(x-1)(x-4)]*[(x-2)(x-3)]*(gy.h+gy.l)
 510  *                = [(x.h*(x.h-5)+4+x.l(x+(x.h-5)))]*[(x-2)*(x-3)]*(gy.h+gy.l)
 511  *                = (y.h+y.l)*(y.h+1+y.l)*(gy.h+gy.l)
 512  *      n=5 (x in [6,7])
 513  *       gamma(x) = [(x-1)(x-4)]*[(x-2)(x-3)]*[(x-5)*(gy.h+gy.l)]
 514  *      n=6 (x in [7,8])
 515  *       gamma(x) = [(x-1)(x-6)]*[(x-2)(x-5)]*[(x-3)(x-4)]*(gy.h+gy.l)]
 516  *                = [(y.h+y.l)(y.h+4+y.l)][(y.h+6+y.l)(gy.h+gy.l)]
 517  *
 518  * (E)Overflow Thresold. For x > Overflow thresold of gamma,
 519  *    return huge*huge (overflow).
 520  *
```

```
 *    By checking whether lgamma(x) >= 2**{128,1024,16384}, one can
 *    determine the overflow threshold for x in single, double, and
 *    quad precision. See over.c for details.
 *
 *    The overflow threshold of gamma(x) are
 *
 *    single: x = 3.5040096283e+01
 *              = 0x420C290F (IEEE single)
 *    double: x = 1.71624376956302711505e+02
 *              = 0x406573FAE561F647 (IEEE double)
 *    quad:   x = 1.75554834290446291700388921607020320341 77e+03
 *              = 0x4009B6E3180CD66A5C4206F128BA77F4  (quad)
 *
 * (F)For overflow_threshold >= x >= 8, we use asymptotic approximation.
 *    (1) Stirling's formula
 *
 *      log(G(x)) ~= (x-.5)*(log(x)-1) + .5(log(2*pi)-1) + (1/x)*P(1/(x*x))
 *                 = L1 + L2 + L3,
 *    where
 *              L1(x) = (x-.5)*(log(x)-1),
 *              L2    = .5(log(2pi)-1) = 0.41893853....,
 *              L3(x) = (1/x)P(1/(x*x)),
 *
 *    The range of L1,L2, and L3 are as follows:
 *
 *      ------------------------------------------------------------------
 *      Range(L1) =  (single) [8.09..,88.30..]   =[2** 3.01..,2**  6.46..]
 *                   (double) [8.09..,709.3..]   =[2** 3.01..,2**  9.47..]
 *                   (quad)   [8.09..,11356.10..]=[2** 3.01..,2** 13.47..]
 *      Range(L2) = 0.41893853.....
 *      Range(L3) = [0.0104...., 0.00048....]    =[2**-6.58..,2**-11.02..]
 *      ------------------------------------------------------------------
 *
 *    Gamma(x) is then computed by exp(L1+L2+L3).
 *
 *    (2) Error analysis of (F):
 *    --------------------------
 *    The error in Gamma(x) depends on the error inherited in the computation
 *    of L= L1+L2+L3. Let L' be the computed value of L. The absolute error
 *    in L' is t = L-L'. Since exp(L') = exp(L-t) = exp(L)*exp(t) ~
 *    (1+t)*exp(L), the relative error in exp(L') is approximately t.
 *
 *    To guarantee the relatively accuracy in exp(L'), we would like
 *    |t| < 2**(-P-5) where P denotes for the number of significant bits
 *    of the working precision. Consequently, each of the L1,L2, and L3
 *    must be computed with absolute error bounded by 2**(-P-5) in absolute
 *    value.
 *
 *    Since L2 is a constant, it can be pre-computed to the desired accuracy.
 *    Also |L3| < 2**-6; therefore, it suffices to compute L3 with the
 *    working precision.  That is,
 *      L3(x) approxmiate log(G(x))-(x-.5)(log(x)-1)-.5(log(2pi)-1)
 *    to a precision bounded by 2**(-P-5).
 *
 *                                  2**(-6)
 *                              _____V_____________________
 *              L1(x):     |_____|_____|_____|
 *                                 __ _____________________
 *              L2:              |__|_____|_____|
 *                                  _____________________
 *         +    L3(x):              |_____|_____|
 *                        ----------------------------------------
 *                          [leading] + [Trailing]
 *
 *    For L1(x)=(x-0.5)*(log(x)-1), we need ilogb(L1(x))+5 extra bits for
 *    both multiplicants to guarantee L1(x)'s absolute error is bounded by
```



```
 *    2**(-P-5) in absolute value. Here ilogb(y) is defined to be the unbias
 *    binary exponent of y in IEEE format.  We can get x-0.5 to the desire
 *    accuracy easily. It remains to compute log(x)-1 with ilogb(L1(x))+5
 *    extra bits accracy. Note that the range of L1 is 88.30.., 709.3.., and
 *    11356.10... for single, double, and quadruple precision, we have
 *
 *                             single     double      quadruple
 *                           ------------------------------------
 *      ilogb(L1(x))+5 <=      11          14           18
 *                           ------------------------------------
 *
 *    (3) Table Driven Method for log(x)-1:
 *    -------------------------------------
 *    Let x = 2**n * y, where 1 <= y < 2. Let Z={z(i),i=1,...,m}
 *    be a set of predetermined evenly distributed floating point numbers
 *    in [1, 2]. Let z(j) be the closest one to y, then
 *      log(x)-1 = n*log(2)-1  +  log(y)
 *               = n*log(2)-1  +  log(z(j)*y/z(j))
 *               = n*log(2)-1  +  log(z(j))  +  log(y/z(j))
 *               = T1(n)       +  T2(j)      +  T3,
 *
 *    where T1(n) = n*log(2)-1 and T2(j) = log(z(j)). Both T1 and T2 can be
 *    pre-calculated and be looked-up in a table. Note that 8 <= x < 1756
 *    implies 3<=n<=10 implies 1.079.. < T1(n) < 6.931.
 *
 *
 *                      y-z(i)           y       1+s
 *    For T3, let s = --------; then ----- =  ----- and
 *                      y+z(i)         z(i)      1-s
 *                 1+s              2   3     2   5
 *        T3 = log(-----) = 2s + --- s  + --- s  + ....
 *                 1-s              3       5
 *
 *    Suppose the first term 2s is compute in extra precision. The
 *    dominating error in T3 would then be the rounding error of the
 *    second term 2/3*s**3. To force the rounding bounded by
 *    the required accuracy, we have
 *        single:  |2/3*s**3| < 2**-11  ==> |s|<0.09014...
 *        double:  |2/3*s**3| < 2**-14  ==> |s|<0.04507...
 *        quad  :  |2/3*s**3| < 2**-18  ==> |s|<0.01788... = 2**(-5.80..)
 *
 *    Base on this analysis, we choose Z = {z(i)|z(i)=1+i/64+1/128, 0<=i<=63}.
 *    For any y in [1,2), let j = [64*y] chopped to integer, then z(j) is
 *    the closest to y, and it is not difficult to see that |s| < 2**(-8).
 *    Please note that the polynomial approximation of T3 must be accurate
 *        -24-11   -35    -53-14    -67         -113-18   -131
 *    to 2       =2    ,  2       = 2    ,  and  2        =2
 *    for single, double, and quadruple precision respectively.
 *
 *    Inplementation notes.
 *    (1) Table look-up entries for T1(n) and T2(j), as well as the calculation
 *        of the leading term 2s in T3,  are broken up into leading and trailing
 *        part such that (leading part)* 2**24 will always be an integer. That
 *        will guarantee the addition of the leading parts will be exact.
 *
 *                                     2**(-24)
 *                                 _____V_____________________
 *              T1(n):     |_____|_____|_____|
 *                                  _____ _____________________
 *              T2(j):       |_____|_____|_____|
 *                                   ____ _____________________
 *              2s:              |____|_____|_____|
 *                                  _____________________
 *         +    T3(s)-2s:           |_____|_____|
 *                          ----------------------------------------
 *                            [leading] + [Trailing]
```

```
653  *
654  *    (2) How to compute 2s accurately.
655  *        (A) Compute v = 2s to the working precision. If |v| < 2**(-18),
656  *            stop.
657  *        (B) chopped v to 2**(-24): v = ((int)(v*2**24))/2**24
658  *        (C) 2s = v + (2s - v), where
659  *                          1
660  *                2s - v = --- * (2(y-z) - v*(y+z) )
661  *                         y+z
662  *                           1
663  *                        = --- * ( [2(y-z) - v*(y+z)_h ]  - v*(y+z)_l  )
664  *                         y+z
665  *             where (y+z)_h = (y+z) rounded to 24 bits by (double)(float),
666  *           and (y+z)_l = ((z+z)-(y+z)_h)+(y-z).  Note the the quantity
667  *           in [] is exact.
668  *                                                          2        4
669  *    (3) Remez approximation for (T3(s)-2s)/s = T3[0]*s + T3[1]*s + ...:
670  *       Single precision: 1 term (compute in double precision arithmetic)
671  *          T3(s) = 2s + S1*s^3, S1 = 0.66667172318485180546936236975392 30
672  *          Remez error: |T3(s)/s - (2s+S1*s^3)| < 2**(-35.87)
673  *       Double precision: 3 terms, Remez error is bounded by 2**(-72.40),
674  *          see "tgamma_log"
675  *       Quad precision: 7 terms, Remez error is bounded by 2**(-136.54),
676  *          see "tgammal_log"
677  *
678  *    The computation of 0.5*(ln(2pi)-1):
679  *       0.5*(ln(2pi)-1) =  0.41893853320467274178032973640561763986 14...
680  *       split 0.5*(ln(2pi)-1) to hln2pi_h + hln2pi_l, where hln2pi_h is the
681  *       leading 21 bits of the constant.
682  *          hln2pi_h= 0.418938398361206054687 5
683  *          hln2pi_l= 1.34843466687092829736405617639861217364 8e-07
684  *
685  *    The computation of 1/x*P(1/x^2) = log(G(x))-(x-.5)(ln(x)-1)-(.5ln(2pi)-1):
686  *       Let s = 1/x <= 1/8 < 0.125. We have
687  *       quad precision
688  *          |GP(s) - s*P(s^2)| <= 2**(-120.6), where
689  *                              3      5           39
690  *          GP(s) = GP0*s+GP1*s +GP2*s +... +GP19*s    ,
691  *        GP0  =   0.0833333333333333333333333333333 3172839171301
692  *                       hex 0x3ffe5555 55555555 55555555 55555548
693  *        GP1  =  -2.7777777777777777777777777749250121199939942 4104e-0003
694  *        GP2  =   7.9365079365079365079365650541638236350020883 243e-0004
695  *        GP3  =  -5.9523809523809523805729977267932450333924196 1704e-0004
696  *        GP4  =   8.4175084175084169613842298797768352492614260 0321e-0004
697  *        GP5  =  -1.9175269175268668282503254782369966217884212 3308e-0003
698  *        GP6  =   6.4102564102240348092189155935647345116127935 9322e-0003
699  *        GP7  =  -2.9550653579841401918981958745557700373280818 5071e-0002
700  *        GP8  =   1.7964436722997003148607918006092307347656873 2136e-0001
701  *        GP9  =  -1.3924308648727466217456287256705720025564929 0646e+0000
702  *        GP10 =   1.3402587404441796218867781647784226525960826 9775e+0001
703  *        GP11 =  -1.5680371348012746941449554539998250870074827 4318e+0002
704  *        GP12 =   2.1873984165620156169492763033509931396892449 3891e+0003
705  *        GP13 =  -3.5524984864410033841918703809025410976237921 269e+0004
706  *        GP14 =   6.4346488043783528621676895943948437644917957 6452e+0005
707  *        GP15 =  -1.2045915438557701499260034278282138960589390 4624e+0007
708  *        GP16 =   2.0926324963735129856393494234974971849107109 3210e+0008
709  *        GP17 =  -2.9624748318316921934374531643389959983468570 3457e+0009
710  *        GP18 =   2.8898493360589603315472762608650675697232720 2981e+0010
711  *        GP19 =  -1.4096043414603000773283838241623061030267806 3984e+0011
712  *
713  *       double precision
714  *          |GP(s) - s*P(s^2)| <= 2**(-63.5), where
715  *                              3      5      7      9      11      13      15
716  *          GP(s) = GP0*s+GP1*s +GP2*s +GP3*s +GP4*s +GP5*s  +GP6*s  +GP7*s  ,
717  *
718  *              GP0=  0.0833333333333333328707404064061847 7 (3FB55555 55555555)
```



```
719  *              GP1= -2.7777777777664935520056561111462767008913077284 3e-0003
720  *              GP2=  7.9365078748608372480547619417021177578415855150 9e-0004
721  *              GP3= -5.9523662855831492875781141958028129459390358297 1e-0004
722  *              GP4=  8.4156647399985345198313716278042781278117893254 0e-0004
723  *              GP5= -1.9042477667044137356451294203892616817592130321 2e-0003
724  *              GP6=  5.8493316153094966631233394953448230300735429917 8e-0003
725  *              GP7= -1.5945322893108203026212483250614439249656169455 0e-0002
726  *       single precision
727  *          |GP(s) - s*P(s^2)| <= 2**(-37.78), where
728  *                                3      5
729  *            GP(s) = GP0*s+GP1*s +GP2*s
730  *         GP0 =   8.3333333095969406524573688874904281190999457317 8e-0002
731  *         GP1 =  -2.7776554560166717976770660089036153522550776216 8e-0003
732  *         GP2 =   7.7783085347977528178108527832462103352303748988 3e-0004
733  *
734  *
735  *      Implementation note:
736  *      z = (1/x), z2 = z*z, z4 = z2*z2;
737  *      p = z*(GP0+z2*(GP1+....+z2*GP7))
738  *        = z*(GP0+(z4*(GP2+z4*(GP4+z4*GP6))+z2*(GP1+z4*(GP3+z4*(GP5+z4*GP7)))))
739  *
740  *   Adding everything up:
741  *      t = rr.h*ww.h+hln2pi_h                    ... exact
742  *      w = (hln2pi_l + ((x-0.5)*ww.l+rr.l*ww.h)) + p
743  *
744  *   Computing exp(t+w):
745  *      s = t+w; write s = (n+j/32)*ln2+r, |r|<=(1/64)*ln2, then
746  *      exp(s) = 2**n * (2**(j/32) + 2**(j/32)*expm1(r)), where
747  *      expm1(r) = r + Et1*r^2 + Et2*r^3 + ... + Et5*r^6, and
748  *      2**(j/32) is obtained by table look-up S[j]+S_trail[j].
749  *      Remez error bound:
750  *      |exp(r) - (1+r+Et1*r^2+...+Et5*r^6)| <= 2^(-63).
751  */

753 #include "libm.h"

755 #define __HI(x) ((int *) &x)[HIWORD]
756 #define __LO(x) ((unsigned *) &x)[LOWORD]

758 struct Double {
759         double h;
760         double l;
761 };

763 /* Hex value of GP0 shoule be 3FB55555 55555555 */
764 static const double c[] = {
765         +1.0,
766         +2.0,
767         +0.5,
768         +1.0e-300,
769         +6.6666666666666740682e-01,                                     /* A1=T3[0] */
770         +3.9999999995562647802309390867490221292 0e-01,                 /* A2=T3[1] */
771         +2.8572022153314565980923739870937233098 0e-01,                 /* A3=T3[2] */
772         +0.0833333333333333287074040640618477,                          /* GP[0] */
773         -2.7777777776649355200565611114627670089130772843e-03,
774         +7.9365078748608372480547619417021177578415855150 9e-04,
775         -5.9523662855831492875781141958028129459390358297 1e-04,
776         +8.4156647399985345198313716278042781278117893254 0e-04,
777         -1.9042477667044137356451294203892616817592130321 2e-03,
778         +5.8493316153094966631233394953448230300735429917 8e-03,
779         -1.5945322893108203026212483250614439249656169455 0e-02,
780         +4.1893768310546875000e-01,                                     /* hln2pi_h */
781         +8.5009920399178027964 0e-07,                                   /* hln2pi_l */
782         +4.1893853320467274174415078836869577992332032836 9e-01, /* hln2pi */
783         +2.1660849386535119265 3e-02,                                   /* ln2_32hi */
784         +5.9631716539705865625 7e-12,                                   /* ln2_32lo */
```

```
785         +4.6166241308446828384 1e+01,                                   /* invln2_32 */
786         +5.0000000000000000000e-1,                                      /* Et1 */
787         +1.6666666666522358556060599194370389619605402006 0e-01, /* Et2 */
788         +4.1666666666589510352015407353427528674378842168 7e-02, /* Et3 */
789         +8.3333684409353652077586509653877319750552382602 9e-03, /* Et4 */
790         +1.3888920193084343604020409695005298479358764022 7e-03, /* Et5 */
791 };

793 #define one       c[0]
794 #define two       c[1]
795 #define half      c[2]
796 #define tiny      c[3]
797 #define A1        c[4]
798 #define A2        c[5]
799 #define A3        c[6]
800 #define GP0       c[7]
801 #define GP1       c[8]
802 #define GP2       c[9]
803 #define GP3       c[10]
804 #define GP4       c[11]
805 #define GP5       c[12]
806 #define GP6       c[13]
807 #define GP7       c[14]
808 #define hln2pi_h  c[15]
809 #define hln2pi_l  c[16]
810 #define hln2pi    c[17]
811 #define ln2_32hi  c[18]
812 #define ln2_32lo  c[19]
813 #define invln2_32 c[20]
814 #define Et1       c[21]
815 #define Et2       c[22]
816 #define Et3       c[23]
817 #define Et4       c[24]
818 #define Et5       c[25]

820 /*
821  * double precision coefficients for computing log(x)-1 in tgamma.
822  *  See "algorithm" for details
823  *
824  *  log(x) - 1 = T1(n) + T2(j) + T3(s), where x = 2**n * y,  1<=y<2,
825  *  j=[64*y], z[j]=1+j/64+1/128, s = (y-z[j])/(y+z[j]), and
826  *       T1(n) = T1[2n,2n+1] = n*log(2)-1,
827  *       T2(j) = T2[2j,2j+1] = log(z[j]),
828  *       T3(s) = 2s + T3[0]s^3 + T3[1]s^5 + T3[2]s^7
829  *             = 2s + A1*s^3 + A2*s^5 + A3*s^7  (see const A1,A2,A3)
830  *  Note
831  *  (1) the leading entries are truncated to 24 binary point.
832  *      See Remezpak/sun/tgamma_log_64.c
833  *  (2) Remez error for T3(s) is bounded by 2**(-72.4)
834  *      See mpremez/work/Log/tgamma_log_4_outr2
835  */

837 static const double T1[] = {
838         -1.0000000000000000000e+00,    /* 0xBFF00000 0x00000000 */
839         +0.0000000000000000000e+00,    /* 0x00000000 0x00000000 */
840         -3.0685281753540039062 5e-01,    /* 0xBFD3A37A 0x00000000 */
841         -1.9046542999577676316 6e-09,    /* 0xBE205C61 0x0CA86C38 */
842         +3.8629430532455444335 9e-01,    /* 0x3FD8B90B 0xC0000000 */
843         +5.5795336175475089736 7e-08,    /* 0x3E6DF473 0xDE6AF279 */
844         +1.0794414877891540527 3e+00,    /* 0x3FF14564 0x70000000 */
845         +5.3890681875517318796 3e-08,    /* 0x3E6CEEAD 0xCDA06BB5 */
846         +1.7725886702537536621 1e+00,    /* 0x3FFC5C85 0xF0000000 */
847         +5.1986027575559554473 4e-08,    /* 0x3E6BE8E7 0xBCD5E4F2 */
848         +2.4657358527183532714 8e+00,    /* 0x4003B9D3 0xB8000000 */
849         +5.0081373275017835330 e-08,    /* 0x3E6AE321 0xAC0B5E2E */
850         +3.1588830351829528808 6e+00,    /* 0x40094564 0x78000000 */
```



```
851         +4.8176718975644019210 0e-08,    /* 0x3E69DD5B 0x9B40D76B */
852         +3.8520302176475524902 3e+00,    /* 0x400ED0F5 0x38000000 */
853         +4.6272064675686248269 7e-08,    /* 0x3E68D795 0x8A7650A7 */
854         +4.5451774001121520996 1e+00,    /* 0x40122E42 0xFC000000 */
855         +4.4367410375728483946 7e-08,    /* 0x3E67D1CF 0x79ABC9E4 */
856         +5.2383245825767517089 8e+00,    /* 0x4014F40B 0x5C000000 */
857         +4.2462756075770713006 3e-08,    /* 0x3E66CC09 0x68E14320 */
858         +5.9314717650413513183 6e+00,    /* 0x4017B9D3 0xBC000000 */
859         +4.0558101775812948683 4e-08,    /* 0x3E65C643 0x5816BC5D */
860 };

862 static const double T2[] = {
863         +7.7821016311645507812 5e-03,    /* 0x3F7FE020 0x00000000 */
864         +3.8810890398166214088 4e-08,    /* 0x3E64D620 0xCF11F86F */
865         +2.3167014122009277343 8e-02,    /* 0x3F97B918 0x00000000 */
866         +4.5159525100885051374 0e-08,    /* 0x3E683EAD 0x88D54940 */
867         +3.8318812847137451171 9e-02,    /* 0x3FA39E86 0x00000000 */
868         +5.1454999148021882341 1e-08,    /* 0x3E6B9FEB 0xD5FA9016 */
869         +5.3244471549987792968 8e-02,    /* 0x3FAB42DC 0x00000000 */
870         +4.2968824489897118216 5e-08,    /* 0x3E671197 0x1BEC28D1 */
871         +6.7950606346130371093 8e-02,    /* 0x3FB16536 0x00000000 */
872         +5.5562377378300818511 4e-08,    /* 0x3E6DD46F 0x5C1D0C4C */
873         +8.2443654537200927734 4e-02,    /* 0x3FB51B07 0x00000000 */
874         +1.4673873663533784731 3e-08,    /* 0x3E4F830C 0x1FB493C7 */
875         +9.6729576587677001953 1e-02,    /* 0x3FB8C345 0x00000000 */
876         +4.9870874110342449228 2e-08,    /* 0x3E6AC633 0x641EB597 */
877         +1.1081433296203613281 2e-01,    /* 0x3FBC5E54 0x00000000 */
878         +3.3378253981382306222 6e-08,    /* 0x3E61EB78 0xE862BAC3 */
879         +1.2470346689224243164 1e-01,    /* 0x3FBFEC91 0x00000000 */
880         +1.1608714804222781845 0e-08,    /* 0x3E48EDF5 0x5D551729 */
881         +1.3840228319168090820 3e-01,    /* 0x3FC1B72A 0x80000000 */
882         +3.9667438227482200195 7e-08,    /* 0x3E654BD9 0xE80A4181 */
883         +1.5191602706909179687 5e-01,    /* 0x3FC371FC 0x00000000 */
884         +1.4956750178196802149 4e-08,    /* 0x3E500F47 0xBA1DE6CB */
885         +1.6524952650070190429 7e-01,    /* 0x3FC526E5 0x80000000 */
886         +4.6394605258578733406 2e-08,    /* 0x3E68E86D 0x0DE8B900 */
887         +1.7840760946273803710 9e-01,    /* 0x3FC6D60F 0x80000000 */
888         +4.8010080260010027953 8e-08,    /* 0x3E69C674 0x8723551E */
889         +1.9139480590820312500 0e-01,    /* 0x3FC87FA0 0x00000000 */
890         +4.7091426329609297143 6e-08,    /* 0x3E694832 0x44240802 */
891         +2.0421552658081054687 5e-01,    /* 0x3FCA23BC 0x00000000 */
892         +1.4847880344628820900 1e-08,    /* 0x3E4FE2B5 0x63193712 */
893         +2.1687388420104980468 8e-01,    /* 0x3FCBC286 0x00000000 */
894         +5.4099564554931591948 8e-08,    /* 0x3E6D0B63 0x358A7E74 */
895         +2.2937405109405517578 1e-01,    /* 0x3FCD5C21 0x00000000 */
896         +4.9970790654210228411 7e-08,    /* 0x3E6AD3EE 0xE456E443 */
897         +2.4171990156173706054 7e-01,    /* 0x3FCEF0AD 0x80000000 */
898         +3.5325408107597435280 4e-08,    /* 0x3E62F716 0x4D948638 */
899         +2.5391519069671630859 4e-01,    /* 0x3FD04025 0x80000000 */
900         +1.9284247135543573909 1e-08,    /* 0x3E54B4D0 0x40DAE27C */
901         +2.6596349477767944335 9e-01,    /* 0x3FD1058B 0xC0000000 */
902         +5.3719458497979748712 5e-08,    /* 0x3E6CD725 0x6A8C4FD0 */
903         +2.7786844968795776367 2e-01,    /* 0x3FD1C898 0xC0000000 */
904         +1.3154985425144749650 6e-09,    /* 0x3E16999F 0xAFBC68E7 */
905         +2.8963327407836914062 5e-01,    /* 0x3FD2895A 0x00000000 */
906         +1.8504673536253892991 1e-08,    /* 0x3E53DE86 0xA35EB493 */
907         +3.0126130580902099609 4e-01,    /* 0x3FD347DD 0x80000000 */
908         +2.4769140784919124505 2e-08,    /* 0x3E5A987D 0x54D64567 */
909         +3.1275570326086425781 1e-01,    /* 0x3FD40430 0x80000000 */
910         +6.0778104626049965861 0e-09,    /* 0x3E3A1A9F 0x8EF4304A */
911         +3.2411944866180419921 9e-01,    /* 0x3FD4BE5F 0x80000000 */
912         +1.9992407776871919804 5e-08,    /* 0x3E557778 0xA0DB4C99 */
913         +3.3535552024841308593 8e-01,    /* 0x3FD57677 0x00000000 */
914         +2.1672724744319680277 1e-08,    /* 0x3E57455A 0x6C549AB7 */
915         +3.4646672010421752929 7e-01,    /* 0x3FD62C82 0xC0000000 */
916         +4.7241991051621590049 3e-08,    /* 0x3E695CE3 0xCA97B7B0 */
```

```
917         +3.57455849647521972656e-01,    /* 0x3FD6E08E 0x80000000 */
918         +3.92742818015697624778e-08,    /* 0x3E6515D0 0xF1C609CA */
919         +3.68325531482696533203e-01,    /* 0x3FD792A5 0x40000000 */
920         +2.96760111198451042238e-08,    /* 0x3E5FDD47 0xA27C15DA */
921         +3.79078328609466552734e-01,    /* 0x3FD842D1 0xC0000000 */
922         +2.43255029056564770289e-08,    /* 0x3E5A1E8B 0x17493B14 */
923         +3.89716744422912597656e-01,    /* 0x3FD8F11E 0x80000000 */
924         +6.71711261571421332726e-09,    /* 0x3E3CD98B 0x1DF85DA7 */
925         +4.00243163108825683594e-01,    /* 0x3FD99D95 0x80000000 */
926         +1.01818702333557515008e-09,    /* 0x3E117E08 0xACBA92EF */
927         +4.10659909248352050781e-01,    /* 0x3FDA4840 0x80000000 */
928         +1.57369163351530571459e-08,    /* 0x3E50E5BB 0x0A2BFCA7 */
929         +4.20969247817993164062e-01,    /* 0x3FDAF129 0x00000000 */
930         +4.68261364720663662040e-08,    /* 0x3E6923BC 0x358899C2 */
931         +4.31173443794250488281e-01,    /* 0x3FDB9858 0x80000000 */
932         +2.10241208525779214510e-08,    /* 0x3E569310 0xFB598FB1 */
933         +4.41274523735046386719e-01,    /* 0x3FDC3DD7 0x80000000 */
934         +3.70698288427707487748e-08,    /* 0x3E63E6D6 0xA6B9D9E1 */
935         +4.51274633407592773438e-01,    /* 0x3FDCE1AF 0x00000000 */
936         +1.07318658117071930723e-08,    /* 0x3E470BE7 0xD6F6FA58 */
937         +4.61175680160522460938e-01,    /* 0x3FDD83E7 0x00000000 */
938         +3.49616477054305011286e-08,    /* 0x3E62C517 0x9F2828AE */
939         +4.70979690551757812500e-01,    /* 0x3FDE2488 0x00000000 */
940         +2.46670332000468969567e-08,    /* 0x3E5A7C6C 0x261CBD8F */
941         +4.80688512325286865234e-01,    /* 0x3FDEC399 0xC0000000 */
942         +1.70204650424422423704e-08,    /* 0x3E52468C 0xC0175CEE */
943         +4.90303933620452880859e-01,    /* 0x3FDF6123 0xC0000000 */
944         +5.44247409572909703749e-08,    /* 0x3E6D3814 0x5630A2B6 */
945         +4.99827861785888671875e-01,    /* 0x3FDFFD2E 0x00000000 */
946         +7.77056065794633071345e-09,    /* 0x3E40AFE9 0x30AB2FA0 */
947         +5.09261846542358398438e-01,    /* 0x3FE04BDF 0x80000000 */
948         +5.52474495483665749052e-08,    /* 0x3E6DA926 0xD265FCC1 */
949         +5.18607735633850097656e-01,    /* 0x3FE0986F 0x40000000 */
950         +2.85741955344967264536e-08,    /* 0x3E5EAE6A 0x41723FB5 */
951         +5.27867078781127929688e-01,    /* 0x3FE0E449 0x80000000 */
952         +1.08397144554263914271e-08,    /* 0x3E474732 0x2FDBAB97 */
953         +5.37041425704956054688e-01,    /* 0x3FE12F71 0x80000000 */
954         +4.01919275998792285777e-08,    /* 0x3E6593EF 0xBC530123 */
955         +5.46132385730743408203e-01,    /* 0x3FE179EA 0xA0000000 */
956         +5.18673922421792693237e-08,    /* 0x3E6BD899 0xA0BFC60E */
957         +5.55141448974609375000e-01,    /* 0x3FE1C3B8 0x00000000 */
958         +5.85658922177154808539e-08,    /* 0x3E6F713C 0x24BC94F9 */
959         +5.64070105552673339844e-01,    /* 0x3FE20CDC 0xC0000000 */
960         +3.27321296262276338905e-08,    /* 0x3E6192AB 0x6D93503D */
961         +5.72919726371765136719e-01,    /* 0x3FE2555B 0xC0000000 */
962         +2.71900203723740076878e-08,    /* 0x3E5D31EF 0x96780876 */
963         +5.81691682338714599609e-01,    /* 0x3FE29D37 0xE0000000 */
964         +5.72959078829112371070e-08,    /* 0x3E6EC2B0 0x8AC85CD7 */
965         +5.90387403964996337891e-01,    /* 0x3FE2E474 0x20000000 */
966         +4.26371800367512948470e-08,    /* 0x3E66E402 0x68405422 */
967         +5.99008142948150634766e-01,    /* 0x3FE32B13 0x20000000 */
968         +4.66979327646159769249e-08,    /* 0x3E69121D 0x71320557 */
969         +6.07555210590362548828e-01,    /* 0x3FE37117 0xA0000000 */
970         +3.96341792466729582847e-08,    /* 0x3E654747 0xB5C5DD02 */
971         +6.16029858589172363281e-01,    /* 0x3FE3B684 0x40000000 */
972         +1.86263416563663175432e-08,    /* 0x3E53FFF8 0x455F1DBE */
973         +6.24433279037475585938e-01,    /* 0x3FE3FB5B 0x80000000 */
974         +8.97441791510503832111e-09,    /* 0x3E4345BD 0x096D3A75 */
975         +6.32766664028167724609e-01,    /* 0x3FE43F9F 0xE0000000 */
976         +5.54287010493641158796e-09,    /* 0x3E37CE73 0x3BD393DD */
977         +6.41031146049499511719e-01,    /* 0x3FE48353 0xC0000000 */
978         +3.33714317793368531132e-08,    /* 0x3E61EA88 0xDF73D5E9 */
979         +6.49227917194366455078e-01,    /* 0x3FE4C679 0xA0000000 */
980         +2.94307433638127158696e-08,    /* 0x3E5F99DC 0x7362D1DA */
981         +6.57358050346374511719e-01,    /* 0x3FE50913 0xC0000000 */
982         +2.23619855184231409785e-08,    /* 0x3E5802D0 0xD6979675 */
```



```
983         +6.65422618389129638672e-01,    /* 0x3FE54B24 0x60000000 */
984         +1.41559608102782173188e-08,    /* 0x3E4E6652 0x5EA4550A */
985         +6.73422634601593017578e-01,    /* 0x3FE58CAD 0xA0000000 */
986         +4.06105737027198329700e-08,    /* 0x3E65CD79 0x893092F2 */
987         +6.81359171867370605469e-01,    /* 0x3FE5CDB1 0xC0000000 */
988         +5.29405324634793230630e-08,    /* 0x3E6C6C17 0x648CF6E4 */
989         +6.89233243465423583984e-01,    /* 0x3FE60E32 0xE0000000 */
990         +3.77733853963405370102e-08,    /* 0x3E644788 0xD8CA7C89 */
991 };

993 /* S[j],S_trail[j] = 2**(j/32.) for the final computation of exp(t+w) */
994 static const double S[] = {
995         +1.00000000000000000000e+00,    /* 3FF0000000000000 */
996         +1.02189714865411662714e+00,    /* 3FF059B0D3158574 */
997         +1.04427378242741375480e+00,    /* 3FF0B5586CF9890F */
998         +1.06714040067682369717e+00,    /* 3FF11301D0125B51 */
999         +1.09050773266525768967e+00,    /* 3FF172B83C7D517B */
1000        +1.11438674259589243221e+00,    /* 3FF1D4873168B9AA */
1001        +1.13878863475669156458e+00,    /* 3FF2387A6E756238 */
1002        +1.16372485877757747552e+00,    /* 3FF29E9DF51FDEE1 */
1003        +1.18920711500272102690e+00,    /* 3FF306FE0A31B715 */
1004        +1.21524735998046895524e+00,    /* 3FF371A7373AA9CB */
1005        +1.24185781207348400201e+00,    /* 3FF3DEA64C123422 */
1006        +1.26905095719173321989e+00,    /* 3FF44E086061892D */
1007        +1.29683955465100964055e+00,    /* 3FF4BFDAD5362A27 */
1008        +1.32523664315974132322e+00,    /* 3FF5342B569D4F82 */
1009        +1.35425554693689265129e+00,    /* 3FF5AB07DD485429 */
1010        +1.38390988196383202258e+00,    /* 3FF6247EB03A5585 */
1011        +1.41421356237309514547e+00,    /* 3FF6A09E667F3BCD */
1012        +1.44518080697704665027e+00,    /* 3FF71F75E8EC5F74 */
1013        +1.47682614593949934623e+00,    /* 3FF7A11473EB0187 */
1014        +1.50916442759342284141e+00,    /* 3FF82589994CCE13 */
1015        +1.54221082540794074411e+00,    /* 3FF8ACE5422AA0DB */
1016        +1.57598084510788649659e+00,    /* 3FF93737B0CDC5E5 */
1017        +1.61049033194925428347e+00,    /* 3FF9C49182A3F090 */
1018        +1.64575547815396494578e+00,    /* 3FFA5503B23E255D */
1019        +1.68179283050742900407e+00,    /* 3FFAE89F995AD3AD */
1020        +1.71861929812247793414e+00,    /* 3FFB7F76F2FB5E47 */
1021        +1.75625216037329945351e+00,    /* 3FFC199BDD85529C */
1022        +1.79470907500310716820e+00,    /* 3FFCB720DCEF9069 */
1023        +1.83400808640934243066e+00,    /* 3FFD5818DCFBA487 */
1024        +1.87416763411029996256e+00,    /* 3FFDFC97337B9B5F */
1025        +1.91520656139714740007e+00,    /* 3FFEA4AFA2A490DA */
1026        +1.95714412417540017941e+00,    /* 3FFF50765B6E4540 */
1027 };

1029 static const double S_trail[] = {
1030         +0.00000000000000000000e+00,
1031         +5.10922502897344389359e-17,    /* 3C8D73E2A475B465 */
1032         +8.55188970553796365958e-17,    /* 3C98A62E4ADC610A */
1033         -7.89985396684158212226e-17,    /* BC96C51039449B3A */
1034         -3.04678207981247114697e-17,    /* BC819041B9D78A76 */
1035         +1.04102784568455709549e-16,    /* 3C9E016E00A2643C */
1036         +8.91281267602540777782e-17,    /* 3C99B07EB6C70573 */
1037         +3.82920483692409349872e-17,    /* 3C8612E8AFAD1255 */
1038         +3.98201523146564611098e-17,    /* 3C86F46AD23182E4 */
1039         -7.71263069268148813091e-17,    /* BC963AEABF42EAE2 */
1040         +4.65802759183693679123e-17,    /* 3C8ADA0911F09EBC */
1041         +2.66793213134218609523e-18,    /* 3C489B7A04EF80D0 */
1042         +2.53825027948883149593e-17,    /* 3C7D4397AFEC42E2 */
1043         -2.85873121003886075697e-17,    /* BC807ABE1DB13CAC */
1044         +7.70094837980298946162e-17,    /* 3C96324C054647AD */
1045         -6.77051165879478628716e-17,    /* BC9383C17E40B497 */
1046         -9.66729331345291345105e-17,    /* BC9BDD3413B26456 */
1047         -3.02375813499398731940e-17,    /* BC816E4786887A99 */
1048         -3.48399455689279579579e-17,    /* BC841577EE04992F */
```

```
        -1.0164553277542950391 1e-16,    /* BC9D4C1DD41532D8 */
        +7.9498348096976208561 6e-17,    /* 3C96E9F156864B27 */
        -1.0136916471278303980 8e-17,    /* BC675FC781B57EBC */
        +2.4707192569797887852 2e-17,    /* 3C7C7C46B071F2BE */
        -1.0125679913674772603 8e-16,    /* BC9D2F6EDB8D41E1 */
        +8.1990100205814965201 3e-17,    /* 3C97A1CD345DCC81 */
        -1.8513804182631109882 1e-17,    /* BC75584F7E54AC3B */
        +2.9601406954488733070 3e-17,    /* 3C811065895048DD */
        +1.8227458427912086769 8e-17,    /* 3C7503CBD1E949DB */
        +3.2831072242456265872 2e-17,    /* 3C82ED02D75B3706 */
        -6.1227634130041425616 4e-17,    /* BC91A5CD4F184B5C */
        -1.0619946056195962637 6e-16,    /* BC9E9C23179C2893 */
        +8.9607677910366677676 0e-17,    /* 3C99D3E12DD8A18B */
};

/* Primary interval GTi() */
static const double cr[] = {
/* p1, q1 */
        +0.7090868361997779700800492719281464815139770507812 5000,
        +1.7198706139304855808957951338435644166835172006 1e-0001,
        -3.1927334579199097029332031612281396052770545067 1e-0002,
        +8.3617264541911003626716960039054997356353447698 9e-0003,
        +1.1374533664857283833315221347427797124462975810 1e-0003,
        +1.0,
        +9.7198021782603293752646073177847238979132196808 2e-0001,
        -7.4357674332675617659408413725604265349708766603 0e-0002,
        -1.1934594493226555976971947051510201224699525537 2e-0001,
        +1.5991344575142500262093512047078138221505028476 2e-0002,
        +1.1260113685337498456657269130640232191154755078 3e-0003,
/* p2, q2 */
        +0.4284868158555860118141822567849885672330856323 2421875,
        +6.5359676266897081602371884510566741848312210362 9e-0002,
        -6.9728082963121293132105077092512826427276893673 1e-0003,
        +6.4634235902198171894720860567481326016611663289 9e-0003,
        +1.0,
        +4.5757262056050604706255395745406201232751931393 6e-0001,
        -2.5218259488607545285965500340779610308342257203 6e-0001,
        -1.8297094540777859468134816604010319717871155282 7e-0002,
        +2.4357472699316956647522764212883014130495384050 2e-0002,
        -5.2039040646694252535864595756489741125866708550 1e-0003,
        +4.7952025138327983763555243198802325603195113388 5e-0004,
/* p3, q3 */
        +0.3824094797345674590083319799305172637104988098144531 25,
        +1.4287604869766816159906981404344930157292803414 0e-0001,
        +3.4215757105225053681792386601356176078574889907 1e-0003,
        -5.0154262171006752140508788785699170098770927293 7e-0004,
        +8.8928581486674091012383468816383828761833212267 0e-0004,
        +1.0,
        +3.0425308662944420100221564094895789790629963316 8e-0001,
        -2.2316240737999947728255567283488121387318552000 6e-0001,
        -1.0506086774195206592180981193367013142755290363 6e-0002,
        +1.7051176391618698247330186198085635200592666932 0e-0002,
        -2.1295020168360918792789941670009463076418247746 4e-0003,
};

#define P10   cr[0]
#define P11   cr[1]
#define P12   cr[2]
#define P13   cr[3]
#define P14   cr[4]
#define Q10   cr[5]
#define Q11   cr[6]
#define Q12   cr[7]
#define Q13   cr[8]
#define Q14   cr[9]
#define Q15   cr[10]
```



```
#define P20   cr[11]
#define P21   cr[12]
#define P22   cr[13]
#define P23   cr[14]
#define Q20   cr[15]
#define Q21   cr[16]
#define Q22   cr[17]
#define Q23   cr[18]
#define Q24   cr[19]
#define Q25   cr[20]
#define Q26   cr[21]
#define P30   cr[22]
#define P31   cr[23]
#define P32   cr[24]
#define P33   cr[25]
#define P34   cr[26]
#define Q30   cr[27]
#define Q31   cr[28]
#define Q32   cr[29]
#define Q33   cr[30]
#define Q34   cr[31]
#define Q35   cr[32]

static const double
        GZ1_h = +0.938204627909682398190,
        GZ1_l = +5.1219526002482051579 35e-17,
        GZ2_h = +0.885603194410888749921,
        GZ2_l = -4.9642368725563398106 92e-17,
        GZ3_h = +0.936781411463652347038,
        GZ3_l = -2.5419231108344794150 23e-17,
        TZ1 = -0.3517214357852935791015625,
        TZ3 = +0.2805306315422058105468 75;
/* INDENT ON */

/* compute gamma(y=yh+yl) for y in GT1 = [1.0000, 1.2845] */
/* assume yh got 20 significant bits */
static struct Double
GT1(double yh, double yl) {
        double t3, t4, y, z;
        struct Double r;

        y = yh + yl;
        z = y * y;
        t3 = (z * (P10 + y * ((P11 + y * P12) + z * (P13 + y * P14)))) /
                (Q10 + y * ((Q11 + y * Q12) + z * ((Q13 + Q14 * y) + z * Q15)));
        t3 += (TZ1 * yl + GZ1_l);
        t4 = TZ1 * yh;
        r.h = (double) ((float) (t4 + GZ1_h + t3));
        t3 += (t4 - (r.h - GZ1_h));
        r.l = t3;
        return (r);
}

/* compute gamma(y=yh+yl) for y in GT2 = [1.2844, 1.6374] */
/* assume yh got 20 significant bits */
static struct Double
GT2(double yh, double yl) {
        double t3, y, z;
        struct Double r;

        y = yh + yl;
        z = y * y;
        t3 = (z * (P20 + y * P21 + z * (P22 + y * P23))) /
                (Q20 + (y * ((Q21 + Q22 * y) + z * Q23) +
                (z * z) * ((Q24 + Q25 * y) + z * Q26))) + GZ2_l;
        r.h = (double) ((float) (GZ2_h + t3));
```

```
        r.l = t3 - (r.h - GZ2_h);
        return (r);
}

/* compute gamma(y=yh+yl) for y in GT3 = [1.6373, 2.0000] */
/* assume yh got 20 significant bits */
static struct Double
GT3(double yh, double yl) {
        double t3, t4, y, z;
        struct Double r;

        y = yh + yl;
        z = y * y;
        t3 = (z * (P30 + y * ((P31 + y * P32) + z * (P33 + y * P34)))) /
                (Q30 + y * ((Q31 + y * Q32) + z * ((Q33 + Q34 * y) + z * Q35)));
        t3 += (TZ3 * yl + GZ3_l);
        t4 = TZ3 * yh;
        r.h = (double) ((float) (t4 + GZ3_h + t3));
        t3 += (t4 - (r.h - GZ3_h));
        r.l = t3;
        return (r);
}

/* INDENT OFF */
/*
 * return tgamma(x) scaled by 2**-m for 8<x<=171.62... using Stirling's formula
 *     log(G(x)) ~= (x-.5)*(log(x)-1) + .5(log(2*pi)-1) + (1/x)*P(1/(x*x))
 *                = L1 + L2 + L3,
 */
/* INDENT ON */
static struct Double
large_gam(double x, int *m) {
        double z, t1, t2, t3, z2, t5, w, y, u, r, z4, v, t24 = 16777216.0,
               p24 = 1.0 / 16777216.0;
        int n2, j2, k, ix, j;
        unsigned lx;
        struct Double zz;
        double u2, ss_h, ss_l, r_h, w_h, w_l, t4;

/* INDENT OFF */
/*
 * compute ss = ss.h+ss.l = log(x)-1 (see tgamma_log.h for details)
 *
 *  log(x) - 1 = T1(n) + T2(j) + T3(s), where x = 2**n * y,  1<=y<2,
 *  j=[64*y], z[j]=1+j/64+1/128, s = (y-z[j])/(y+z[j]), and
 *       T1(n) = T1[2n,2n+1] = n*log(2)-1,
 *       T2(j) = T2[2j,2j+1] = log(z[j]),
 *       T3(s) = 2s + A1[0]s^3 + A2[1]s^5 + A3[2]s^7
 *  Note
 *  (1) the leading entries are truncated to 24 binary point.
 *  (2) Remez error for T3(s) is bounded by 2**(-72.4)
 *                                    2**(-24)
 *                                 _____V_____________________
 *              T1(n):     |_____|_____|
 *                                 _____ _____________________
 *              T2(j):       |_____|_____|
 *                                    ____ _____________________
 *              2s:             |____|_____|
 *                                          _____________________
 *         +    T3(s)-2s:           |_____|
 *                        ----------------------------------------
 *                           [leading] + [Trailing]
 */
/* INDENT ON */
        ix = __HI(x);
        lx = __LO(x);
```



```
        n2 = (ix >> 20) - 0x3ff;        /* exponent of x, range:3-7 */
        n2 += n2;                       /* 2n */
        ix = (ix & 0x000fffff) | 0x3ff00000;    /* y = scale x to [1,2] */
        __HI(y) = ix;
        __LO(y) = lx;
        __HI(z) = (ix & 0xffffc000) | 0x2000;   /* z[j]=1+j/64+1/128 */
        __LO(z) = 0;
        j2 = (ix >> 13) & 0x7e; /* 2j */
        t1 = y + z;
        t2 = y - z;
        r = one / t1;
        t1 = (double) ((float) t1);
        u = r * t2;             /* u = (y-z)/(y+z) */
        t4 = T2[j2 + 1] + T1[n2 + 1];
        z2 = u * u;
        k = __HI(u) & 0x7fffffff;
        t3 = T2[j2] + T1[n2];
        if ((k >> 20) < 0x3ec) {        /* |u|<2**-19 */
                t2 = t4 + u * ((two + z2 * A1) + (z2 * z2) * (A2 + z2 * A3));
        } else {
                t5 = t4 + u * (z2 * A1 + (z2 * z2) * (A2 + z2 * A3));
                u2 = u + u;
                v = (double) ((int) (u2 * t24)) * p24;
                t2 = t5 + r * ((two * t2 - v * t1) - v * (y - (t1 - z)));
                t3 += v;
        }
        ss_h = (double) ((float) (t2 + t3));
        ss_l = t2 - (ss_h - t3);

        /*
         * compute ww = (x-.5)*(log(x)-1) + .5*(log(2pi)-1) + 1/x*(P(1/x^2)))
         * where ss = log(x) - 1 in already in extra precision
         */
        z = one / x;
        r = x - half;
        r_h = (double) ((float) r);
        w_h = r_h * ss_h + hln2pi_h;
        z2 = z * z;
        w = (r - r_h) * ss_h + r * ss_l;
        z4 = z2 * z2;
        t1 = z2 * (GP1 + z4 * (GP3 + z4 * (GP5 + z4 * GP7)));
        t2 = z4 * (GP2 + z4 * (GP4 + z4 * GP6));
        t1 += t2;
        w += hln2pi_l;
        w_l = z * (GP0 + t1) + w;
        k = (int) ((w_h + w_l) * invln2_32 + half);

        /* compute the exponential of w_h+w_l */
        j = k & 0x1f;
        *m = (k >> 5);
        t3 = (double) k;

        /* perform w - k*ln2_32 (represent as w_h - w_l) */
        t1 = w_h - t3 * ln2_32hi;
        t2 = t3 * ln2_32lo;
        w = w_l - t2;
        w_h = t1 + w_l;
        w_l = t2 - (w_l - (w_h - t1));

        /* compute exp(w_h+w_l) */
        z = w_h - w_l;
        z2 = z * z;
        t1 = z2 * (Et1 + z2 * (Et3 + z2 * Et5));
        t2 = z2 * (Et2 + z2 * Et4);
        t3 = w_h - (w_l - (t1 + z * t2));
        zz.l = S_trail[j] * (one + t3) + S[j] * t3;
```

```
1313         zz.h = S[j];
1314         return (zz);
1315 }

1317 /* INDENT OFF */
1318 /*
1319  * kpsin(x)= sin(pi*x)/pi
1320  *                3        5        7        9        11        13        15
1321  *      = x+ks[0]*x +ks[1]*x +ks[2]*x +ks[3]*x +ks[4]*x  +ks[5]*x  +ks[6]*x
1322  */
1323 static const double ks[] = {
1324         -1.64493406684822640606569,
1325         +8.11742425283341655883668741874008920850698590621e-0001,
1326         -1.90751824120862873825597279118304943994042258291e-0001,
1327         +2.61478477632554278317289628332654539353521911570e-0002,
1328         -2.34607978510202710377617190278735525354347705866e-0003,
1329         +1.48413292290051695897242899977121846763824221705e-0004,
1330         -6.87730769637543488108688726777687262485357072242e-0006,
1331 };
1332 /* INDENT ON */

1334 /* assume x is not tiny and positive */
1335 static struct Double
1336 kpsin(double x) {
1337         double z, t1, t2, t3, t4;
1338         struct Double xx;

1340         z = x * x;
1341         xx.h = x;
1342         t1 = z * x;
1343         t2 = z * z;
1344         t4 = t1 * ks[0];
1345         t3 = (t1 * z) * ((ks[1] + z * ks[2] + t2 * ks[3]) + (z * t2) *
1346                 (ks[4] + z * ks[5] + t2 * ks[6]));
1347         xx.l = t4 + t3;
1348         return (xx);
1349 }

1351 /* INDENT OFF */
1352 /*
1353  * kpcos(x)= cos(pi*x)/pi
1354  *                2        4        6        8        10        12
1355  *      = 1/pi +kc[0]*x +kc[1]*x +kc[2]*x +kc[3]*x +kc[4]*x  +kc[5]*x
1356  */

1358 static const double one_pi_h = 0.31830988618379063570529 70,
1359                 one_pi_l = 3.58324745560753400671427 6420e-17;
1360 static const double npi_2_h = -1.5625,
1361                 npi_2_l = -0.00829632679489661923132169163975055099555883223;
1362 static const double kc[] = {
1363         -1.57079632679489661923132169163975055099555883223e+0000,
1364         +1.29192819501230224953283586722575766189551966008e+0000,
1365         -4.25027339940149518500158850753393173519732149213e-0001,
1366         +7.49080625187015312373925142219429422375556727752e-0002,
1367         -8.21442040906099210866977352284054849051348692715e-0003,
1368         +6.10411356829515414575566564733632532333904115968e-0004,
1369 };
1370 /* INDENT ON */

1372 /* assume x is not tiny and positive */
1373 static struct Double
1374 kpcos(double x) {
1375         double z, t1, t2, t3, t4, x4, x8;
1376         struct Double xx;

1378         z = x * x;
```



```
1379         xx.h = one_pi_h;
1380         t1 = (double) ((float) x);
1381         x4 = z * z;
1382         t2 = npi_2_l * z + npi_2_h * (x + t1) * (x - t1);
1383         t3 = one_pi_l + x4 * ((kc[1] + z * kc[2]) + x4 * (kc[3] + z *
1384                 kc[4] + x4 * kc[5]));
1385         t4 = t1 * t1;   /* 48 bits mantissa */
1386         x8 = t2 + t3;
1387         t4 *= npi_2_h;  /* npi_2_h is 5 bits const. The product is exact */
1388         xx.l = x8 + t4; /* that will minimized the rounding error in xx.l */
1389         return (xx);
1390 }

1392 /* INDENT OFF */
1393 static const double
1394         /* 0.13486180573279076968979393577465291700 6 */
1395         t0z1   =  0.134861805732790773 7708,
1396         t0z1_l = -4.08100777085782990225 31e-18,
1397         /* 0.46163214496836234126265954232572132846 8 */
1398         t0z2   =  0.461632144968362356 7850,
1399         t0z2_l = -1.55223481628586768905 21e-17,
1400         /* 0.81977310110050060178786870492160699631 2 */
1401         t0z3   =  0.819773101100500611 8708,
1402         t0z3_l = -1.00829451224871034983 25e-17;
1403         /* 1.13486180573279076968979393577465291700 6 */
1404 /* INDENT ON */

1406 /* gamma(x+i) for 0 <= x < 1  */
1407 static struct Double
1408 gam_n(int i, double x) {
1409         struct Double rr = {0.0L, 0.0L}, yy;
1410         double r1, r2, t2, z, xh, xl, yh, yl, zh, z1, z2, zl, x5, wh, wl;

1412         /* compute yy = gamma(x+1) */
1413         if (x > 0.2845) {
1414                 if (x > 0.6374) {
1415                         r1 = x - t0z3;
1416                         r2 = (double) ((float) (r1 - t0z3_l));
1417                         t2 = r1 - r2;
1418                         yy = GT3(r2, t2 - t0z3_l);
1419                 } else {
1420                         r1 = x - t0z2;
1421                         r2 = (double) ((float) (r1 - t0z2_l));
1422                         t2 = r1 - r2;
1423                         yy = GT2(r2, t2 - t0z2_l);
1424                 }
1425         } else {
1426                 r1 = x - t0z1;
1427                 r2 = (double) ((float) (r1 - t0z1_l));
1428                 t2 = r1 - r2;
1429                 yy = GT1(r2, t2 - t0z1_l);
1430         }

1432         /* compute gamma(x+i) = (x+i-1)*...*(x+1)*yy, 0<i<8 */
1433         switch (i) {
1434         case 0:         /* yy/x */
1435                 r1 = one / x;
1436                 xh = (double) ((float) x);      /* x is not tiny */
1437                 rr.h = (double) ((float) ((yy.h + yy.l) * r1));
1438                 rr.l = r1 * (yy.h - rr.h * xh) -
1439                         ((r1 * rr.h) * (x - xh) - r1 * yy.l);
1440                 break;
1441         case 1:         /* yy */
1442                 rr.h = yy.h;
1443                 rr.l = yy.l;
1444                 break;
```

```
1445         case 2:         /* (x+1)*yy */
1446                 z = x + one;    /* may not be exact */
1447                 zh = (double) ((float) z);
1448                 rr.h = zh * yy.h;
1449                 rr.l = z * yy.l + (x - (zh - one)) * yy.h;
1450                 break;
1451         case 3:         /* (x+2)*(x+1)*yy */
1452                 z1 = x + one;
1453                 z2 = x + 2.0;
1454                 z = z1 * z2;
1455                 xh = (double) ((float) z);
1456                 zh = (double) ((float) z1);
1457                 xl = (x - (zh - one)) * (z2 + zh) - (xh - zh * (zh + one));
1458                 rr.h = xh * yy.h;
1459                 rr.l = z * yy.l + xl * yy.h;
1460                 break;

1462         case 4:         /* (x+1)*(x+3)*(x+2)*yy */
1463                 z1 = x + 2.0;
1464                 z2 = (x + one) * (x + 3.0);
1465                 zh = z1;
1466                 __LO(zh) = 0;
1467                 __HI(zh) &= 0xffffffff8; /* zh 18 bits mantissa */
1468                 zl = x - (zh - 2.0);
1469                 z = z1 * z2;
1470                 xh = (double) ((float) z);
1471                 xl = zl * (z2 + zh * (z1 + zh)) - (xh - zh * (zh * zh - one));
1472                 rr.h = xh * yy.h;
1473                 rr.l = z * yy.l + xl * yy.h;
1474                 break;
1475         case 5:         /* ((x+1)*(x+4)*(x+2)*(x+3))*yy */
1476                 z1 = x + 2.0;
1477                 z2 = x + 3.0;
1478                 z = z1 * z2;
1479                 zh = (double) ((float) z1);
1480                 yh = (double) ((float) z);
1481                 yl = (x - (zh - 2.0)) * (z2 + zh) - (yh - zh * (zh + one));
1482                 z2 = z - 2.0;
1483                 z *= z2;
1484                 xh = (double) ((float) z);
1485                 xl = yl * (z2 + yh) - (xh - yh * (yh - 2.0));
1486                 rr.h = xh * yy.h;
1487                 rr.l = z * yy.l + xl * yy.h;
1488                 break;
1489         case 6:         /* ((x+1)*(x+2)*(x+3)*(x+4)*(x+5))*yy */
1490                 z1 = x + 2.0;
1491                 z2 = x + 3.0;
1492                 z = z1 * z2;
1493                 zh = (double) ((float) z1);
1494                 yh = (double) ((float) z);
1495                 z1 = x - (zh - 2.0);
1496                 yl = z1 * (z2 + zh) - (yh - zh * (zh + one));
1497                 z2 = z - 2.0;
1498                 x5 = x + 5.0;
1499                 z *= z2;
1500                 xh = (double) ((float) z);
1501                 zh += 3.0;
1502                 xl = yl * (z2 + yh) - (xh - yh * (yh - 2.0));
1503                                         /* xh+xl=(x+1)*...*(x+4) */
1504                 /* wh+wl=(x+5)*yy */
1505                 wh = (double) ((float) (x5 * (yy.h + yy.l)));
1506                 wl = (z1 * yy.h + x5 * yy.l) - (wh - zh * yy.h);
1507                 rr.h = wh * xh;
1508                 rr.l = z * wl + xl * wh;
1509                 break;
1510         case 7:         /* ((x+1)*(x+2)*(x+3)*(x+4)*(x+5)*(x+6))*yy */
```



```
1511                 z1 = x + 3.0;
1512                 z2 = x + 4.0;
1513                 z = z2 * z1;
1514                 zh = (double) ((float) z1);
1515                 yh = (double) ((float) z);      /* yh+yl = (x+3)(x+4) */
1516                 yl = (x - (zh - 3.0)) * (z2 + zh) - (yh - (zh * (zh + one)));
1517                 z1 = x + 6.0;
1518                 z2 = z - 2.0;   /* z2 = (x+2)*(x+5) */
1519                 z *= z2;
1520                 xh = (double) ((float) z);
1521                 xl = yl * (z2 + yh) - (xh - yh * (yh - 2.0));
1522                                                 /* xh+xl=(x+2)*...*(x+5) */
1523                 /* wh+wl=(x+1)(x+6)*yy */
1524                 z2 -= 4.0;      /* z2 = (x+1)(x+6) */
1525                 wh = (double) ((float) (z2 * (yy.h + yy.l)));
1526                 wl = (z2 * yy.l + yl * yy.h) - (wh - (yh - 6.0) * yy.h);
1527                 rr.h = wh * xh;
1528                 rr.l = z * wl + xl * wh;
1529         }
1530         return (rr);
1531 }

1533 double
1534 tgamma(double x) {
1535         struct Double ss, ww;
1536         double t, t1, t2, t3, t4, t5, w, y, z, z1, z2, z3, z5;
1537         int i, j, k, m, ix, hx, xk;
1538         unsigned lx;

1540         hx = __HI(x);
1541         lx = __LO(x);
1542         ix = hx & 0x7fffffff;
1543         y = x;

1545         if (ix < 0x3ca00000)
1546                 return (one / x);       /* |x| < 2**-53 */
1547         if (ix >= 0x7ff00000)
1548                         /* +Inf -> +Inf, -Inf or NaN -> NaN */
1549                 return (x * ((hx < 0)? 0.0 : x));
1550         if (hx > 0x406573fa ||  /* x > 171.62... overflow to +inf */
1551             (hx == 0x406573fa && lx > 0xE561F647)) {
1552                 z = x / tiny;
1553                 return (z * z);
1554         }
1555         if (hx >= 0x40200000) { /* x >= 8 */
1556                 ww = large_gam(x, &m);
1557                 w = ww.h + ww.l;
1558                 __HI(w) += m << 20;
1559                 return (w);
1560         }
1561         if (hx > 0) {           /* 0 < x < 8 */
1562                 i = (int) x;
1563                 ww = gam_n(i, x - (double) i);
1564                 return (ww.h + ww.l);
1565         }

1567         /* negative x */
1568         /* INDENT OFF */
1569         /*
1570          * compute: xk =
1571          *      -2 ... x is an even int (-inf is even)
1572          *      -1 ... x is an odd int
1573          *      +0 ... x is not an int but chopped to an even int
1574          *      +1 ... x is not an int but chopped to an odd int
1575          */
1576         /* INDENT ON */
```

```
1577         xk = 0;
1578         if (ix >= 0x43300000) {
1579                 if (ix >= 0x43400000)
1580                         xk = -2;
1581                 else
1582                         xk = -2 + (lx & 1);
1583         } else if (ix >= 0x3ff00000) {
1584                 k = (ix >> 20) - 0x3ff;
1585                 if (k > 20) {
1586                         j = lx >> (52 - k);
1587                         if ((j << (52 - k)) == lx)
1588                                 xk = -2 + (j & 1);
1589                         else
1590                                 xk = j & 1;
1591                 } else {
1592                         j = ix >> (20 - k);
1593                         if ((j << (20 - k)) == ix && lx == 0)
1594                                 xk = -2 + (j & 1);
1595                         else
1596                                 xk = j & 1;
1597                 }
1598         }
1599         if (xk < 0)
1600                 /* ideally gamma(-n)= (-1)**(n+1) * inf, but c99 expect NaN */
1601                 return ((x - x) / (x - x));             /* 0/0 = NaN */


1604         /* negative underflow thresold */
1605         if (ix > 0x4066e000 || (ix == 0x4066e000 && lx > 11)) {
1606                 /* x < -183.0 - 11ulp */
1607                 z = tiny / x;
1608                 if (xk == 1)
1609                         z = -z;
1610                 return (z * tiny);
1611         }

1613         /* now compute gamma(x) by  -1/((sin(pi*y)/pi)*gamma(1+y)), y = -x */

1615         /*
1616          * First compute ss = -sin(pi*y)/pi , so that
1617          * gamma(x) = 1/(ss*gamma(1+y))
1618          */
1619         y = -x;
1620         j = (int) y;
1621         z = y - (double) j;
1622         if (z > 0.31830988618837906715377675)
1623                 if (z > 0.68169011381620932846223250)
1624                         ss = kpsin(one - z);
1625                 else
1626                         ss = kpcos(0.5 - z);
1627         else
1628                 ss = kpsin(z);
1629         if (xk == 0) {
1630                 ss.h = -ss.h;
1631                 ss.l = -ss.l;
1632         }

1634         /* Then compute ww = gamma(1+y), note that result scale to 2**m */
1635         m = 0;
1636         if (j < 7) {
1637                 ww = gam_n(j + 1, z);
1638         } else {
1639                 w = y + one;
1640                 if ((lx & 1) == 0) {    /* y+1 exact (note that y<184) */
1641                         ww = large_gam(w, &m);
1642                 } else {
```



```
1643                         t = w - one;
1644                         if (t == y) {   /* y+one exact */
1645                                 ww = large_gam(w, &m);
1646                         } else {        /* use y*gamma(y) */
1647                                 if (j == 7)
1648                                         ww = gam_n(j, z);
1649                                 else
1650                                         ww = large_gam(y, &m);
1651                                 t4 = ww.h + ww.l;
1652                                 t1 = (double) ((float) y);
1653                                 t2 = (double) ((float) t4);
1654                                                 /* t4 will not be too large */
1655                                 ww.l = y * (ww.l - (t2 - ww.h)) + (y - t1) * t2;
1656                                 ww.h = t1 * t2;
1657                         }
1658                 }
1659         }

1661         /* compute 1/(ss*ww) */
1662         t3 = ss.h + ss.l;
1663         t4 = ww.h + ww.l;
1664         t1 = (double) ((float) t3);
1665         t2 = (double) ((float) t4);
1666         z1 = ss.l - (t1 - ss.h);        /* (t1,z1) = ss */
1667         z2 = ww.l - (t2 - ww.h);        /* (t2,z2) = ww */
1668         t3 = t3 * t4;                   /* t3 = ss*ww */
1669         z3 = one / t3;                  /* z3 = 1/(ss*ww) */
1670         t5 = t1 * t2;
1671         z5 = z1 * t4 + t1 * z2;         /* (t5,z5) = ss*ww */
1672         t1 = (double) ((float) t3);     /* (t1,z1) = ss*ww */
1673         z1 = z5 - (t1 - t5);
1674         t2 = (double) ((float) z3);     /* leading 1/(ss*ww) */
1675         z2 = z3 * (t2 * z1 - (one - t2 * t1));
1676         z = t2 - z2;

1678         /* check whether z*2**-m underflow */
1679         if (m != 0) {
1680                 hx = __HI(z);
1681                 i = hx & 0x80000000;
1682                 ix = hx ^ i;
1683                 j = ix >> 20;
1684                 if (j > m) {
1685                         ix -= m << 20;
1686                         __HI(z) = ix ^ i;
1687                 } else if ((m - j) > 52) {
1688                         /* underflow */
1689                         if (xk == 0)
1690                                 z = -tiny * tiny;
1691                         else
1692                                 z = tiny * tiny;
1693                 } else {
1694                         /* subnormal */
1695                         m -= 60;
1696                         t = one;
1697                         __HI(t) -= 60 << 20;
1698                         ix -= m << 20;
1699                         __HI(z) = ix ^ i;
1700                         z *= t;
1701                 }
1702         }
1703         return (z);
1704 }
```

```
**********************************************************
   15261 Sat May 10 12:09:34 2014
new/usr/src/lib/libm/common/m9x/tgammaf.c
comment in tgamma*.c
patch06 - libm: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#pragma weak tgammaf = __tgammaf

/*
 * True gamma function
 *
 * float tgammaf(float x)
 *
 * Algorithm: see tgamma.c
 *
 * Maximum error observed: 0.87ulp (both positive and negative arguments)
 */

#include "libm.h"
#include "libm_synonyms.h"
#include <math.h>
#if defined(__SUNPRO_C)
#include <sunmath.h>
#endif
#include <sys/isa_defs.h>

#if defined(_BIG_ENDIAN)
#define HIWORD  0
#define LOWORD  1
#else
#define HIWORD  1
#define LOWORD  0
#endif
#define __HI(x) ((int *) &x)[HIWORD]
#define __LO(x) ((unsigned *) &x)[LOWORD]
```



```
/* Coefficients for primary intervals GTi() */
static const double cr[] = {
        /* p1 */
        +7.09087253435088360271451613398019280077561279443e-0001,
        -5.17229560788652108545141978238701790105241761089e-0001,
        +5.23403394528150789405825222323770647162337764327e-0001,
        -4.54586308717075010784041566069480411732634814899e-0001,
        +4.20596490915239085459964590559256913498190955233e-0001,
        -3.57307589712377520978332185838241458642142185789e-0001,

        /* p2 */
        +4.28486983980295198166056119223984284434264344578e-0001,
        -1.30704539487709138528680121627899735386650103914e-0001,
        +1.60856285038051955072861219352655851542955430871e-0001,
        -9.22285161346010583774458802067371182158937943507e-0002,
        +7.19240511767225260740890292605070595560626179357e-0002,
        -4.88158265593355093703112238534484636193260459574e-0002,

        /* p3 */
        +3.82409531118807759081121479786092134814808872880e-0001,
        +2.65309888180188647956400403013495759365167853426e-0002,
        +8.06815109775079171923561169415370309376296739835e-0002,
        -1.54821591666137613928840890835174351674007764799e-0002,
        +1.76308239242717268530498313416899188157165183405e-0002,

        /* GZi and TZi */
        +0.93820462790968244940975356158032695769 88,    /* GZ1 */
        +0.88560319441088870027881590058258873320 80,    /* GZ2 */
        +0.93678141146365232161884689708083784974 26,    /* GZ3 */
        -0.35172143578529357910156 25,   /* TZ1 */
        +0.28053063154220581054687 5,    /* TZ3 */
};

#define P10     cr[0]
#define P11     cr[1]
#define P12     cr[2]
#define P13     cr[3]
#define P14     cr[4]
#define P15     cr[5]
#define P20     cr[6]
#define P21     cr[7]
#define P22     cr[8]
#define P23     cr[9]
#define P24     cr[10]
#define P25     cr[11]
#define P30     cr[12]
#define P31     cr[13]
#define P32     cr[14]
#define P33     cr[15]
#define P34     cr[16]
#define GZ1     cr[17]
#define GZ2     cr[18]
#define GZ3     cr[19]
#define TZ1     cr[20]
#define TZ3     cr[21]

/* compute gamma(y) for y in GT1 = [1.0000, 1.2845] */
static double
GT1(double y) {
        double z, r;

        z = y * y;
        r = TZ1 * y + z * ((P10 + y * P11 + z * P12) + (z * y) * (P13 + y *
                P14 + z * P15));
        return (GZ1 + r);
}
```

```
/* compute gamma(y) for y in GT2 = [1.2844, 1.6374] */
static double
GT2(double y) {
        double z;

        z = y * y;
        return (GZ2 + z * ((P20 + y * P21 + z * P22) + (z * y) * (P23 + y *
                P24 + z * P25)));
}

/* compute gamma(y) for y in GT3 = [1.6373, 2.0000] */
static double
GT3(double y) {
double z, r;

        z = y * y;
        r = TZ3 * y + z * ((P30 + y * P31 + z * P32) + (z * y) * (P33 + y *
                P34));
        return (GZ3 + r);
}

/* INDENT OFF */
static const double c[] = {
+1.0,
+2.0,
+0.5,
+1.0e-300,
+6.66671723184851805469362369753923 0e-0001,                    /* A1=T3[0] */
+8.33333309596940652457368887490428119099945731 78e-0002,       /* GP[0] */
-2.77765545601667179767706600890361535225507762168e-0003,       /* GP[1] */
+7.77830853479775281781085278324621033523037489883e-0004,       /* GP[2] */
+4.18938533204672741744150788368695779923320328369e-0001,       /* hln2pi   */
+2.16608493924982901946e-02,                                     /* ln2_32 */
+4.61662413084468283841e+01,                                     /* invln2_32 */
+5.00004103388988968841156421415669985414073453720e-0001,       /* Et1 */
+1.66667656752800761782778278278281102081086875459 08e-0001,    /* Et2 */
};

#define one             c[0]
#define two             c[1]
#define half            c[2]
#define tiny            c[3]
#define A1              c[4]
#define GP0             c[5]
#define GP1             c[6]
#define GP2             c[7]
#define hln2pi          c[8]
#define ln2_32          c[9]
#define invln2_32       c[10]
#define Et1             c[11]
#define Et2             c[12]

/* S[j] = 2**(j/32.) for the final computation of exp(w) */
static const double S[] = {
+1.00000000000000000000e+00,    /* 3FF0000000000000 */
+1.02189714865411662714e+00,    /* 3FF059B0D3158574 */
+1.04427378242741375480e+00,    /* 3FF0B5586CF9890F */
+1.06714040067682369717e+00,    /* 3FF11301D0125B51 */
+1.09050773266525768967e+00,    /* 3FF172B83C7D517B */
+1.11438674259589243221e+00,    /* 3FF1D4873168B9AA */
+1.13878863475669156458e+00,    /* 3FF2387A6E756238 */
+1.16372485877757747552e+00,    /* 3FF29E9DF51FDEE1 */
+1.18920711500272102690e+00,    /* 3FF306FE0A31B715 */
+1.21524735998046895524e+00,    /* 3FF371A7373AA9CB */
+1.24185781207348400201e+00,    /* 3FF3DEA64C123422 */
```



```
+1.26905095719173321989e+00,    /* 3FF44E086061892D */
+1.29683955465100964055e+00,    /* 3FF4BFDAD5362A27 */
+1.32523664315974132322e+00,    /* 3FF5342B569D4F82 */
+1.35425554693689265129e+00,    /* 3FF5AB07DD485429 */
+1.38390988196383202258e+00,    /* 3FF6247EB03A5585 */
+1.41421356237309514547e+00,    /* 3FF6A09E667F3BCD */
+1.44518080697704665027e+00,    /* 3FF71F75E8EC5F74 */
+1.47682614593949934623e+00,    /* 3FF7A11473EB0187 */
+1.50916442759342284141e+00,    /* 3FF82589994CCE13 */
+1.54221082540794074411e+00,    /* 3FF8ACE5422AA0DB */
+1.57598084510788649659e+00,    /* 3FF93737B0CDC5E5 */
+1.61049033194925428347e+00,    /* 3FF9C49182A3F090 */
+1.64575547815396494578e+00,    /* 3FFA5503B23E255D */
+1.68179283050742900407e+00,    /* 3FFAE89F995AD3AD */
+1.71861929812247793414e+00,    /* 3FFB7F76F2FB5E47 */
+1.75625216037329945351e+00,    /* 3FFC199BDD85529C */
+1.79470907500310716820e+00,    /* 3FFCB720DCEF9069 */
+1.83400808640934243066e+00,    /* 3FFD5818DCFBA487 */
+1.87416763411029996256e+00,    /* 3FFDFC97337B9B5F */
+1.91520656139714740007e+00,    /* 3FFEA4AFA2A490DA */
+1.95714412417540017941e+00,    /* 3FFF50765B6E4540 */
};
/* INDENT ON */

/* INDENT OFF */
/*
 * return tgammaf(x) in double for 8<x<=35.040096283... using Stirling's formula
 *      log(G(x)) ~= (x-.5)*(log(x)-1) + .5(log(2*pi)-1) + (1/x)*P(1/(x*x))
 */
/*
 * compute ss = log(x)-1
 *
 *  log(x) - 1 = T1(n) + T2(j) + T3(s), where x = 2**n * y,  1<=y<2,
 *  j=[64*y], z[j]=1+j/64+1/128, s = (y-z[j])/(y+z[j]), and
 *       T1(n-3) = n*log(2)-1,  n=3,4,5
 *       T2(j) = log(z[j]),
 *       T3(s) = 2s + A1*s^3
 *  Note
 *  (1) Remez error for T3(s) is bounded by 2**(-35.8)
 *      (see mpremez/work/Log/tgamma_log_2_outr1)
 */

static const double T1[] = { /* T1[j]=(j+3)*log(2)-1 */
+1.07944154167983592825169636 4375e+00,
+1.77258872223978123766892848 5833e+00,
+2.46573590279972654708616060 7291e+00,
};

static const double T2[] = {   /* T2[j]=log(1+j/64+1/128) */
+7.78214044205494894746290006 1137e-03,
+2.31670592815343782287991609 6229e-02,
+3.83188643021365991937553251 2380e-02,
+5.32445145188122828658701937 8653e-02,
+6.79506619085077493945652777 7263e-02,
+8.24436692110745912681600686 6831e-02,
+9.67296264585511122955705648 746e-02,
+1.10814366340290114194806169 3232e-01,
+1.24703478500957235863406515 3809e-01,
+1.38402322859119135685325873 6016e-01,
+1.51916042025841975071803424 8969e-01,
+1.65249572895307162875611449 2772e-01,
+1.78407657472818297119400241 5109e-01,
+1.91394852999629454609298807 5613e-01,
+2.04215541428690891503820386 1962e-01,
+2.16873938300614359619089525 7443e-01,
+2.29374101064845829991480725 0461e-01,
```

```
+2.41719936887145168144307515913 5e-01,
+2.53915209980963444137323297906 6e-01,
+2.65963548497137941339125926537 5e-01,
+2.77868451003456306186350032923 4e-01,
+2.89633292583042676878893055525 7e-01,
+3.01261330578161781012875538233 8e-01,
+3.12755710003896888386246559688 3e-01,
+3.24119468654211976090670760435 0e-01,
+3.35355541921137830257179579814 2e-01,
+3.46466767346208580918462188425 8e-01,
+3.57455888921803774226009490140 9e-01,
+3.68325561158707653048230154050 4e-01,
+3.79078352934969458390853345631 0e-01,
+3.89716751140025213370463604003 5e-01,
+4.00243164127012706929325101995 1e-01,
+4.10659924985268385934306203175 8e-01,
+4.20969294644129636128867161506 8e-01,
+4.31173464818371340859172478955 6e-01,
+4.41274560804875229489496441661 3e-01,
+4.51274644139458585144692383079 0e-01,
+4.61175715122170166367999925597 9e-01,
+4.70979715218791012546897856056 4e-01,
+4.80688529345751907676618455448 0e-01,
+4.90303988045193838150346159645 7e-01,
+4.99827869556449329821331415247 0e-01,
+5.09261901789807946804074919228 3e-01,
+5.18607764208045632152976996364 8e-01,
+5.27867089620842385113892217783 4e-01,
+5.37041465896883654566729244153 8e-01,
+5.46132437598135650382397209231 2e-01,
+5.55141507540501592715480359515 9e-01,
+5.64070138284802966071384290090 2e-01,
+5.72919753561785509092756726626 3e-01,
+5.81691739634622482520610753725 4e-01,
+5.90387446602176374641916708123 6e-01,
+5.99008189646083399381600024461 7e-01,
+6.07555250224541795510085152791 1e-01,
+6.16029877215514019647565928196 7e-01,
+6.24433288011893501042538744054 7e-01,
+6.32766669571037829545786485036 e-01,
+6.41031794209312910556013344054 e-01,
+6.49227946625109818890839969905 3e-01,
+6.57358072708360030141890023245 9e-01,
+6.65422632545090448950092610006 7e-01,
+6.73422675212166720297960388801 0e-01,
+6.81359224807903068948071559568 1e-01,
+6.89233281238808980324914337814 6e-01,
};
/* INDENT ON */

static double
large_gam(double x) {
        double ss, zz, z, t1, t2, w, y, u;
        unsigned lx;
        int k, ix, j, m;

        ix = __HI(x);
        lx = __LO(x);
        m = (ix >> 20) - 0x3ff;                 /* exponent of x, range:3-5 */
        ix = (ix & 0x000fffff) | 0x3ff00000;    /* y = scale x to [1,2] */
        __HI(y) = ix;
        __LO(y) = lx;
        __HI(z) = (ix & 0xffffc000) | 0x2000;   /* z[j]=1+j/64+1/128 */
        __LO(z) = 0;
        j = (ix >> 14) & 0x3f;
        t1 = y + z;
```



```
        t2 = y - z;
        u = t2 / t1;
        ss = T1[m - 3] + T2[j] + u * (two + A1 * (u * u));
                                                /* ss = log(x)-1 */
        /*
         * compute ww = (x-.5)*(log(x)-1) + .5*(log(2pi)-1) + 1/x*(P(1/x^2)))
         * where ss = log(x) - 1
         */
        z = one / x;
        zz = z * z;
        w = ((x - half) * ss + hln2pi) + z * (GP0 + zz * GP1 + (zz * zz) * GP2);
        k = (int) (w * invln2_32 + half);

        /* compute the exponential of w */
        j = k & 0x1f;
        m = k >> 5;
        z = w - (double) k *ln2_32;
        zz = S[j] * (one + z + (z * z) * (Et1 + z * Et2));
        __HI(zz) += m << 20;
        return (zz);
}
/* INDENT OFF */
/*
 * kpsin(x)= sin(pi*x)/pi
 *                    3        5        7        9
 *      = x+ks[0]*x +ks[1]*x +ks[2]*x +ks[3]*x
 */
static const double ks[] = {
-1.64493404985645811354476665052005342839447790544e+0000,
+8.11740794458351064092797249069438269367389272270e-0001,
-1.90703144603551216933075809162889536878854055202e-0001,
+2.55742333994264563281155312271481108635575331201e-0002,
};
/* INDENT ON */

static double
kpsin(double x) {
        double z;

        z = x * x;
        return (x + (x * z) * ((ks[0] + z * ks[1]) + (z * z) * (ks[2] + z *
                ks[3])));
}

/* INDENT OFF */
/*
 * kpcos(x)= cos(pi*x)/pi
 *                    2        4        6
 *      = kc[0]+kc[1]*x +kc[2]*x +kc[3]*x
 */
static const double kc[] = {
+3.18309886183790671537767526745028724068919291480e-0001,
-1.57079581447762568199467875065854538626594937791e+0000,
+1.29183528092558692844073004029568674027807393862e+0000,
-4.20232949771307685981015914425195471602739075537e-0001,
};
/* INDENT ON */

static double
kpcos(double x) {
        double z;

        z = x * x;
        return (kc[0] + z * (kc[1] + z * kc[2] + (z * z) * kc[3]));
}
```

```
/* INDENT OFF */
static const double
t0z1 = 0.134861805732790769689793935774652917006,
t0z2 = 0.461632144968362341262659542325721328468,
t0z3 = 0.819773101100500601787868704921606996312;
        /* 1.134861805732790769689793935774652917006 */
/* INDENT ON */

/*
 * gamma(x+i) for 0 <= x < 1
 */
static double
gam_n(int i, double x) {
        double rr = 0.0L, yy;
        double z1, z2;

        /* compute yy = gamma(x+1) */
        if (x > 0.2845) {
                if (x > 0.6374)
                        yy = GT3(x - t0z3);
                else
                        yy = GT2(x - t0z2);
        } else
                yy = GT1(x - t0z1);

        /* compute gamma(x+i) = (x+i-1)*...*(x+1)*yy, 0<i<8 */
        switch (i) {
        case 0:         /* yy/x */
                rr = yy / x;
                break;
        case 1:         /* yy */
                rr = yy;
                break;
        case 2:         /* (x+1)*yy */
                rr = (x + one) * yy;
                break;
        case 3:         /* (x+2)*(x+1)*yy */
                rr = (x + one) * (x + two) * yy;
                break;

        case 4:         /* (x+1)*(x+3)*(x+2)*yy */
                rr = (x + one) * (x + two) * ((x + 3.0) * yy);
                break;
        case 5:         /* ((x+1)*(x+4)*(x+2)*(x+3))*yy */
                z1 = (x + two) * (x + 3.0) * yy;
                z2 = (x + one) * (x + 4.0);
                rr = z1 * z2;
                break;
        case 6:         /* ((x+1)*(x+2)*(x+3)*(x+4)*(x+5))*yy */
                z1 = (x + two) * (x + 3.0);
                z2 = (x + 5.0) * yy;
                rr = z1 * (z1 - two) * z2;
                break;
        case 7:         /* ((x+1)*(x+2)*(x+3)*(x+4)*(x+5)*(x+6))*yy */
                z1 = (x + two) * (x + 3.0);
                z2 = (x + 5.0) * (x + 6.0) * yy;
                rr = z1 * (z1 - two) * z2;
                break;
        }
        return (rr);
}

float
tgammaf(float xf) {
        float zf;
        double ss, ww;
```



```
        double x, y, z;
        int i, j, k, ix, hx, xk;

        hx = *(int *) &xf;
        ix = hx & 0x7fffffff;

        x = (double) xf;
        if (ix < 0x33800000)
                return (1.0F / xf);     /* |x| < 2**-24 */

        if (ix >= 0x7f800000)
                return (xf * ((hx < 0)? 0.0F : xf)); /* +-Inf or NaN */

        if (hx > 0x420C290F)    /* x > 35.040096283... overflow */
                return (float)(x / tiny);

        if (hx >= 0x41000000)   /* x >= 8 */
                return ((float) large_gam(x));

        if (hx > 0) {           /* 0 < x < 8 */
                i = (int) xf;
                return ((float) gam_n(i, x - (double) i));
        }

        /* negative x */
        /* INDENT OFF */
        /*
         * compute xk =
         *      -2 ... x is an even int (-inf is considered even)
         *      -1 ... x is an odd int
         *      +0 ... x is not an int but chopped to an even int
         *      +1 ... x is not an int but chopped to an odd int
         */
        /* INDENT ON */
        xk = 0;
        if (ix >= 0x4b000000) {
                if (ix > 0x4b000000)
                        xk = -2;
                else
                        xk = -2 + (ix & 1);
        } else if (ix >= 0x3f800000) {
                k = (ix >> 23) - 0x7f;
                j = ix >> (23 - k);
                if ((j << (23 - k)) == ix)
                        xk = -2 + (j & 1);
                else
                        xk = j & 1;
        }
        if (xk < 0) {
                /* 0/0 invalid NaN, ideally gamma(-n)= (-1)**(n+1) * inf */
                zf = xf - xf;
                return (zf / zf);
        }

        /* negative underflow thresold */
        if (ix > 0x4224000B) {  /* x < -(41+11ulp) */
                if (xk == 0)
                        z = -tiny;
                else
                        z = tiny;
                return ((float)z);
        }

        /* INDENT OFF */
        /* now compute gamma(x) by  -1/((sin(pi*y)/pi)*gamma(1+y)), y = -x */
        /*
```

```
522          * First compute ss = -sin(pi*y)/pi , so that
523          * gamma(x) = 1/(ss*gamma(1+y))
524          */
525         /* INDENT ON */
526         y = -x;
527         j = (int) y;
528         z = y - (double) j;
529         if (z > 0.31830988618379067153776675)
530                 if (z > 0.68169011381620932846223325)
531                         ss = kpsin(one - z);
532                 else
533                         ss = kpcos(0.5 - z);
534         else
535                 ss = kpsin(z);
536         if (xk == 0)
537                 ss = -ss;

539         /* Then compute ww = gamma(1+y)  */
540         if (j < 7)
541                 ww = gam_n(j + 1, z);
542         else
543                 ww = large_gam(y + one);

545         /* return 1/(ss*ww) */
546         return ((float) (one / (ww * ss)));
547 }
```

```
**********************************************************
   40087 Sat May 10 12:09:34 2014
new/usr/src/lib/libm/common/m9x/tgammal.c
comment in tgamma*.c
patch06 - libm: fixed compilation issues after updates
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak tgammal = __tgammal
#endif

#include "libm.h"
#include <sys/isa_defs.h>

#if defined(_BIG_ENDIAN)
#define H0_WORD(x)      ((unsigned *) &x)[0]
#define H3_WORD(x)      ((unsigned *) &x)[3]
#define CHOPPED(x)      (long double) ((double) (x))
#else
#define H0_WORD(x)      ((((int *) &x)[2] << 16) | \
                        (0x0000ffff & (((unsigned *) &x)[1] >> 15)))
#define H3_WORD(x)      ((unsigned *) &x)[0]
#define CHOPPED(x)      (long double) ((float) (x))
#endif

struct LDouble {
        long double h, l;
};

/* INDENT OFF */
/* Primary interval GTi() */
static const long double P1[] = {
        +0.709086836199777919037185741507610124611513720557L,
        +4.457547812064890358279159693673548356673916069 51e-0001L,
        +3.210492987358323823116622738826322100629181538 52e-0002L,
        -5.712967963421066176517652458582891973696888643 50e-0003L,
```



```
        +6.046668928919989770816191749698558316069653527 73e-0003L,
        +8.991061869968887119396278121747652588226586451 68e-0004L,
        -6.964968461444077414312070085270184418101755689 49e-0005L,
        +1.525970461189840208142254093001314450702138824 29e-0005L,
        +5.685210761684956738447114654074321891906815415 47e-0007L,
        +3.307496735196348952205820625202865656104189529 79e-0008L,
};
static const long double Q1[] = {
        +1.0+0000L,
        +1.358065117216710704085708535372570795794906506 68e+0000L,
        +2.975678101534295534053271400960630869940729529 61e-0001L,
        -1.529568359825885715029543728216818516811180978 70e-0001L,
        -2.882485195614201097687816152890820535979545212 18e-0002L,
        +1.034753117199374052197899484563139363023783959 55e-0002L,
        +4.123102032438912223689653601243912973748227423 13e-0004L,
        -3.126537081522908672489319251203807295183325073 88e-0004L,
        +2.366721708504097452373581056677577605270143324 58e-0005L,
};
static const long double P2[] = {
        +0.428486815855585429730209907810650135255270600668084114L,
        +2.627684791038097628056917433054240779795230551176e-0001L,
        +3.811875326853922976083108379951939465914258961 50e-0002L,
        +3.000630758918110438206668461291312559485279253 81e-0003L,
        +2.473154078122791642283984707974986491425134086 54e-0003L,
        +3.628381999178483725861734831472148804647829386 64e-0004L,
        +3.439911059754926239827256440464730300981726924 23e-0006L,
        +4.569021515696032722370142407942576591590454328 95e-0006L,
        +2.137347558375956956020451006755400113529489584 53e-0007L,
        +9.741234405479182307816702669678824922348771253 58e-0009L,
};
static const long double Q2[] = {
        +1.0L,
        +9.182841186325068426646455168307614897005561797 01e-0001L,
        -6.414308588378307660452020769659237761891548749 47e-0003L,
        -1.244008858097710732133457474379641497754109213 76e-0001L,
        +4.698037981462517575388565675224819796247468759 64e-0003L,
        +7.183094470694953159142847051098686962626620827 31e-0003L,
        -8.758126269878946951127226006976534257861663991 05e-0004L,
        -1.235399723777692779959593391884314986266748351 69e-0004L,
        +3.100190175901515987323600978496729254485875477 46e-0005L,
        -1.772602233493326176589218742880267774657823640 70e-0006L,
};
static const long double P3[] = {
        +0.382409479734567504850274766107535564007043938 902L,
        +3.421980930766184954158549063359084271598333777 74e-0001L,
        +9.638281895005855683039614068631532374407027548 58e-0002L,
        +8.760694210426963848524620441885202521568467686 67e-0003L,
        +1.864778903891614912248720141493090152618975374 88e-0003L,
        +8.168713545403098958799747428537013115412869441 91e-0004L,
        +6.837834836746003225186950908646593816501256252 16e-0005L,
        -1.101682697192615747085659351727192092721908284 56e-0006L,
        +9.662432285083804201592348532789067170656297210 16e-0007L,
        +2.318588855791772505411638206711216649743347281 42e-0008L,
};
static const long double Q3[] = {
        +1.0L,
        +8.254798211688136346324374300903762525127930673 39e-0001L,
        -1.622513630739377697396396236692951103460155763 20e-0002L,
        -1.106212869059167327587451306294265596911875798 52e-0001L,
        +3.483096939709856126444464157892300155153652914 59e-0003L,
        +6.735537374874883330324312611312896723470434013 28e-0003L,
        -7.632220083933726301627435878110046130502451280 51e-0004L,
        -1.357926706691906314767847689619537117730732513 36e-0004L,
        +3.196101509542235870062207300656081564602056906 18e-0005L,
        -1.820965538628223466101095220151295856933543483 22e-0006L,
};
```

```
126 static const long double
127 #if defined(__x86)
128 GZ1_h   =  0.9382046279096824493645701004140846634982153 77L,
129 GZ1_l   =  4.5183461166242294200553276327185306172279441 06e-20L,
130 GZ2_h   =  0.8856031944108887002647251263098837625875603 40L,
131 GZ2_l   =  1.4090774272704970620391192907765082170772971 69e-20L,
132 GZ3_h   =  0.9367814114636523216135370606405530224947142 41L,
133 GZ3_l   =  5.3098364402848272478977729638872190352219968 13e-21L,
134 #else
135 GZ1_h   =  0.9382046279096824494097535615803269108546470 31L,
136 GZ1_l   =  4.6844121621994600896424525809023459764462970 37e-35L,
137 GZ2_h   =  0.8856031944108887002788159005825886581926587 94L,
138 GZ2_l   =  7.5015292738902537892199355697587135346410748 60e-35L,
139 GZ3_h   =  0.9367814114636523216188468970808378188553998 40L,
140 GZ3_l   =  3.0887212174047843635855919145293616874037769 17e-35L,
141 #endif
142 TZ1     = -0.3517214357852935791015625L,
143 TZ3     =  0.2805306315422058105468 75L;
144 /* INDENT ON */

146 /* INDENT OFF */
147 /*
148  * compute gamma(y=yh+yl) for y in GT1 = [1.0000, 1.2845]
149  * ...assume yh got 53 or 24(i386) significant bits
150  */
151 /* INDENT ON */
152 static struct LDouble
153 GT1(long double yh, long double yl) {
154         long double t3, t4, y;
155         int i;
156         struct LDouble r;

158         y = yh + yl;
159         for (t4 = Q1[8], t3 = P1[8] + y * P1[9], i = 7; i >= 0; i--) {
160                 t4 = t4 * y + Q1[i];
161                 t3 = t3 * y + P1[i];
162         }
163         t3 = (y * y) * t3 / t4;
164         t3 += (TZ1 * yl + GZ1_l);
165         t4 = TZ1 * yh;
166         r.h = CHOPPED((t4 + GZ1_h + t3));
167         t3 += (t4 - (r.h - GZ1_h));
168         r.l = t3;
169         return (r);
170 }

172 /* INDENT OFF */
173 /*
174  * compute gamma(y=yh+yl) for y in GT2 = [1.2844, 1.6374]
175  * ...assume yh got 53 significant bits
176  */
177 /* INDENT ON */
178 static struct LDouble
179 GT2(long double yh, long double yl) {
180         long double t3, t4, y;
181         int i;
182         struct LDouble r;

184         y = yh + yl;
185         for (t4 = Q2[9], t3 = P2[9], i = 8; i >= 0; i--) {
186                 t4 = t4 * y + Q2[i];
187                 t3 = t3 * y + P2[i];
188         }
189         t3 = GZ2_l + (y * y) * t3 / t4;
190         r.h = CHOPPED((GZ2_h + t3));
```



```
191         r.l = t3 - (r.h - GZ2_h);
192         return (r);
193 }

195 /* INDENT OFF */
196 /*
197  * compute gamma(y=yh+yl) for y in GT3 = [1.6373, 2.0000]
198  * ...assume yh got 53 significant bits
199  */
200 /* INDENT ON */
201 static struct LDouble
202 GT3(long double yh, long double yl) {
203         long double t3, t4, y;
204         int i;
205         struct LDouble r;

207         y = yh + yl;
208         for (t4 = Q3[9], t3 = P3[9], i = 8; i >= 0; i--) {
209                 t4 = t4 * y + Q3[i];
210                 t3 = t3 * y + P3[i];
211         }
212         t3 = (y * y) * t3 / t4;
213         t3 += (TZ3 * yl + GZ3_l);
214         t4 = TZ3 * yh;
215         r.h = CHOPPED((t4 + GZ3_h + t3));
216         t3 += (t4 - (r.h - GZ3_h));
217         r.l = t3;
218         return (r);
219 }

221 /* INDENT OFF */
222 /* Hex value of GP[0] shoule be 3FB55555 55555555 */
223 static const long double GP[] = {
224         +0.0833333333333333333333333333333172839171301L,
225         -2.7777777777777777777777777749250121199939942410 4e-0003L,
226         +7.9365079365079365079365365054163823635002088324 3e-0004L,
227         -5.9523809523809523805729977267932450333924196170 4e-0004L,
228         +8.4175084175084169613842298797768352492614260032 1e-0004L,
229         -1.9175269175268668282503254782369966217884212330 8e-0003L,
230         +6.4102564102240348092189155935647345116127935932 2e-0003L,
231         -2.9550653579841401918981958745557700373280818507 1e-0002L,
232         +1.7964436722997003148607918006092307347656873213 6e-0001L,
233         -1.3924308648727466217456287256705720025564929064 6e+0000L,
234         +1.3402587404441796218867781647784226525960826977 5e+0001L,
235         -1.5680371348012746941449554539998250870074827431 8e+0002L,
236         +2.1873984165620156169492763033509931396892449389 1e+0003L,
237         -3.5524984864410033841918703809092541097623792126 9e+0004L,
238         +6.4346488043783528621676895943948437644917957645 2e+0005L,
239         -1.2045915438557701499260034278282138960589390462 4e+0007L,
240         +2.0926324963735129856393494234974971849107109321 0e+0008L,
241         -2.9624748318316921934374531643389959983468570345 7e+0009L,
242         +2.8898493360589603315472762608650675697232729298 1e+0010L,
243         -1.4096043414603000773283838241623061030267806398 4e+0011L,      /* 19 */
244 };

246 static const long double T3[] = {
247         +0.6666666666666666666666666666666634567834260213L,   /* T3[0] */
248         +0.4000000000000000000000000040853636176634934140L,   /* T3[1] */
249         +0.2857142857142857142856969752527539878690202634 48L,   /* T3[2] */
250         +0.2222222222222222225593221101192317258554772129875L,   /* T3[3] */
251         +0.1818181818178501921058471834617781867037792629 16L,   /* T3[4] */
252         +0.1538461698613486337571012859523333692225670145 96L,   /* T3[5] */
253         +0.1330334628892601939222612967728412299850475712 65L,   /* T3[6] */
254 };

256 static const long double c[] = {
```

```
0.0L,
1.0L,
2.0L,
0.5L,
1.0e-4930L,                                                     /* tiny */
4.189376831054687500000e-01L,                                   /* hln2pim1_h */
8.500992039917803297364056176398613974736377834128171152e-07L,   /* hln2pim1_l */
0.418938533204672741780329736405617639861397473637783412817152L, /* hln2pim1 */
2.166084938653511926531791687011718 75e-02L,                    /* ln2_32hi */
5.963171653970586925450830252359379198757976691271 30e-12L,     /* ln2_32lo */
46.166241308446829035517589792060548397652670532895549892 33L,   /* invln2_32 */
#if defined(__x86)
1.755548342904462917002383903763984562829 1e+03L,               /* overflow */
#else
1.755548342904462917003889216070203203417 7e+03L,               /* overflow */
#endif
};

#define zero            c[0]
#define one             c[1]
#define two             c[2]
#define half            c[3]
#define tiny            c[4]
#define hln2pim1_h      c[5]
#define hln2pim1_l      c[6]
#define hln2pim1        c[7]
#define ln2_32hi        c[8]
#define ln2_32lo        c[9]
#define invln2_32       c[10]
#define overflow        c[11]

/*
 * |exp(r) - (1+r+Et0*r^2+...+Et10*r^12)| <= 2^(-128.88) for |r|<=ln2/64
 */
static const long double Et[] = {
        +5.0000000000000000000e-1L,
        +1.6666666666666666666666666668288351662921524 66e-0001L,
        +4.1666666666666666666666666666693398646592712189e-0002L,
        +8.3333333333333333333333174877451260177559111595 1e-0003L,
        +1.3888888888888888888888884536011511394764753997e-0003L,
        +1.9841269841269841323714035009299325268419888 2102e-0004L,
        +2.4801587301587301608022202535744265989581437 1694e-0005L,
        +2.7557319223902892111457298644197214093343231 7798e-0006L,
        +2.7557319223944847055554810289552636973985621 9317e-0007L,
        +2.5052167786768393594085399799593760021416723 2477e-0008L,
        +2.0876792889901036737498444851368556651415214 7362e-0009L,
};

/*
 * long double precision coefficients for computing log(x)-1 in tgamma.
 *  See "algorithm" for details
 *
 *  log(x) - 1 = T1(n) + T2(j) + T3(s), where x = 2**n * y,  1<=y<2,
 *  j=[64*y], z[j]=1+j/64+1/128, s = (y-z[j])/(y+z[j]), and
 *       T1(n) = T1[2n,2n+1] = n*log(2)-1,
 *       T2(j) = T2[2j,2j+1] = log(z[j]),
 *       T3(s) = 2s + T3[0]s^3 + T3[1]s^5 + T3[2]s^7 + ... + T3[6]s^15
 *  Note
 *  (1) the leading entries are truncated to 24 binary point.
 *  (2) Remez error for T3(s) is bounded by 2**(-136.54)
 */
static const long double T1[] = {
-1.0000000000000000000000000000000000000000000e+00L,
        +0.0000000000000000000000000000000000000000000e+00L,
-3.0685281753540039062500000000000000000000e-01L,
-1.9046542999577678785418234319245000011926579e-09L,
```



```
        +3.8629430532455444335937500000000000000000e-01L,
        +5.5795336175475089242916353136151001411076 47e-08L,
        +1.0794414877891540527343750000000000000000e+00L,
        +5.3890681875517321364374529704226502116614 70e-08L,
        +1.7725886702537536621093750000000000000000e+00L,
        +5.1986027575559553485832706272302002822152 94e-08L,
        +2.4657358527183532714843750000000000000000e+00L,
        +5.0081373275601785607290882840377503527691 17e-08L,
        +3.1588830351829528808593750000000000000000e+00L,
        +4.8176718975644017728749059408452998493510 90e-08L,
        +3.8520302176475524902343750000000000000000e+00L,
        +4.6272064675686249850207235976528499199049 13e-08L,
        +4.5451774001121520996093750000000000000000e+00L,
        +4.4367410375728481971665412544603999904587 37e-08L,
        +5.2383245825767517089843750000000000000000e+00L,
        +4.2462756075770714093123589112679500610125 60e-08L,
        +5.9314717650413513183593750000000000000000e+00L,
        +4.0558101775812946214581765680755001315663 84e-08L,
};

/*
 * T2[2i,2i+1] = log(1+i/64+1/128)
 */
static const long double T2[] = {
        +7.7821016311645507812500000000000000000000e-03L,
        +3.8810890398166212900061136763678127453570e-08L,
        +2.3167014122009277343750000000000000000000e-02L,
        +4.5159525100885049160962289916579411752759e-08L,
        +3.8318812847137451171875000000000000000000e-02L,
        +5.1454999148021880325123797290345960518164e-08L,
        +5.3244471549987792968750000000000000000000e-02L,
        +4.2968824489897120193786528776939573415076e-08L,
        +6.7950606346130371093750000000000000000000e-02L,
        +5.5562377378300815277772629414034632394030e-08L,
        +8.2443654537200927734375000000000000000000e-02L,
        +1.4673873663533785068683078059140953666 00e-08L,
        +9.6729576587677001953125000000000000000000e-02L,
        +4.9870874110342446056487463437015041543346e-08L,
        +1.1081433296203613281250000000000000000000e-01L,
        +3.3378253981382306169323211928098474801099e-08L,
        +1.2470346689224243164062500000000000000000e-01L,
        +1.1608714804222781515380863268491613205318e-08L,
        +1.3840228319168090820312500000000000000000e-01L,
        +3.9667438227482200873601649187393160823607e-08L,
        +1.5191602706909179687500000000000000000000e-01L,
        +1.4956750178196803424896884511327584958252e-08L,
        +1.6524952650070190429687500000000000000000e-01L,
        +4.6394605258578736449277240313729237989366e-08L,
        +1.7840760946273803710937500000000000000000e-01L,
        +4.8010080260010025241510941968354682199540e-08L,
        +1.9139480590820312500000000000000000000000e-01L,
        +4.7091426329609298807561308873447039132856e-08L,
        +2.0421552658081054687500000000000000000000e-01L,
        +1.4847880344628820386196239272213742113867e-08L,
        +2.1687388420104980468750000000000000000000e-01L,
        +5.4099564554931589525744347498478964801484e-08L,
        +2.2937405109405517578125000000000000000000e-01L,
        +4.9970790654210230725046139871550961365282e-08L,
        +2.4171990156173706054687500000000000000000e-01L,
        +3.5325408107597432515913513900103385655073e-08L,
        +2.5391519069671630859375000000000000000000e-01L,
        +1.9284247135543573297906606667466299224747e-08L,
        +2.6596349477767944335937500000000000000000e-01L,
        +5.3719458497979750926537543389268821141517e-08L,
        +2.7786844968795776367187500000000000000000e-01L,
        +1.3154985425144750329234012330820349974537e-09L,
```

```
389         +2.89633274078369140625000000000000000000e-01L,
390         +1.85046735362538930555256689700038603697 60e-08L,
391         +3.01261305809020996093750000000000000000e-01L,
392         +2.47691407849191255382337554926573526807 23e-08L,
393         +3.12755703926086425781250000000000000000e-01L,
394         +6.07781046260499655968831903215978614554 75e-09L,
395         +3.24119448661804199218750000000000000000e-01L,
396         +1.99924077768719207604349873521823361588 73e-08L,
397         +3.35355520248413085937500000000000000000e-01L,
398         +2.16727247443196795798141661990744330068 07e-08L,
399         +3.46466720104217529296875000000000000000e-01L,
400         +4.72419910516215871884257729507118305384 14e-08L,
401         +3.57455849647521972656250000000000000000e-01L,
402         +3.92742818015697594901409044744346699565 62e-08L,
403         +3.68325531482696533203125000000000000000e-01L,
404         +2.96760111198451051540503988268971787657 58e-08L,
405         +3.79078328609466552734375000000000000000e-01L,
406         +2.43255029056564783456310198588814080092 10e-08L,
407         +3.89716744422912597656250000000000000000e-01L,
408         +6.71711261571421360400352086705105565294 87e-09L,
409         +4.00243163108825683593750000000000000000e-01L,
410         +1.01818702333557510199513117007994061249 57e-09L,
411         +4.10659909248352050781250000000000000000e-01L,
412         +1.57369163351530562031758227876615675342 20e-08L,
413         +4.20969247817993164062500000000000000000e-01L,
414         +4.68261364720663671615067959724498572687 07e-08L,
415         +4.31173443794250488281250000000000000000e-01L,
416         +2.10241208525779224789555949984801440512 25e-08L,
417         +4.41274523735046386718750000000000000000e-01L,
418         +3.70698288427707464416613012253626055287 86e-08L,
419         +4.51274633407592773437500000000000000000e-01L,
420         +1.07318658117071923830790124786859228790 10e-08L,
421         +4.61175680160522460937500000000000000000e-01L,
422         +3.49616477054304999255978553586030990305 15e-08L,
423         +4.70979690551757812500000000000000000000e-01L,
424         +2.46670332000468978560563592513735109646 34e-08L,
425         +4.80688512325286865234375000000000000000e-01L,
426         +1.70204650424422434554480115512088612168 78e-08L,
427         +4.90303933620452880859375000000000000000e-01L,
428         +5.44247409572909711596457468605305833095 71e-08L,
429         +4.99827861785888671875000000000000000000e-01L,
430         +7.77056065794633141524704414151265735661 05e-09L,
431         +5.09261846542358398437500000000000000000e-01L,
432         +5.52474495483665749192283238248785657457 13e-08L,
433         +5.18607735633850097656250000000000000000e-01L,
434         +2.85741955344967269963647986985562357308 48e-08L,
435         +5.27867078781127929687500000000000000000e-01L,
436         +1.08397144554263922177783009635585220881 93e-08L,
437         +5.37041425704956054687500000000000000000e-01L,
438         +4.01919275998792292441538322990237443459 99e-08L,
439         +5.46132385730743408203125000000000000000e-01L,
440         +5.18673922421792722092312091638649717928 89e-08L,
441         +5.55141448974609375000000000000000000000e-01L,
442         +5.85658922177154803595159040501701257431 78e-08L,
443         +5.64070105552673339843750000000000000000e-01L,
444         +3.27321296262276342900901907118176816923 54e-08L,
445         +5.72919726371765136718750000000000000000e-01L,
446         +2.71900203723740067266262610686264003939 36e-08L,
447         +5.81691682338714599609375000000000000000e-01L,
448         +5.72959078829112357537253723407099675973 94e-08L,
449         +5.90387403964996337890625000000000000000e-01L,
450         +4.26371800367512917081235987575777836150 14e-08L,
451         +5.99008142948150634765625000000000000000e-01L,
452         +4.66979327646159750244616515020604740487 74e-08L,
453         +6.07555210590362548828125000000000000000e-01L,
454         +3.96341792466729601527911253718931498206 25e-08L,
```



```
455         +6.16029858589172363281250000000000000000e-01L,
456         +1.86263416563663159281967006502925296882 19e-08L,
457         +6.24433279037475585937500000000000000000e-01L,
458         +8.97441791510503874404567311990939039879 228e-09L,
459         +6.32766664028167724609375000000000000000e-01L,
460         +5.54287010493641146850357975848875860997 26e-09L,
461         +6.41031146049499511718750000000000000000e-01L,
462         +3.33714317793368513344053925467089490473 61e-08L,
463         +6.49227917194366455078125000000000000000e-01L,
464         +2.94307433638127149699053111222712691008 85e-08L,
465         +6.57358050346374511718750000000000000000e-01L,
466         +2.23619855184231400232459361655141470932 50e-08L,
467         +6.65422618389129638671875000000000000000e-01L,
468         +1.41559608102782176100066601811483030916 49e-08L,
469         +6.73422634601593017578125000000000000000e-01L,
470         +4.06105737027198353888010172647508434778 78e-08L,
471         +6.81359171867370605468750000000000000000e-01L,
472         +5.29405324634793215595680894417355841566 89e-08L,
473         +6.89233243465423583984375000000000000000e-01L,
474         +3.77733853963405393378146039032327962165 37e-08L,
475 };

477 /*
478  * S[j],S_trail[j] = 2**(j/32.) for the final computation of exp(t+w)
479  */
480 static const long double S[] = {
481 #if defined(__x86)
482         +1.00000000000000000000000000e+00L,
483         +1.02189714865411667820815 22e+00L,
484         +1.04427378242741384023820 06e+00L,
485         +1.06714040067682361812972 24e+00L,
486         +1.09050773266525765910033 02e+00L,
487         +1.11438674259589253628943 69e+00L,
488         +1.13878863475669165369712 21e+00L,
489         +1.16372485877757751379386 19e+00L,
490         +1.18920711500272106668756 74e+00L,
491         +1.21524735998046887804763 25e+00L,
492         +1.24185781207348404852567 47e+00L,
493         +1.26905095719173322248857 22e+00L,
494         +1.29683955465100966592158 22e+00L,
495         +1.32523664315974129459391 18e+00L,
496         +1.35425554693689272826688 52e+00L,
497         +1.38390988196383195481514 03e+00L,
498         +1.41421356237309504876378 81e+00L,
499         +1.44518080697704662002534 70e+00L,
500         +1.47682614593949931131554 31e+00L,
501         +1.50916442759342273971338 85e+00L,
502         +1.54221082540749082358596 30e+00L,
503         +1.57598084510788648640068 62e+00L,
504         +1.61049033194925430808371 74e+00L,
505         +1.64575547815396484451107 30e+00L,
506         +1.68179283050742908603783 50e+00L,
507         +1.71861929812247791560329 14e+00L,
508         +1.75625216037329948310947 30e+00L,
509         +1.79470907500310718641484 13e+00L,
510         +1.83400808640934246336891 66e+00L,
511         +1.87416763411029990130021 03e+00L,
512         +1.91520656139714729382025 89e+00L,
513         +1.95714412417540026896574 38e+00L,
514 #else
515         +1.0000000000000000000000000000000000e+00L,
516         +1.02189714865411667823448013478329942e+00L,
517         +1.04427378242741384032196647873992910e+00L,
518         +1.06714040067682361816952112099280918e+00L,
519         +1.09050773266525765920701065576070789e+00L,
520         +1.11438674259589253630881295691960313e+00L,
```

```
        +1.13878863475669165370383028384151134e+00L,
        +1.16372485877757751381357359909218536e+00L,
        +1.18920711500272106671749997056047593e+00L,
        +1.21524735998046887811652025133879836e+00L,
        +1.24185781207348404859367746872659561e+00L,
        +1.26905095719173322255441908103233805e+00L,
        +1.29683955465100966593375411779245118e+00L,
        +1.32523664315974129462953709549872168e+00L,
        +1.35425554693689272829801474014070273e+00L,
        +1.38390988196383195487265952726519287e+00L,
        +1.41421356237309504880168872420969798e+00L,
        +1.44518080697704662003700624147167095e+00L,
        +1.47682614593949931138690748037404985e+00L,
        +1.50916442759342273976601955103319352e+00L,
        +1.54221082540794082361229186209073479e+00L,
        +1.57598084510788648645527016018190504e+00L,
        +1.61049033194925430817952066735740067e+00L,
        +1.64575547815396484451875672472582254e+00L,
        +1.68179283050742908606225095246642969e+00L,
        +1.71861929812247791562934437645631244e+00L,
        +1.75625216037329948311216061937531314e+00L,
        +1.79470907500310718642770324212778174e+00L,
        +1.83400808640934246348708318958828892e+00L,
        +1.87416763411029990132999894995444645e+00L,
        +1.91520656139714729387261127029583086e+00L,
        +1.95714412417540026901832225162687149e+00L,
#endif
};
static const long double S_trail[] = {
#if defined(__x86)
        +0.0000000000000000000000000e+00L,
        +2.6327965667180882569382524e-20L,
        +8.3765863521895191129661899e-20L,
        +3.9798705777454504249209575e-20L,
        +1.0668046596651558640993042e-19L,
        +1.9376009847285360448117114e-20L,
        +6.7081819456112953751277576e-21L,
        +1.9711680502629186462729727e-20L,
        +2.9932584438449523689104569e-20L,
        +6.8887754153039109411061914e-20L,
        +6.8002718741225378942847820e-20L,
        +6.5846917376975403439742349e-20L,
        +1.2171958727511372194876001e-20L,
        +3.5625253228704087115438260e-20L,
        +3.1129551559077560956309179e-20L,
        +5.7519192396164779846216492e-20L,
        +3.7900651177865141593101239e-20L,
        +1.1659262405698741798080115e-20L,
        +7.1364385105284695967172478e-20L,
        +5.2631003710812203588788949e-20L,
        +2.6328853788732632868460580e-20L,
        +5.4583950085438242788190141e-20L,
        +9.5803254376938269960718656e-20L,
        +7.6837733983874245823512279e-21L,
        +2.4415965910835093824202087e-20L,
        +2.6052966871016580981769728e-20L,
        +2.6876456344632553875309579e-21L,
        +1.2861930155613700201703279e-20L,
        +8.8166633394037485606572294e-20L,
        +2.9788615389580190940837037e-20L,
        +5.2352341619805098677422139e-20L,
        +5.2578463064010463732242363e-20L,
#else
        +0.00000000000000000000000000000000000e+00L,
        +1.80506787420330954745573333054573786e-35L,
-9.37452029228042742195756741973083214e-35L,
```



```
-1.59696844729275877071290963023149997e-35L,
        +9.11249341012502297851168610167248666e-35L,
-6.50422820697854828723037477525938871e-35L,
-8.14846884452585113732569176748815532e-35L,
-5.06621457672180031337233074514290335e-35L,
-1.35983097468881697374987563824591912e-35L,
        +9.49742763556319647030771056643324660e-35L,
-3.28317052317699860161506596533391526e-36L,
-5.01723570938719041029018653045842895e-35L,
-2.39147479768910917162283430160264014e-35L,
-8.35057135763390881529889073794408385e-36L,
        +7.03675688907326504242173719067187644e-35L,
-5.18248485306464645753689301856695619e-35L,
        +9.42224254862183206569211673639406488e-35L,
-3.96750082539886230916730613021641828e-35L,
        +7.14352899156330061452327361509276724e-35L,
        +1.15987125286798512424651783410044433e-35L,
        +4.69693347835811549530973921320187447e-35L,
-3.38651317599500471079924198499981917e-35L,
-8.58731877429824706886865593510387445e-35L,
-9.60595154874935050318549936224606909e-35L,
        +9.60973393212801278450755869714178581e-35L,
        +6.37839792144002843924476144978084855e-35L,
        +7.79243078569586424945646112516927770e-35L,
        +7.36133776758845652413193083663393220e-35L,
-6.47299514791334723003521457561217053e-35L,
        +8.58747441795369869427879806229522962e-35L,
        +2.37181542282517483569165122830269098e-35L,
-3.02689168209611877300459737342190031e-37L,
#endif
};
/* INDENT ON */

/* INDENT OFF */
/*
 * return tgamma(x) scaled by 2**-m for 8<x<=171.62... using Stirling’s formula
 *     log(G(x)) ~= (x-.5)*(log(x)-1) + .5(log(2*pi)-1) + (1/x)*P(1/(x*x))
 *                = L1 + L2 + L3,
 */
/* INDENT ON */
static struct LDouble
large_gam(long double x, int *m) {
        long double z, t1, t2, t3, z2, t5, w, y, u, r, v;
        long double t24 = 16777216.0L, p24 = 1.0L / 16777216.0L;
        int n2, j2, k, ix, j, i;
        struct LDouble zz;
        long double u2, ss_h, ss_l, r_h, w_h, w_l, t4;

/* INDENT OFF */
/*
 * compute ss = ss.h+ss.l = log(x)-1 (see tgamma_log.h for details)
 *
 *  log(x) - 1 = T1(n) + T2(j) + T3(s), where x = 2**n * y,  1<=y<2,
 *  j=[64*y], z[j]=1+j/64+1/128, s = (y-z[j])/(y+z[j]), and
 *       T1(n) = T1[2n,2n+1] = n*log(2)-1,
 *       T2(j) = T2[2j,2j+1] = log(z[j]),
 *       T3(s) = 2s + T3[0]s^3 + T3[1]s^5 + ... + T3[6]s^15
 *  Note
 *  (1) the leading entries are truncated to 24 binary point.
 *  (2) Remez error for T3(s) is bounded by 2**(-72.4)
 *                                   2**(-24)
 *                           _________V___________________
 *               T1(n):     |_________|___________________|
 *                             _______ ______________________
 *               T2(j):       |_______|______________________|
 *                                ____ _______________________
```

```
 *               2s:             |____|_____________________|
 *                                                 _____________________
 *          +    T3(s)-2s:            |_____________________|
 *                        ----------------------------------------
 *                           [leading] + [Trailing]
 */
        /* INDENT ON */
        ix = H0_WORD(x);
        n2 = (ix >> 16) - 0x3fff;       /* exponent of x, range:3-10 */
        y = scalbnl(x, -n2);    /* y = scale x to [1,2] */
        n2 += n2;               /* 2n */
        j = (ix >> 10) & 0x3f;  /* j */
        z = 1.0078125L + (long double) j * 0.015625L;   /* z[j]=1+j/64+1/128 */
        j2 = j + j;
        t1 = y + z;
        t2 = y - z;
        r = one / t1;
        u = r * t2;             /* u = (y-z)/(y+z) */
        t1 = CHOPPED(t1);
        t4 = T2[j2 + 1] + T1[n2 + 1];
        z2 = u * u;
        k = H0_WORD(u) & 0x7fffffff;
        t3 = T2[j2] + T1[n2];
        for (t5 = T3[6], i = 5; i >= 0; i--)
                t5 = z2 * t5 + T3[i];
        if ((k >> 16) < 0x3fec) {       /* |u|<2**-19 */
                t2 = t4 + u * (two + z2 * t5);
        } else {
                t5 = t4 + (u * z2) * t5;
                u2 = u + u;
                v = (long double) ((int) (u2 * t24)) * p24;
                t2 = t5 + r * ((two * t2 - v * t1) - v * (y - (t1 - z)));
                t3 += v;
        }
        ss_h = CHOPPED((t2 + t3));
        ss_l = t2 - (ss_h - t3);
/* INDENT OFF */
/*
 * compute ww = (x-.5)*(log(x)-1) + .5*(log(2pi)-1) + 1/x*(P(1/x^2)))
 * where ss = log(x) - 1 in already in extra precision
 */
        /* INDENT ON */
        z = one / x;
        r = x - half;
        r_h = CHOPPED((r));
        w_h = r_h * ss_h + hln2pim1_h;
        z2 = z * z;
        w = (r - r_h) * ss_h + r * ss_l;
        t1 = GP[19];
        for (i = 18; i > 0; i--)
                t1 = z2 * t1 + GP[i];
        w += hln2pim1_l;
        w_l = z * (GP[0] + z2 * t1) + w;
        k = (int) ((w_h + w_l) * invln2_32 + half);

        /* compute the exponential of w_h+w_l */

        j = k & 0x1f;
        *m = k >> 5;
        t3 = (long double) k;

        /* perform w - k*ln2_32 (represent as w_h - w_l) */
        t1 = w_h - t3 * ln2_32hi;
        t2 = t3 * ln2_32lo;
        w = t2 - w_l;
        w_h = t1 - w;
```



```
        w_l = w - (t1 - w_h);

        /* compute exp(w_h-w_l) */
        z = w_h - w_l;
        for (t1 = Et[10], i = 9; i >= 0; i--)
                t1 = z * t1 + Et[i];
        t3 = w_h - (w_l - (z * z) * t1);        /* t3 = expm1(z) */
        zz.l = S_trail[j] * (one + t3) + S[j] * t3;
        zz.h = S[j];
        return (zz);
}

/* INDENT OFF */
/*
 * kpsin(x)= sin(pi*x)/pi
 *                  3       5       7       9       11                27
 *      = x+ks[0]*x +ks[1]*x +ks[2]*x +ks[3]*x +ks[4]*x  + ... + ks[12]*x
 */
static const long double ks[] = {
        -1.64493406684822643647241516664602518705158902870e+0000L,
        +8.11742425283353643637002772405874238094995726160e-0001L,
        -1.90751824122084213696472111835337366232282723933e-0001L,
        +2.61478478176548005046532613563241288115395517084e-0002L,
        -2.34608103545582363750893072647117829448016479971e-0003L,
        +1.48428793031071003684606647212534027556262040158e-0004L,
        -6.97587366165638046518462722252768122615952898698e-0006L,
        +2.53121740413702536928659271747187500934840057929e-0007L,
        -7.30471182221385990397683641695766121301933621956e-0009L,
        +1.71653847451163495739958249695549313987973589884e-0010L,
        -3.34813314714560776122245796929054813458341420565e-0012L,
        +5.50724992262622033449487808306969135431411753047e-0014L,
        -7.67678132753577998601234393215802221104236979928e-0016L,
};
/* INDENT ON */

/*
 * assume x is not tiny and positive
 */
static struct LDouble
kpsin(long double x) {
        long double z, t1, t2;
        struct LDouble xx;
        int i;

        z = x * x;
        xx.h = x;
        for (t2 = ks[12], i = 11; i > 0; i--)
                t2 = z * t2 + ks[i];
        t1 = z * x;
        t2 *= z * t1;
        xx.l = t1 * ks[0] + t2;
        return (xx);
}

/* INDENT OFF */
/*
 * kpcos(x)= cos(pi*x)/pi
 *                      2       4       6       8       10       12
 *      = 1/pi +kc[0]*x +kc[1]*x +kc[2]*x +kc[3]*x +kc[4]*x  +kc[5]*x
 *
 *                      2       4       6       8       10              22
 *      = 1/pi - pi/2*x +kc[0]*x +kc[1]*x +kc[2]*x +kc[3]*x  +...+kc[9]*x
 *
 * -pi/2*x*x = (npi_2_h + npi_2_l) * (x_f+x_l)*(x_f+x_l)
 *         =  npi_2_h*(x_f+x_l)*(x_f+x_l) + npi_2_l*x*x
 *         =  npi_2_h*x_f*x_f + npi_2_h*(x*x-x_f*x_f) + npi_2_l*x*x
```

```
 *         =  npi_2_h*x_f*x_f + npi_2_h*(x+x_f)*(x-x_f) + npi_2_l*x*x
 * Here x_f = (long double) (float)x
 * Note that pi/2(in hex) =
 *  1.921FB54442D18469898CC51701B839A252049C1114CF98E804177D4C76273644A29
 * npi_2_h = -pi/2 chopped to 25 bits = -1.921FB5000000000000000000000000 =
 *  -1.57079631090164184570312500000000 and
 * npi_2_l =
 *  -0.0000004442D18469898CC51701B839A252049C1114CF98E804177D4C76273644A29 =
 *  -.000000015893254773528196691639751442098584699687552910487472296153 =
 *  -1.589325477352819669163975144209858469968755291048747229615 3e-8
 * 1/pi(in hex) =
 *  .517CC1B727220A94FE13ABE8FA9A6EE06DB14ACC9E21C820FF28B1D5EF5DE2B
 * will be splitted into:
 *  one_pi_h = 1/pi chopped to 48 bits = .517CC1B727220000000000...  and
 *  one_pi_l = .0000000000000A94FE13ABE8FA9A6EE06DB14ACC9E21C820FF28B1D5EF5DE2B
 */

static const long double
#if defined(__x86)
one_pi_h = 0.31830988618481994390487670898437500L,       /* 31 bits */
one_pi_l = 3.55912324890004369012787240689192914 8e-11L,
#else
one_pi_h = 0.31830988618379052468299050815403461456298828125L,
one_pi_l = 1.46854777018590994109505931010230912897495334688117e-16L,
#endif
npi_2_h = -1.57079631090164184570312500000000L,
npi_2_l = -1.58932547735281966916397514420985846996875529104874722961539e-8L;

static const long double kc[] = {
        +1.29192819501249250731151312779548918765320728489e+0000L,
        -4.25027339979557573976029596929319207009444090366e-0001L,
        +7.49080661650990096109672954618317623888421628613e-0002L,
        -8.21458866111282287985539464173976555436050215120e-0003L,
        +6.14202578809529228503205255165761204750211603402e-0004L,
        -3.33073432691149607007217330302595267179545908740e-0005L,
        +1.36970959047832085796809745461530865597993680204e-0006L,
        -4.41780774262583514450246512727201806217271097336e-0008L,
        +1.14741409212381858820016567664488123478660705759e-0009L,
        -2.44261236114707374558437500654381006300502749632e-0011L,
};
/* INDENT ON */

/*
 * assume x is not tiny and positive
 */
static struct LDouble
kpcos(long double x) {
        long double z, t1, t2, t3, t4, x4, x8;
        int i;
        struct LDouble xx;

        z = x * x;
        xx.h = one_pi_h;
        t1 = (long double) ((float) x);
        x4 = z * z;
        t2 = npi_2_l * z + npi_2_h * (x + t1) * (x - t1);
        for (i = 8, t3 = kc[9]; i >= 0; i--)
                t3 = z * t3 + kc[i];
        t3 = one_pi_l + x4 * t3;
        t4 = t1 * t1 * npi_2_h;
        x8 = t2 + t3;
        xx.l = x8 + t4;
        return (xx);
}

/* INDENT OFF */
```



```
static const long double
        /* 0.134861805732790769689793935774652917006425111395524293982 33 */
#if defined(__x86)
t0z1   =  0.13486180573279076967793850549970358088 10L,
t0z1_l =  1.18554302749493361253927171502573796146 54e-20L,
#else
t0z1   =  0.13486180573279076968979393577465291685 4L,
t0z1_l =  1.41020885886768794187391644861595146743 10e-37L,
#endif
        /* 0.461632144968362341262659542325721328468196204006446351295 99 */
#if defined(__x86)
t0z2   =  0.46163214496836234125381158432954720183 26L,
t0z2_l =  8.84795799617412663558532305039261747030 640e-21L,
#else
t0z2   =  0.46163214496836234126265954232572132343 318L,
t0z2_l =  5.03501162329616380465302666480916271611 101e-36L,
#endif
        /* 0.819773101100500601787868704921606996311744078462451791195 86 */
#if defined(__x86)
t0z3   =  0.81977310110050060178773362329351925836 817L,
t0z3_l =  1.35081628087737943565807705253457455625 6230e-22L
#else
t0z3   =  0.81977310110050060178786870492160695169 57449L,
t0z3_l =  4.46159991694701441904549261593351648857 380e-35L
#endif
;
/* INDENT ON */

/*
 * gamma(x+i) for 0 <= x < 1
 */
static struct LDouble
gam_n(int i, long double x) {
        struct LDouble rr = {0.0L, 0.0L}, yy;
        long double r1, r2, t2, z, xh, xl, yh, yl, zh, z1, z2, zl, x5, wh, wl;

        /* compute yy = gamma(x+1) */
        if (x > 0.2845L) {
                if (x > 0.6374L) {
                        r1 = x - t0z3;
                        r2 = CHOPPED((r1 - t0z3_l));
                        t2 = r1 - r2;
                        yy = GT3(r2, t2 - t0z3_l);
                } else {
                        r1 = x - t0z2;
                        r2 = CHOPPED((r1 - t0z2_l));
                        t2 = r1 - r2;
                        yy = GT2(r2, t2 - t0z2_l);
                }
        } else {
                r1 = x - t0z1;
                r2 = CHOPPED((r1 - t0z1_l));
                t2 = r1 - r2;
                yy = GT1(r2, t2 - t0z1_l);
        }
        /* compute gamma(x+i) = (x+i-1)*...*(x+1)*yy, 0<i<8 */
        switch (i) {
        case 0:         /* yy/x */
                r1 = one / x;
                xh = CHOPPED((x));      /* x is not tiny */
                rr.h = CHOPPED(((yy.h + yy.l) * r1));
                rr.l = r1 * (yy.h - rr.h * xh) - ((r1 * rr.h) * (x - xh) -
                        r1 * yy.l);
                break;
        case 1:         /* yy */
                rr.h = yy.h;
```

```
                rr.l = yy.l;
                break;
        case 2:         /* (x+1)*yy */
                z = x + one;    /* may not be exact */
                zh = CHOPPED((z));
                rr.h = zh * yy.h;
                rr.l = z * yy.l + (x - (zh - one)) * yy.h;
                break;
        case 3:         /* (x+2)*(x+1)*yy */
                z1 = x + one;
                z2 = x + 2.0L;
                z = z1 * z2;
                xh = CHOPPED((z));
                zh = CHOPPED((z1));
                xl = (x - (zh - one)) * (z2 + zh) - (xh - zh * (zh + one));

                rr.h = xh * yy.h;
                rr.l = z * yy.l + xl * yy.h;
                break;

        case 4:         /* (x+1)*(x+3)*(x+2)*yy */
                z1 = x + 2.0L;
                z2 = (x + one) * (x + 3.0L);
                zh = CHOPPED(z1);
                zl = x - (zh - 2.0L);
                xh = CHOPPED(z2);
                xl = zl * (zh + z1) - (xh - (zh * zh - one));

                /* wh+wl=(x+2)*yy */
                wh = CHOPPED((z1 * (yy.h + yy.l)));
                wl = (zl * yy.h + z1 * yy.l) - (wh - zh * yy.h);

                rr.h = xh * wh;
                rr.l = z2 * wl + xl * wh;

                break;
        case 5:         /* ((x+1)*(x+4)*(x+2)*(x+3))*yy */
                z1 = x + 2.0L;
                z2 = x + 3.0L;
                z = z1 * z2;
                zh = CHOPPED((z1));
                yh = CHOPPED((z));
                yl = (x - (zh - 2.0L)) * (z2 + zh) - (yh - zh * (zh + one));
                z2 = z - 2.0L;
                z *= z2;
                xh = CHOPPED((z));
                xl = yl * (z2 + yh) - (xh - yh * (yh - 2.0L));
                rr.h = xh * yy.h;
                rr.l = z * yy.l + xl * yy.h;
                break;
        case 6:         /* ((x+1)*(x+2)*(x+3)*(x+4)*(x+5))*yy */
                z1 = x + 2.0L;
                z2 = x + 3.0L;
                z = z1 * z2;
                zh = CHOPPED((z1));
                yh = CHOPPED((z));
                z1 = x - (zh - 2.0L);
                yl = z1 * (z2 + zh) - (yh - zh * (zh + one));
                z2 = z - 2.0L;
                x5 = x + 5.0L;
                z *= z2;
                xh = CHOPPED(z);
                zh += 3.0;
                xl = yl * (z2 + yh) - (xh - yh * (yh - 2.0L));
                                                /* xh+xl=(x+1)*...*(x+4) */
                /* wh+wl=(x+5)*yy */
```



```
                wh = CHOPPED((x5 * (yy.h + yy.l)));
                wl = (z1 * yy.h + x5 * yy.l) - (wh - zh * yy.h);
                rr.h = wh * xh;
                rr.l = z * wl + xl * wh;
                break;
        case 7:         /* ((x+1)*(x+2)*(x+3)*(x+4)*(x+5)*(x+6))*yy */
                z1 = x + 3.0L;
                z2 = x + 4.0L;
                z = z2 * z1;
                zh = CHOPPED((z1));
                yh = CHOPPED((z));      /* yh+yl = (x+3)(x+4) */
                yl = (x - (zh - 3.0L)) * (z2 + zh) - (yh - (zh * (zh + one)));
                z1 = x + 6.0L;
                z2 = z - 2.0L;  /* z2 = (x+2)*(x+5) */
                z *= z2;
                xh = CHOPPED((z));
                xl = yl * (z2 + yh) - (xh - yh * (yh - 2.0L));
                                                /* xh+xl=(x+2)*...*(x+5) */
                /* wh+wl=(x+1)(x+6)*yy */
                z2 -= 4.0L;     /* z2 = (x+1)(x+6) */
                wh = CHOPPED((z2 * (yy.h + yy.l)));
                wl = (z2 * yy.l + yl * yy.h) - (wh - (yh - 6.0L) * yy.h);
                rr.h = wh * xh;
                rr.l = z * wl + xl * wh;
        }
        return (rr);
}

long double
tgammal(long double x) {
        struct LDouble ss, ww;
        long double t, t1, t2, t3, t4, t5, w, y, z, z1, z2, z3, z5;
        int i, j, m, ix, hx, xk;
        unsigned lx;

        hx = H0_WORD(x);
        lx = H3_WORD(x);
        ix = hx & 0x7fffffff;
        y = x;
        if (ix < 0x3f8e0000) {  /* x < 2**-113 */
                return (one / x);
        }
        if (ix >= 0x7fff0000)
                return (x * ((hx < 0)? zero : x));      /* Inf or NaN */
        if (x > overflow)       /* overflow threshold */
                return (x * 1.0e4932L);
        if (hx >= 0x40020000) { /* x >= 8 */
                ww = large_gam(x, &m);
                w = ww.h + ww.l;
                return (scalbnl(w, m));
        }

        if (hx > 0) {           /* 0 < x < 8 */
                i = (int) x;
                ww = gam_n(i, x - (long double) i);
                return (ww.h + ww.l);
        }
        /* INDENT OFF */
        /* negative x */
        /*
         * compute xk =
         *      -2 ... x is an even int (-inf is considered an even #)
         *      -1 ... x is an odd int
         *      +0 ... x is not an int but chopped to an even int
         *      +1 ... x is not an int but chopped to an odd int
         */
```

```
1049         /* INDENT ON */
1050         xk = 0;
1051 #if defined(__x86)
1052         if (ix >= 0x403e0000) { /* x >= 2**63 } */
1053                 if (ix >= 0x403f0000)
1054                         xk = -2;
1055                 else
1056                         xk = -2 + (lx & 1);
1057 #else
1058         if (ix >= 0x406f0000) { /* x >= 2**112 */
1059                 if (ix >= 0x40700000)
1060                         xk = -2;
1061                 else
1062                         xk = -2 + (lx & 1);
1063 #endif
1064         } else if (ix >= 0x3fff0000) {
1065                 w = -x;
1066                 t1 = floorl(w);
1067                 t2 = t1 * half;
1068                 t3 = floorl(t2);
1069                 if (t1 == w) {
1070                         if (t2 == t3)
1071                                 xk = -2;
1072                         else
1073                                 xk = -1;
1074                 } else {
1075                         if (t2 == t3)
1076                                 xk = 0;
1077                         else
1078                                 xk = 1;
1079                 }
1080         }

1082         if (xk < 0) {
1083                 /* return NaN. Ideally gamma(-n)= (-1)**(n+1) * inf */
1084                 return (x - x) / (x - x);
1085         }

1087         /*
1088          * negative underflow thresold -(1774+9ulp)
1089          */
1090         if (x < -1774.00000000000000000000000000017749370L) {
1091                 z = tiny / x;
1092                 if (xk == 1)
1093                         z = -z;
1094                 return (z * tiny);
1095         }

1097         /* INDENT OFF */
1098         /*
1099          * now compute gamma(x) by  -1/((sin(pi*y)/pi)*gamma(1+y)), y = -x
1100          */
1101         /*
1102          * First compute ss = -sin(pi*y)/pi so that
1103          * gamma(x) = 1/(ss*gamma(1+y))
1104          */
1105         /* INDENT ON */
1106         y = -x;
1107         j = (int) y;
1108         z = y - (long double) j;
1109         if (z > 0.31830988618379067153776752L)
1110                 if (z > 0.68169011381620932846223254L)
1111                         ss = kpsin(one - z);
1112                 else
1113                         ss = kpcos(0.5L - z);
1114         else
```



```
1115                 ss = kpsin(z);
1116         if (xk == 0) {
1117                 ss.h = -ss.h;
1118                 ss.l = -ss.l;
1119         }

1121         /* Then compute ww = gamma(1+y), note that result scale to 2**m */
1122         m = 0;
1123         if (j < 7) {
1124                 ww = gam_n(j + 1, z);
1125         } else {
1126                 w = y + one;
1127                 if ((lx & 1) == 0) {    /* y+1 exact (note that y<184) */
1128                         ww = large_gam(w, &m);
1129                 } else {
1130                         t = w - one;
1131                         if (t == y) {   /* y+one exact */
1132                                 ww = large_gam(w, &m);
1133                         } else {        /* use y*gamma(y) */
1134                                 if (j == 7)
1135                                         ww = gam_n(j, z);
1136                                 else
1137                                         ww = large_gam(y, &m);
1138                                 t4 = ww.h + ww.l;
1139                                 t1 = CHOPPED((y));
1140                                 t2 = CHOPPED((t4));
1141                                                 /* t4 will not be too large */
1142                                 ww.l = y * (ww.l - (t2 - ww.h)) + (y - t1) * t2;
1143                                 ww.h = t1 * t2;
1144                         }
1145                 }
1146         }

1148         /* compute 1/(ss*ww) */
1149         t3 = ss.h + ss.l;
1150         t4 = ww.h + ww.l;
1151         t1 = CHOPPED((t3));
1152         t2 = CHOPPED((t4));
1153         z1 = ss.l - (t1 - ss.h);        /* (t1,z1) = ss */
1154         z2 = ww.l - (t2 - ww.h);        /* (t2,z2) = ww */
1155         t3 = t3 * t4;                   /* t3 = ss*ww */
1156         z3 = one / t3;                  /* z3 = 1/(ss*ww) */
1157         t5 = t1 * t2;
1158         z5 = z1 * t4 + t1 * z2;         /* (t5,z5) = ss*ww */
1159         t1 = CHOPPED((t3));             /* (t1,z1) = ss*ww */
1160         z1 = z5 - (t1 - t5);
1161         t2 = CHOPPED((z3));             /* leading 1/(ss*ww) */
1162         z2 = z3 * (t2 * z1 - (one - t2 * t1));
1163         z = t2 - z2;

1165         return (scalbnl(z, -m));
1166 }
```

```
**********************************************************
    1799 Sat May 10 12:09:34 2014
new/usr/src/lib/libm/common/m9x/trunc.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak trunc = __trunc
#endif

#include "libm.h"

double
trunc(double x) {
        union {
                unsigned i[2];
                double d;
        } xx;
        unsigned hx, sx, i;

        xx.d = x;
        hx = xx.i[HIWORD] & ~0x80000000;
        sx = xx.i[HIWORD] & 0x80000000;
        if (hx < 0x43300000) {  /* |x| < 2^52 */
                if (hx < 0x3ff00000)    /* |x| < 1 */
                        return (sx ? -0.0 : 0.0);

                /* chop x at the integer bit */
                if (hx < 0x41300000) {
                        i = 1 << (0x412 - (hx >> 20));
                        xx.i[HIWORD] &= ~(i | (i - 1));
                        xx.i[LOWORD] = 0;
                } else {
                        i = 1 << (0x432 - (hx >> 20));
                        xx.i[LOWORD] &= ~(i | (i - 1));
                }
                return (xx.d);
        } else if (hx < 0x7ff00000)
```



```
                return (x);
        else
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return (hx >= 0x7ff80000 ? x : x + x);
                /* assumes sparc-like QNaN */
#else
                return (x + x);
#endif
}
```

```
**********************************************************
    1637 Sat May 10 12:09:34 2014
new/usr/src/lib/libm/common/m9x/truncf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak truncf = __truncf
#endif

#include "libm.h"

float
truncf(float x) {
        union {
                unsigned i;
                float f;
        } xx;
        unsigned hx, sx, i;

        xx.f = x;
        hx = xx.i & ~0x80000000;
        sx = xx.i & 0x80000000;
        if (hx < 0x4b000000) {          /* |x| < 2^23 */
                if (hx < 0x3f800000)            /* |x| < 1 */
                        return (sx ? -0.0F : 0.0F);

                /* chop x at the integer bit */
                i = 1 << (0x95 - (hx >> 23));
                xx.i &= ~((i << 1) - 1);
                return (xx.f);
        } else if (hx < 0x7f800000)     /* |x| is integral */
                return (x);
        else
#if defined(FPADD_TRAPS_INCOMPLETE_ON_NAN)
                return (hx > 0x7f800000 ? x * x : x + x);
#else
                return (x + x);
```



```
#endif
}
```

```
**********************************************************
    2695 Sat May 10 12:09:34 2014
new/usr/src/lib/libm/common/m9x/truncl.c
patch05 - fixed amd64 issues with LIBM
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#if defined(ELFOBJ)
#pragma weak truncl = __truncl
#endif

#include "libm.h"

#if defined(__sparc)
long double
truncl(long double x) {
        union {
                unsigned i[4];
                long double q;
        } xx;
        unsigned hx, sx;
        int j;

        xx.q = x;
        sx = xx.i[0] & 0x80000000;
        hx = xx.i[0] & ~0x80000000;

        /* handle trivial cases */
        if (hx >= 0x406f0000) /* |x| >= 2^112 + ... or x is nan */
                return (hx >= 0x7fff0000 ? x + x : x);

        /* handle |x| < 1 */
        if (hx < 0x3fff0000)
                return (sx ? -0.0L : 0.0L);

        j = 0x406f - (hx >> 16);                /* 1 <= j <= 112 */
        xx.i[0] = hx;
        if (j >= 96) {                          /* 96 <= j <= 112 */
```



```
                xx.i[0] &= ~((1 << (j - 96)) - 1);
                xx.i[1] = xx.i[2] = xx.i[3] = 0;
        } else if (j >= 64) {                   /* 64 <= j <= 95 */
                xx.i[1] &= ~((1 << (j - 64)) - 1);
                xx.i[2] = xx.i[3] = 0;
        } else if (j >= 32) {                   /* 32 <= j <= 63 */
                xx.i[2] &= ~((1 << (j - 32)) - 1);
                xx.i[3] = 0;
        } else                                  /* 1 <= j <= 31 */
                xx.i[3] &= ~((1 << j) - 1);

        /* negate result if need be */
        if (sx)
                xx.i[0] |= 0x80000000;
        return (xx.q);
}
#elif defined(__x86)
long double
truncl(long double x) {
        union {
                unsigned i[3];
                long double e;
        } xx;
        int ex, sx, i;

        xx.e = x;
        ex = xx.i[2] & 0x7fff;
        sx = xx.i[2] & 0x8000;
        if (ex < 0x403e) {      /* |x| < 2^63 */
                if (ex < 0x3fff)        /* |x| < 1 */
                        return (sx ? -0.0L : 0.0L);

                /* chop x at the integer bit */
                if (ex < 0x401e) {
                        i = 1 << (0x401d - ex);
                        xx.i[1] &= ~(i | (i - 1));
                        xx.i[0] = 0;
                } else {
                        i = 1 << (0x403d - ex);
                        xx.i[0] &= ~(i | (i - 1));
                }
                return (xx.e);
        } else if (ex < 0x7fff) /* x is integral */
                return (x);
        else                            /* inf or nan */
                return (x + x);
}
#else
#error Unknown architecture
#endif  /* defined(__sparc) || defined(__x86) */
```

```
**********************************************************
   12308 Sat May 10 12:09:34 2014
new/usr/src/lib/libm/common/mapfile-vers
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#
# Interface definition for libm.so.2
#
# For information regarding the establishment of versioned definitions see:
#       The Linker and Libraries Manual (version 2.5 or greater)
# This is part of the Developers Guide in the Answerbook.  Specifically refer
# to Chapter 2 under section "Defining Additional Symbols" through section
# "Reducing Symbol Scope", and Chapter 5 "Versioning".
#
# For specific rules for the modification (evolution) of these version
# definitions see:
#       psarc_1995_14: Integration of Scoped Libraries
#                (/shared/sac/PSARC/1995/014)
#       Policy for Shared Library Version Names and Interface Definitions
#                (/shared/ON/general_docs/scoping-rules.ps)

$mapfile_version 2

$if _ELF32
$add lf64
$endif
$if _sparc && _ELF32
$add sparc32
$endif
$if _sparc && _ELF64
$add sparcv9
$endif
$if _x86 && _ELF32
$add i386
$endif
$if _x86 && _ELF64
$add amd64
$endif

SYMBOL_VERSION SUNW_1.3 {
        global:
                __isnanf;                       #LSARC/2003/658
```



```
                __isnanl;                       #LSARC/2003/658
                _isnan          { FLAGS = NODYNSORT };  #LSARC/2003/658
                _isnand         { FLAGS = NODYNSORT };  #LSARC/2003/658
                _isnanf         { FLAGS = NODYNSORT };  #LSARC/2003/658
                _logb           { FLAGS = NODYNSORT };  #LSARC/2003/658
                _modf           { FLAGS = NODYNSORT };  #LSARC/2003/658
                _modff          { FLAGS = NODYNSORT };  #LSARC/2003/658
                _nextafter      { FLAGS = NODYNSORT };  #LSARC/2003/658
                _scalb          { FLAGS = NODYNSORT };  #LSARC/2003/658
                isnand          { FLAGS = NODYNSORT };  #LSARC/2003/658
                isnanf;                         #LSARC/2003/658
                isnanl;                         #LSARC/2003/658
} SUNW_1.2;

SYMBOL_VERSION SUNW_1.2 {
        global:
                __acoshf;
                __acoshl;
                __asinhf;
                __asinhl;
                __atanhf;
                __atanhl;
                __cabs;
                __cabsf;
                __cabsl;
                __cacos;
                __cacosf;
                __cacosh;
                __cacoshf;
                __cacoshl;
                __cacosl;
                __carg;
                __cargf;
                __cargl;
                __casin;
                __casinf;
                __casinh;
                __casinhf;
                __casinhl;
                __casinl;
                __catan;
                __catanf;
                __catanh;
                __catanhf;
                __catanhl;
                __catanl;
                __cbrtf;
                __cbrtl;
                __ccos;
                __ccosf;
                __ccosh;
                __ccoshf;
                __ccoshl;
                __ccosl;
                __cexp;
                __cexpf;
                __cexpl;
                __cimag;
                __cimagf;
                __cimagl;
                __clog;
                __clogf;
                __clogl;
                __conj;
                __conjf;
                __conjl;
```

```
128                 __copysignf;
129                 __copysignl;
130                 __cpow;
131                 __cpowf;
132                 __cpowl;
133                 __cproj;
134                 __cprojf;
135                 __cprojl;
136                 __creal;
137                 __crealf;
138                 __creall;
139                 __csin;
140                 __csinf;
141                 __csinh;
142                 __csinhf;
143                 __csinhl;
144                 __csinl;
145                 __csqrt;
146                 __csqrtf;
147                 __csqrtl;
148                 __ctan;
149                 __ctanf;
150                 __ctanh;
151                 __ctanhf;
152                 __ctanhl;
153                 __ctanl;
154                 __erfcf;
155                 __erfcl;
156                 __erff;
157                 __erfl;
158                 __exp2;
159                 __exp2f;
160                 __exp2l;
161                 __expm1f;
162                 __expm1l;
163                 __fdim;
164                 __fdimf;
165                 __fdiml;
166                 __feclearexcept;
167                 __fegetenv;
168                 __fegetexceptflag;
169 $if _x86
170                 __fegetprec;                    #LSARC/1996/175
171 $endif
172                 __fegetround;
173                 __feholdexcept;
174                 __fenv_dfl_env;                 #LSARC/1996/175
175                 __feraiseexcept;
176                 __fesetenv;
177                 __fesetexceptflag;
178 $if _x86
179                 __fesetprec;                    #LSARC/1996/175
180 $endif
181                 __fesetround;
182                 __fetestexcept;
183                 __feupdateenv;
184                 __fex_get_handling;             #LSARC/1996/175
185                 __fex_get_log;                  #LSARC/1996/175
186                 __fex_get_log_depth;            #LSARC/1996/175
187                 __fex_getexcepthandler;         #LSARC/1996/175
188                 __fex_log_entry;                #LSARC/1996/175
189                 __fex_merge_flags;              #LSARC/1996/175
190                 __fex_set_handling;             #LSARC/1996/175
191                 __fex_set_log;                  #LSARC/1996/175
192                 __fex_set_log_depth;            #LSARC/1996/175
193                 __fex_setexcepthandler;         #LSARC/1996/175
```



```
194                 __fma;
195                 __fmaf;
196                 __fmal;
197                 __fmax;
198                 __fmaxf;
199                 __fmaxl;
200                 __fmin;
201                 __fminf;
202                 __fminl;
203                 __frexp;
204                 __gammaf;                       #LSARC/2003/279
205                 __gammaf_r;                     #LSARC/2003/279
206                 __gammal;                       #LSARC/2003/279
207                 __gammal_r;                     #LSARC/2003/279
208                 __hypotf;
209                 __hypotl;
210                 __ilogbf;
211                 __ilogbl;
212                 __j0f;                          #LSARC/2003/279
213                 __j0l;                          #LSARC/2003/279
214                 __j1f;                          #LSARC/2003/279
215                 __j1l;                          #LSARC/2003/279
216                 __jnf;                          #LSARC/2003/279
217                 __jnl;                          #LSARC/2003/279
218                 __ldexp;
219                 __lgammaf;
220                 __lgammaf_r;                    #LSARC/2003/279
221                 __lgammal;
222                 __lgammal_r;                    #LSARC/2003/279
223                 __llrint;
224                 __llrintf;
225                 __llrintl;
226                 __llround;
227                 __llroundf;
228                 __llroundl;
229                 __log1pf;
230                 __log1pl;
231                 __log2;
232                 __log2f;
233                 __log2l;
234                 __logbf;
235                 __logbl;
236 $if amd64 || sparcv9
237                 __lrint         { FLAGS = NODYNSORT };
238                 __lrintf        { FLAGS = NODYNSORT };
239                 __lrintl        { FLAGS = NODYNSORT };
240                 __lround        { FLAGS = NODYNSORT };
241                 __lroundf       { FLAGS = NODYNSORT };
242                 __lroundl       { FLAGS = NODYNSORT };
243 $else
244                 __lrint;
245                 __lrintf;
246                 __lrintl;
247                 __lround;
248                 __lroundf;
249                 __lroundl;
250 $endif
251                 __modf;
252                 __nan;
253                 __nanf;
254                 __nanl;
255                 __nearbyint;
256                 __nearbyintf;
257                 __nearbyintl;
258                 __nextafterf;
259                 __nextafterl;
```

```
260                 __nexttoward;
261                 __nexttowardf;
262                 __nexttowardl;
263                 __remainderf;
264                 __remainderl;
265                 __remquo;
266                 __remquof;
267                 __remquol;
268                 __rintf;
269                 __rintl;
270                 __round;
271                 __roundf;
272                 __roundl;
273                 __scalbf;                       #LSARC/2003/279
274                 __scalbl;                       #LSARC/2003/279
275                 __scalbln;
276                 __scalblnf;
277                 __scalblnl;
278                 __scalbnf;
279                 __scalbnl;
280                 __signgamf;                     #LSARC/2003/279
281                 __signgaml;                     #LSARC/2003/279
282                 __significandf;                 #LSARC/2003/279
283                 __significandl;                 #LSARC/2003/279
284                 __sincos;                       #LSARC/2003/279
285                 __sincosf;                      #LSARC/2003/279
286                 __sincosl;                      #LSARC/2003/279
287                 __tgamma;
288                 __tgammaf;
289                 __tgammal;
290                 __trunc;
291                 __truncf;
292                 __truncl;
293                 __xpg6 { FLAGS = NODIRECT };    #private contract with libc grou
294                 __y0f;                          #LSARC/2003/279
295                 __y0l;                          #LSARC/2003/279
296                 __y1f;                          #LSARC/2003/279
297                 __y1l;                          #LSARC/2003/279
298                 __ynf;                          #LSARC/2003/279
299                 __ynl;                          #LSARC/2003/279
300                 acosf;
301                 acoshf;
302                 acoshl;
303                 acosl;
304                 asinf;
305                 asinhf;
306                 asinhl;
307                 asinl;
308                 atan2f;
309                 atan2l;
310                 atanf;
311                 atanhf;
312                 atanhl;
313                 atanl;
314                 cabs;
315                 cabsf;
316                 cabsl;
317                 cacos;
318                 cacosf;
319                 cacosh;
320                 cacoshf;
321                 cacoshl;
322                 cacosl;
323                 carg;
324                 cargf;
325                 cargl;
```



```
326                 casin;
327                 casinf;
328                 casinh;
329                 casinhf;
330                 casinhl;
331                 casinl;
332                 catan;
333                 catanf;
334                 catanh;
335                 catanhf;
336                 catanhl;
337                 catanl;
338                 cbrtf;
339                 cbrtl;
340                 ccos;
341                 ccosf;
342                 ccosh;
343                 ccoshf;
344                 ccoshl;
345                 ccosl;
346                 ceilf;
347                 ceill;
348                 cexp;
349                 cexpf;
350                 cexpl;
351                 cimag;
352                 cimagf;
353                 cimagl;
354                 clog;
355                 clogf;
356                 clogl;
357                 conj;
358                 conjf;
359                 conjl;
360                 copysignf;
361                 copysignl;
362                 cosf;
363                 coshf;
364                 coshl;
365                 cosl;
366                 cpow;
367                 cpowf;
368                 cpowl;
369                 cproj;
370                 cprojf;
371                 cprojl;
372                 creal;
373                 crealf;
374                 creall;
375                 csin;
376                 csinf;
377                 csinh;
378                 csinhf;
379                 csinhl;
380                 csinl;
381                 csqrt;
382                 csqrtf;
383                 csqrtl;
384                 ctan;
385                 ctanf;
386                 ctanh;
387                 ctanhf;
388                 ctanhl;
389                 ctanl;
390                 erfcf;
391                 erfcl;
```

```
392                 erff;
393                 erfl;
394                 exp2;
395                 exp2f;
396                 exp2l;
397                 expf;
398                 expl;
399                 expm1f;
400                 expm1l;
401                 fabsf;
402                 fabsl;
403                 fdim;
404                 fdimf;
405                 fdiml;
406                 feclearexcept;
407                 fegetenv;
408                 fegetexceptflag;
409 $if _x86
410                 fegetprec;                      #LSARC/1996/175
411 $endif
412                 fegetround;
413                 feholdexcept;
414                 feraiseexcept;
415                 fesetenv;
416                 fesetexceptflag;
417 $if _x86
418                 fesetprec;                      #LSARC/1996/175
419 $endif
420                 fesetround;
421                 fetestexcept;
422                 feupdateenv;
423                 fex_get_handling;               #LSARC/1996/175
424                 fex_get_log;                    #LSARC/1996/175
425                 fex_get_log_depth;              #LSARC/1996/175
426                 fex_getexcepthandler;           #LSARC/1996/175
427                 fex_log_entry;                  #LSARC/1996/175
428                 fex_merge_flags;                #LSARC/1996/175
429                 fex_set_handling;               #LSARC/1996/175
430                 fex_set_log;                    #LSARC/1996/175
431                 fex_set_log_depth;              #LSARC/1996/175
432                 fex_setexcepthandler;           #LSARC/1996/175
433                 floorf;
434                 floorl;
435                 fma;
436                 fmaf;
437                 fmal;
438                 fmax;
439                 fmaxf;
440                 fmaxl;
441                 fmin;
442                 fminf;
443                 fminl;
444                 fmodf;
445                 fmodl;
446                 frexp;
447                 frexpf;
448                 frexpl;
449                 gammaf;                         #LSARC/2003/279
450                 gammaf_r;                       #LSARC/2003/279
451                 gammal;                         #LSARC/2003/279
452                 gammal_r;                       #LSARC/2003/279
453                 hypotf;
454                 hypotl;
455                 ilogbf;
456                 ilogbl;
457                 j0f;                            #LSARC/2003/279
```



```
458                 j0l;                            #LSARC/2003/279
459                 j1f;                            #LSARC/2003/279
460                 j1l;                            #LSARC/2003/279
461                 jnf;                            #LSARC/2003/279
462                 jnl;                            #LSARC/2003/279
463                 ldexp;
464                 ldexpf;
465                 ldexpl;
466                 lgammaf;
467                 lgammaf_r;                      #LSARC/2003/279
468                 lgammal;
469                 lgammal_r;                      #LSARC/2003/279
470 $if amd64 || sparcv9
471                 llrint          { FLAGS = NODYNSORT };
472                 llrintf         { FLAGS = NODYNSORT };
473                 llrintl         { FLAGS = NODYNSORT };
474                 llround         { FLAGS = NODYNSORT };
475                 llroundf        { FLAGS = NODYNSORT };
476                 llroundl        { FLAGS = NODYNSORT };
477 $else
478                 llrint;
479                 llrintf;
480                 llrintl;
481                 llround;
482                 llroundf;
483                 llroundl;
484 $endif
485                 log10f;
486                 log10l;
487                 log1pf;
488                 log1pl;
489                 log2;
490                 log2f;
491                 log2l;
492                 logbf;
493                 logbl;
494                 logf;
495                 logl;
496                 lrint;
497                 lrintf;
498                 lrintl;
499                 lround;
500                 lroundf;
501                 lroundl;
502                 modf;
503                 modff;
504                 modfl;
505                 nan;
506                 nanf;
507                 nanl;
508                 nearbyint;
509                 nearbyintf;
510                 nearbyintl;
511                 nextafterf;
512                 nextafterl;
513                 nexttoward;
514                 nexttowardf;
515                 nexttowardl;
516                 powf;
517                 powl;
518                 remainderf;
519                 remainderl;
520                 remquo;
521                 remquof;
522                 remquol;
523                 rintf;
```

```
524                 rintl;
525                 round;
526                 roundf;
527                 roundl;
528                 scalbf;                         #LSARC/2003/279
529                 scalbl;                         #LSARC/2003/279
530                 scalbln;
531                 scalblnf;
532                 scalblnl;
533                 scalbnf;
534                 scalbnl;
535                 signgamf;                       #LSARC/2003/279
536                 signgaml;                       #LSARC/2003/279
537                 significandf;                   #LSARC/2003/279
538                 significandl;                   #LSARC/2003/279
539                 sincos;                         #LSARC/2003/279
540                 sincosf;                        #LSARC/2003/279
541                 sincosl;                        #LSARC/2003/279
542                 sinf;
543                 sinhf;
544                 sinhl;
545                 sinl;
546                 sqrtf;
547                 sqrtl;
548                 tanf;
549                 tanhf;
550                 tanhl;
551                 tanl;
552                 tgamma;
553                 tgammaf;
554                 tgammal;
555                 trunc;
556                 truncf;
557                 truncl;
558                 y0f;                            #LSARC/2003/279
559                 y0l;                            #LSARC/2003/279
560                 y1f;                            #LSARC/2003/279
561                 y1l;                            #LSARC/2003/279
562                 ynf;                            #LSARC/2003/279
563                 ynl;                            #LSARC/2003/279
564 } SUNW_1.1.1;

566 SYMBOL_VERSION SUNW_1.1.1 {
567         global:
568                 __acosf;
569                 __acosl;
570                 __asinf;
571                 __asinl;
572                 __atan2f;
573                 __atan2l;
574                 __atanf;
575                 __atanl;
576                 __ceilf;
577                 __ceill;
578                 __cosf;
579                 __coshf;
580                 __coshl;
581                 __cosl;
582                 __expf;
583                 __expl;
584                 __fabsf;
585                 __fabsl;
586                 __floorf;
587                 __floorl;
588                 __fmodf;
589                 __fmodl;
```



```
590                 __frexpf;
591                 __frexpl;
592                 __ldexpf;
593                 __ldexpl;
594                 __log10f;
595                 __log10l;
596                 __logf;
597                 __logl;
598                 __modff;
599                 __modfl;
600                 __powf;
601                 __powl;
602                 __sinf;
603                 __sinhf;
604                 __sinhl;
605                 __sinl;
606                 __sqrtf;
607                 __sqrtl;
608                 __tanf;
609                 __tanhf;
610                 __tanhl;
611                 __tanl;
612 } SUNW_1.1;

614 SYMBOL_VERSION SUNW_1.1 {
615         global:
616                 __acos;
617                 __acosh;
618                 __asin;
619                 __asinh;
620                 __atan;
621                 __atan2;
622                 __atanh;
623                 __cbrt;
624                 __ceil;
625                 __copysign;
626                 __cos;
627                 __cosh;
628                 __erf;
629                 __erfc;
630                 __exp;
631                 __expm1;
632                 __fabs;
633                 __floor;
634                 __fmod;
635                 __gamma;
636                 __gamma_r;
637                 __hypot;
638                 __ilogb;
639                 __isnan;
640                 __j0;
641                 __j1;
642                 __jn;
643                 __lgamma;
644                 __lgamma_r;
645                 __log;
646                 __log10;
647                 __log1p;
648                 __logb;
649                 __nextafter;
650                 __pow;
651                 __remainder;
652                 __rint;
653                 __scalb;
654                 __scalbn;
655                 __signgam;
```

```
656                 __significand;
657                 __sin;
658                 __sinh;
659                 __sqrt;
660                 __tan;
661                 __tanh;
662                 __y0;
663                 __y1;
664                 __yn;
665                 acos;
666                 acosh;
667                 asin;
668                 asinh;
669                 atan;
670                 atan2;
671                 atanh;
672                 cbrt;
673                 ceil;
674                 copysign;
675                 cos;
676                 cosh;
677                 erf;
678                 erfc;
679                 exp;
680                 expm1;
681                 fabs;
682                 floor;
683                 fmod;
684                 gamma;
685                 gamma_r;
686                 hypot;
687                 ilogb;
688                 isnan;
689                 j0;
690                 j1;
691                 jn;
692                 lgamma;
693                 lgamma_r;
694                 log;
695                 log10;
696                 log1p;
697                 logb;
698                 matherr;
699                 nextafter;
700                 pow;
701                 remainder;
702                 rint;
703                 scalb;
704                 scalbn;
705                 signgam;
706                 significand;
707                 sin;
708                 sinh;
709                 sqrt;
710                 tan;
711                 tanh;
712                 y0;
713                 y1;
714                 yn;
715 };

717 $if amd64 || sparcv9
718 SYMBOL_VERSION SUNWprivate_1.2 {
719 $else
720 SYMBOL_VERSION SUNWprivate_1.3 {
721 $endif
```



```
722         global:
723                 __libm_mt_fex_sync;             # -lmtsk
724                 __mt_fex_sync;                  # -lmtsk
725 $if amd64 || sparcv9
726 } SUNWprivate_1.1;
727 $else
728 } SUNWprivate_1.2;

730 SYMBOL_VERSION SUNWprivate_1.2 {
731         global:
732                 __libm_errno;   # SC3.0.1 -lmopt
733 } SUNWprivate_1.1;
734 $endif

736 SYMBOL_VERSION SUNWprivate_1.1 {
737         global:
738                 _lib_version;
739                 __libm__rem_pio2;
740                 __libm__rem_pio2m;
741         # anything else is local
742         local:
743                 # For symbols with multiple names, move the less preferred
744                 # names out of .SUNW_dynsymsort
745                 feclearexcept96   { FLAGS = NODYNSORT };
746                 feraiseexcept96   { FLAGS = NODYNSORT };
747                 fetestexcept96    { FLAGS = NODYNSORT };
748                 fegetexceptflag96 { FLAGS = NODYNSORT };
749                 fesetexceptflag96 { FLAGS = NODYNSORT };
750                 feupdateenv96     { FLAGS = NODYNSORT };
751                 fegetenv96        { FLAGS = NODYNSORT };
752                 fesetenv96        { FLAGS = NODYNSORT };
753                 fegetround96      { FLAGS = NODYNSORT };
754                 *;      # symbols not mentioned in this file are scoped out
755 };
```

```
**********************************************************
     800 Sat May 10 12:09:34 2014
new/usr/src/lib/libm/i386/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  10 #

  12 #
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  14 #

  16 TARGET_ARCH=    i386
  17 include ../Makefile.com

  19 #
  20 # Without this option GCC will place floats into x87 (or wider) floating point
  21 # registers, ending up with better-than-ieee precision.
  22 #
  23 CFLAGS          += -_gcc=-ffloat-store
  24 $(OBJS_M9XSSE)  := CFLAGS += -xarch=sse2

  26 install:        all $(ROOTLIBS) $(ROOTLINKS) $(ROOTLINT)

  28 include ../Makefile.targ
```

```
**********************************************************
    2424 Sat May 10 12:09:34 2014
new/usr/src/lib/libm/i386/src/__reduction.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "__reduction.s"

/
/    After argument reduction which returns n:
/       n mod 4     sin(x)      cos(x)        tan(x)
/     ------------------------------------------------------
/         0          S           C             S/C
/         1          C           -S            -C/S
/         2          -S          -C            S/C
/         3          -C          S             -C/S
/     ------------------------------------------------------

#include "libm.h"
#include "libm_synonyms.h"
#include "libm_protos.h"
#undef fabs

        ENTRY(__reduction)
#ifndef PIC
        movl    12(%esp),%eax           / load the high part of arg
#else
        movl    16(%esp),%eax           / load the high part of arg
#endif
        andl    $0x7fffffff,%eax        / clear sign
        cmpl    $0x3fe921fb,%eax        / Is |x| < pi/4 (= 0x3fe921fb54...) ?
        jbe     .L0
        cmpl    $0x7ff00000,%eax        / Is arg a NaN or an Inf ?
        jb      .L1
.L0:
#ifndef PIC
        fldl    8(%esp)                 / push arg
#else
        fldl    12(%esp)                / push arg
```



```
#endif
        fwait
        movl    $0,%eax                 / set n = 0
        ret
.L1:
        pushl   %ebp
        movl    %esp,%ebp
        subl    $16,%esp
        PIC_SETUP(1)
        leal    -16(%ebp),%eax          / address of y[0]
        pushl   %eax
#ifndef PIC
        pushl   16(%ebp)
        pushl   12(%ebp)
#else
        pushl   20(%ebp)
        pushl   16(%ebp)
#endif
        call    PIC_F(__rem_pio2)       / call __rem_pio2(x,&y)
        fldl    -8(%ebp)                / y[1]
        fldl    -16(%ebp)               / y[0], y[1]
        faddp   %st,%st(1)              / y[0]+y[1] round-to-extended
        addl    $28,%esp                / 16+4*3
        andl    $3,%eax
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(__reduction)
```

```
**********************************************************
    2032 Sat May 10 12:09:35 2014
new/usr/src/lib/libm/i386/src/acos.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "acos.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(acos,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

#undef fabs

        ENTRY(acos)
        fldl    4(%esp)                 / push x
        fld1                            / push 1
        fld     %st(1)                  / x , 1 , x
        fabs                            / |x| , 1 , x
        fucomp
        fstsw   %ax
        sahf
        ja      .ERR
        fadd    %st(1),%st              / 1+x,x
        fldz
        fucomp
        fstsw   %ax
        sahf
        jp      .L1
        jne     .L1
        / x is -1
        fstp    %st(0)                  / -1
        fstp    %st(0)                  / empty NPX stack
        fldpi
        ret
.L1:
        fxch    %st(1)                  / x,1+x
        fld1                            / 1,x,1+x
```



```
        fsubp   %st,%st(1)              / 1-x,1+x
        fdivp   %st,%st(1)              / (1-x)/(1+x)
        fsqrt
        fld1                            / 1,sqrt((1-x)/(1+x))
        fpatan
        fadd    %st(0),%st
        ret

.ERR:
        / |x| > 1
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(1)
        fstp    %st(0)                  / x
        fstp    %st(0)                  / empty NPX stack
        pushl   $1
        pushl   12(%ebp)                / high x
        pushl   8(%ebp)                 / low x
        pushl   12(%ebp)                / high x
        pushl   8(%ebp)                 / low x
        call    PIC_F(_SVID_libm_err)   / report SVID result/error
        addl    $20,%esp
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(acos)
```

```
**********************************************************
    1745 Sat May 10 12:09:35 2014
new/usr/src/lib/libm/i386/src/acosf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file "acosf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(acosf,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

#undef fabs

        ENTRY(acosf)
        flds    4(%esp)                 / push x
        fld1                            / push 1
        fld     %st(1)                  / x , 1 , x
        fabs                            / |x| , 1 , x
        fucomp
        fstsw   %ax
        sahf
        ja      .ERR
        fadd    %st(1),%st              / 1+x,x
        fldz
        fucomp
        fstsw   %ax
        sahf
        jp      .L1
        jne     .L1
        / x is -1
        fstp    %st(0)                  / x
        fstp    %st(0)                  / empty NPX stack
        fldpi
        ret
.L1:
        fxch    %st(1)                  / x,1+x
        fld1                            / 1,x,1+x
```



```
        fsubp   %st,%st(1)              / 1-x,1+x
        fdivp   %st,%st(1)              / (1-x)/(1+x)
        fsqrt
        fld1                            / 1,sqrt((1-x)/(1+x))
        fpatan
        fadd    %st(0),%st
        ret

.ERR:
        / |x| > 1
        fstp    %st(0)                  / x
        fstp    %st(0)                  / empty NPX stack
        fldz
        fdiv    %st(0),%st              / 0/0
        ret
        .align  4
        SET_SIZE(acosf)
```

```
**********************************************************
    1729 Sat May 10 12:09:35 2014
new/usr/src/lib/libm/i386/src/acosl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file "acosl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(acosl,function)
#include "libm_synonyms.h"

#undef fabs

        ENTRY(acosl)
        fldt    4(%esp)                 / push x
        fld1                            / push 1
        fld     %st(1)                  / x , 1 , x
        fabs                            / |x| , 1 , x
        fucomp
        fstsw   %ax
        sahf
        ja      9f
        fadd    %st(1),%st              / 1+x,x
        fldz
        fucomp
        fstsw   %ax
        sahf
        jp      .L1
        jne     .L1
        / x is -1
        fstp    %st(0)                  / -1
        fstp    %st(0)                  / empty NPX stack
        fldpi
        ret
.L1:
        fxch    %st(1)                  / x,1+x
        fld1                            / 1,x,1+x
        fsubp   %st,%st(1)              / 1-x,1+x
```



```
        fdivp   %st,%st(1)              / (1-x)/(1+x)
        fsqrt
        fld1                            / 1,sqrt((1-x)/(1+x))
        fpatan
        fadd    %st(0),%st
        ret
9:
        / |x| > 1
        fstp    %st(0)                  / x
        fsub    %st,%st(0)              / +/-0 or NaN+invalid
        fdiv    %st,%st(0)              / NaN+invalid or NaN
        ret
        .align  4
        SET_SIZE(acosl)
```

```
**********************************************************
    1893 Sat May 10 12:09:35 2014
new/usr/src/lib/libm/i386/src/asin.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file "asin.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(asin,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

#undef fabs

        ENTRY(asin)
        fldl    4(%esp)                 / push x
        fld1                            / push 1
        fld     %st(1)                  / x , 1 , x
        fabs                            / |x| , 1 , x
        fucomp
        fstsw  %ax
        sahf
        ja      .ERR
        fadd    %st(1),%st              / 1+x,x
        fld1                            / 1,1+x,x
        fsub    %st(2),%st              / 1-x,1+x,x
        fmulp   %st,%st(1)              / (1-x)*(1+x),x
        fsqrt                           / sqrt((1-x)/(1+x)),x
        fpatan                          / atan(x/sqrt((1-x)/(1+x)))
        ret

.ERR:
        / |x| > 1
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(1)
        fstp    %st(0)                  / x
        fstp    %st(0)                  / empty NPX stack
```



```
        pushl   $2
        pushl   12(%ebp)                / high x
        pushl   8(%ebp)                 / low x
        pushl   12(%ebp)                / high x
        pushl   8(%ebp)                 / low x
        call    PIC_F(_SVID_libm_err)   / report SVID result/error
        addl    $20,%esp
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(asin)
```

```
**********************************************************
    1607 Sat May 10 12:09:35 2014
new/usr/src/lib/libm/i386/src/asinf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "asinf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(asinf,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

#undef fabs

        ENTRY(asinf)
        flds    4(%esp)                 / push x
        fld1                            / push 1
        fld     %st(1)                  / x , 1 , x
        fabs                            / |x| , 1 , x
        fucomp
        fstsw  %ax
        sahf
        ja      .ERR
        fadd    %st(1),%st              / 1+x,x
        fld1                            / 1,1+x,x
        fsub    %st(2),%st              / 1-x,1+x,x
        fmulp   %st,%st(1)              / (1-x)*(1+x),x
        fsqrt                           / sqrt((1-x)*(1+x)),x
        fpatan                          / atan(x/sqrt((1-x)*(1+x)))
        ret

.ERR:
        / |x| > 1
        fstp    %st(0)                  / x
        fstp    %st(0)                  / empty NPX stack
        fldz
        fdiv    %st(0),%st              / 0/0
        ret
```



```
        .align  4
        SET_SIZE(asinf)
```

```
**********************************************************
    1579 Sat May 10 12:09:35 2014
new/usr/src/lib/libm/i386/src/asinl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "asinl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(asinl,function)
#include "libm_synonyms.h"

#undef fabs

        ENTRY(asinl)
        fldt    4(%esp)                 / push x
        fld1                            / push 1
        fld     %st(1)                  / x , 1 , x
        fabs                            / |x| , 1 , x
        fucomp
        fstsw   %ax
        sahf
        ja      9f
        fadd    %st(1),%st              / 1+x,x
        fld1                            / 1,1+x,x
        fsub    %st(2),%st              / 1-x,1+x,x
        fmulp   %st,%st(1)              / (1-x)*(1+x),x
        fsqrt                           / sqrt((1-x)*(1+x)),x
        fpatan                          / atan(x/sqrt((1-x)*(1+x)))
        ret
9:
        / |x| > 1
        fstp    %st(0)                  / x
        fsub    %st,%st(0)              / +/-0 or NaN+invalid
        fdiv    %st,%st(0)              / NaN+invalid or NaN
        ret
        .align  4
        SET_SIZE(asinl)
```

****
1214 Sat May 10 12:09:35 2014
new/usr/src/lib/libm/i386/src/atan.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file   "atan.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(atan,function)
#include "libm_synonyms.h"

        ENTRY(atan)
        fldl    4(%esp)                 / push arg
        fld1                            / push 1.0
        fpatan                          / atan(arg/1.0)
        ret
        .align  4
        SET_SIZE(atan)
```

```
**********************************************************
    1809 Sat May 10 12:09:36 2014
new/usr/src/lib/libm/i386/src/atan2.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "atan2.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(atan2,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(atan2)
        movl    4(%esp),%eax            / low part of y
        movl    12(%esp),%ecx           / low part of x
        orl     %eax,%ecx
        jz      .maybe_0s

        / not both x and y are 0's
1:
        fldl    4(%esp)                 / push y
        fldl    12(%esp)                / push x
        fpatan                          / return atan2(y,x)
        ret

.maybe_0s:
        movl    8(%esp),%eax            / high part of y
        movl    16(%esp),%ecx           / high part of x
        orl     %eax,%ecx
        andl    $0x7fffffff,%ecx        / clear sign
        jnz     1b
        / both x and y are 0's
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(1)
        pushl   $3
        pushl   12(%ebp)                / high y
        pushl   8(%ebp)                 / low y
```



```
        pushl   20(%ebp)                / high x
        pushl   16(%ebp)                / low x
        call    PIC_F(_SVID_libm_err)   / report SVID result/error
        addl    $20,%esp
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(atan2)
```

```
**********************************************************
    1261 Sat May 10 12:09:36 2014
new/usr/src/lib/libm/i386/src/atan2f.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "atan2f.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(atan2f,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(atan2f)
        flds    4(%esp)                 / push y
        flds    8(%esp)                 / push x
        fpatan                          / return atan2(y,x)
        ret
        .align  4
        SET_SIZE(atan2f)
```

****
1236 Sat May 10 12:09:36 2014
new/usr/src/lib/libm/i386/src/atan2l.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file "atan2l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(atan2l,function)
#include "libm_synonyms.h"

        ENTRY(atan2l)
        fldt    4(%esp)                 / push y
        fldt    16(%esp)                / push x
        fpatan                          / return atan2(y,x)
        ret
        .align  4
        SET_SIZE(atan2l)
```

```
**********************************************************
    1218 Sat May 10 12:09:36 2014
new/usr/src/lib/libm/i386/src/atanl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "atanl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(atanl,function)
#include "libm_synonyms.h"

        ENTRY(atanl)
        fldt    4(%esp)                 / push arg
        fld1                            / push 1.0
        fpatan                          / atan(arg/1.0)
        ret
        .align  4
        SET_SIZE(atanl)
```

```
**********************************************************
    1467 Sat May 10 12:09:36 2014
new/usr/src/lib/libm/i386/src/ceil.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "ceil.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(ceil,function)
#include "libm_synonyms.h"

        ENTRY(ceil)
        subl    $8,%esp
        fstcw   (%esp)
        fldl    12(%esp)
        movw    (%esp),%cx
        orw     $0x0c00,%cx
        xorw    $0x0400,%cx
        movw    %cx,4(%esp)
        fldcw   4(%esp)                 / set RD = up
        frndint
        fstcw   4(%esp)                 / restore RD
        movw    4(%esp),%dx
        andw    $0xf3ff,%dx
        movw    (%esp),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)                  / restore RD
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(ceil)
```

```
**********************************************************
    1760 Sat May 10 12:09:36 2014
new/usr/src/lib/libm/i386/src/copysign.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "copysign.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(copysign,function)
#include "libm_synonyms.h"

        ENTRY(copysign)
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        movl    16(%esp),%ecx           / ecx <-- hi_32(y)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(abs(x))
        andl    $0x80000000,%ecx        / ecx[31] <-- sign_bit(y)
        orl     %ecx,%eax               / eax <-- hi_32(copysign(x,y))
        movl    4(%esp),%ecx            / ecx <-- lo_32(x)
                                        /       = lo_32(copysign(x,y))
        subl    $8,%esp                 / set up loading dock for result
        movl    %ecx,(%esp)             / copy lo_32(result) to loading dock
        movl    %eax,4(%esp)            / copy hi_32(result) to loading dock
        fldl    (%esp)                  / load copysign(x,y)
        fwait                           / in case fldl causes exception
        addl    $8,%esp                 / restore stack-pointer for return
        ret
        .align  4
        SET_SIZE(copysign)
```

```
**********************************************************
    1599 Sat May 10 12:09:36 2014
new/usr/src/lib/libm/i386/src/copysignf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "copysignf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(copysignf,function)
#include "libm_synonyms.h"

        ENTRY(copysignf)
        movl    4(%esp),%eax            / eax <-- x
        movl    8(%esp),%ecx            / ecx <-- y
        andl    $0x7fffffff,%eax        / eax <-- abs(x)
        andl    $0x80000000,%ecx        / ecx[31] <-- sign_bit(y)
        orl     %ecx,%eax               / eax <-- copysign(x,y)
        subl    $4,%esp                 / set up loading dock for result
        movl    %eax,(%esp)             / copy result to loading dock
        flds    (%esp)                  / load copysign(x,y)
        fwait                           / in case fldl causes exception
        addl    $4,%esp                 / restore stack-pointer for return
        ret
        .align  4
        SET_SIZE(copysignf)
```

```
**********************************************************
    1848 Sat May 10 12:09:36 2014
new/usr/src/lib/libm/i386/src/copysignl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "copysignl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(copysignl,function)
#include "libm_synonyms.h"

        ENTRY(copysignl)
        movl    12(%esp),%eax           / sign and bexp of x
        movl    24(%esp),%ecx           / sign and bexp of y
        andl    $0x00007fff,%eax        / eax <-- bexp(x)
        andl    $0x00008000,%ecx        / ecx <-- sign(y)
        orl     %ecx,%eax               / eax <-- bexp(x) with sign(y)
        movl    8(%esp),%ecx            / ecx <-- hi_32(sgnfcnd(x))
        movl    4(%esp),%edx            / edx <-- lo_32(sgnfcnd(x))
        subl    $12,%esp                / set up loading dock for result
        movl    %edx,(%esp)             / copy lo_32(result's sgnfcnd)
                                        / to loading dock
        movl    %ecx,4(%esp)            / copy hi_32(result's sgnfcnd)
                                        / to loading dock
        movl    %eax,8(%esp)            / copy sign&bexp(result)
                                        / to loading dock
        fldt    (%esp)                  / load copysign(x,y)
        addl    $12,%esp                / restore stack-pointer for return
        ret
        .align  4
        SET_SIZE(copysignl)
```

```
**********************************************************
    1349 Sat May 10 12:09:37 2014
new/usr/src/lib/libm/i386/src/cos.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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        .file "cos.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(cos,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(cos)
        PIC_SETUP(1)
        call    PIC_F(__reduction)
        PIC_WRAPUP
        cmpl    $1,%eax
        jl      .cos0
        je      .cos1
        cmpl    $2,%eax
        je      .cos2
        fsin
        ret
.cos2:
        fcos
        fchs
        ret
.cos1:
        fsin
        fchs
        ret
.cos0:
        fcos
        ret
        .align  4
        SET_SIZE(cos)
```

```
**********************************************************
    4281 Sat May 10 12:09:37 2014
new/usr/src/lib/libm/i386/src/exp.s
patch01 - 693 import Sun Devpro Math Library
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```

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        .file "exp.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(exp,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(exp)
        movl    8(%esp),%ecx            / ecx <-- hi_32(x)
        andl    $0x7fffffff,%ecx        / ecx <-- hi_32(|x|)
        cmpl    $0x3fe62e42,%ecx        / Is |x| < ln(2)?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / |x| may be only slightly < ln(2)
        cmpl    $0x7ff00000,%ecx        / hi_32(|x|) >= hi_32(INF)?
        jae     .not_finite             / if so, x is not finite
.finite_non_special:                    / Here, ln(2) < |x| < INF
        fldl    4(%esp)                 / push x
        subl    $8,%esp
                                        /// overhead of RP save/restore; 63/15
        fstcw   (%esp)                  /// ; 15/3
        movw    (%esp),%ax              /// ; 4/1
        movw    %ax,4(%esp)             /// save old RP; 2/1
        orw     $0x0300,%ax             /// force 64-bit RP; 2/1
        movw    %ax,(%esp)              /// ; 2/1
        fldcw   (%esp)                  /// ; 19/4
        fldl2e                          / push log2e   }not for xtndd_dbl
        fmulp   %st,%st(1)              / z = x*log2e  }not for xtndd_dbl
        fld     %st(0)                  / duplicate stack top
        frndint                         / [z],z
        fucom                           / This and the next 3 instructions
        fstsw  %ax                      / add 10 clocks to runtime of the
        sahf                            / main branch, but save about 265
        je      .z_integral             / upon detection of integral z.
```



```
        / [z] != z, compute exp(x)
        fxch                            / z,[z]
        fsub    %st(1),%st              / z-[z],[z]
        f2xm1                           / 2**(z-[z])-1,[z]
        fld1                            / 1,2**(z-[z])-1,[z]
        faddp   %st,%st(1)              /   2**(z-[z])  ,[z]
.merge:
        fscale                          /   exp(x)      ,[z]
        fstp    %st(1)
        fstcw   (%esp)                  / restore RD
        movw    (%esp),%dx
        andw    $0xfcff,%dx
        movw    4(%esp),%cx
        andw    $0x0300,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)                  /// restore old RP; 19/4
        fstpl   (%esp)                  / round to double
        fldl    (%esp)                  / exp(x) rounded to double
        fxam                            / determine class of exp(x)
        add     $8,%esp
        fstsw   %ax                     / store status in ax
        andw    $0x4500,%ax
        cmpw    $0x0500,%ax
        je      .overflow
        cmpw    $0x4000,%ax
        je      .underflow
        ret

.overflow:
        fstp    %st(0)                  / stack empty
        push    %ebp
        mov     %esp,%ebp
        PIC_SETUP(1)
        pushl   $6
        jmp     .error

.underflow:
        fstp    %st(0)                  / stack empty
        push    %ebp
        mov     %esp,%ebp
        PIC_SETUP(2)
        pushl   $7

.error:
        pushl   12(%ebp)                / high x
        pushl   8(%ebp)                 / low x
        pushl   12(%ebp)                / high x
        pushl   8(%ebp)                 / low x
        call    PIC_F(_SVID_libm_err)
        addl    $20,%esp
        PIC_WRAPUP
        leave
        ret

.z_integral:                            / here, z is integral
        fstp    %st(0)                  / ,z
        fld1                            / 1,z
        jmp     .merge

.check_tail:
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0xfefa39ef,%edx        / Is |x| slightly < ln(2)?
        ja      .finite_non_special     / branch if |x| slightly > ln(2)
.shortcut:
        / Here, |x| < ln(2), so |z| = |x*log2(e)| < 1,
```

```
128         / whence z is in f2xm1's domain.
129         fldl    4(%esp)                 / push x
130         fldl2e                          / push log2e  }not for xtndd_dbl
131         fmulp   %st,%st(1)              / z = x*log2e }not for xtndd_dbl
132         f2xm1                           / 2**(x*log2(e))-1 = e**x - 1
133         fld1                            / 1,2**(z)-1
134         faddp   %st,%st(1)              /   2**(z) = e**x
135         ret

137 .not_finite:
138         / Here, flags still have settings from execution of
139         /       cmpl    $0x7ff00000,%ecx        / hi_32(|x|) > hi_32(INF)?
140         ja      .NaN_or_pinf            / if not, x may be +/- INF
141         movl    4(%esp),%edx            / edx <-- lo_32(x)
142         cmpl    $0,%edx                 / lo_32(x) = 0?
143         jne     .NaN_or_pinf            / if not, x is NaN
144         movl    8(%esp),%eax            / eax <-- hi_32(x)
145         andl    $0x80000000,%eax        / here, x is infinite, but +/-?
146         jz      .NaN_or_pinf            / branch if x = +INF
147         fldz                            / Here, x = -inf, so return 0
148         ret

150 .NaN_or_pinf:
151         / Here, x = NaN or +inf, so load x and return immediately.
152         fldl    4(%esp)
153         fwait
154         ret
155         .align  4
156         SET_SIZE(exp)
```

```
**********************************************************
    3593 Sat May 10 12:09:37 2014
new/usr/src/lib/libm/i386/src/exp10.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "exp10.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(exp10,function)
#include "libm_synonyms.h"

        ENTRY(exp10)
        movl    8(%esp),%ecx            / ecx <-- hi_32(x)
        andl    $0x7fffffff,%ecx        / ecx <-- hi_32(|x|)
        cmpl    $0x3fd34413,%ecx        / Is |x| < log10(2)?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / maybe |x| only slightly < log10(2)
        cmpl    $0x7ff00000,%ecx        / hi_32(|x|) >= hi_32(INF)?
        jae     .not_finite             / if so, x is not finite
.finite_non_special:                    / Here, log10(2) < |x| < INF
        fldl    4(%esp)                 / push x (=arg)

        subl    $8,%esp                 / save RP and set round-to-64-bits
        fstcw   (%esp)
        movw    (%esp),%ax
        movw    %ax,4(%esp)
        orw     $0x0300,%ax
        movw    %ax,(%esp)
        fldcw   (%esp)

        fldl2t                          / push log2(10)  }NOT for xtndd_dbl
        fmulp   %st,%st(1)              / z = x*log2(10) }NOT for xtndd_dbl
        fld     %st(0)                  / duplicate stack top
        frndint                         / [z],z
        fucom                           / z integral?
        fstsw  %ax
        sahf
        je      .z_integral             / branch if z integral
```



```
        fxch                            / z, [z]
        fsub    %st(1),%st              / z-[z], [z]
        f2xm1                           / 2**(z-[z])-1, [z]
        fld1                            / 1,2**(z-[z])-1, [z]
        faddp   %st,%st(1)              / 2**(z-[z]), [z]
        fscale                          / 2**z = 10**(arg), [z]
        fstp    %st(1)

        fstcw   (%esp)                  / restore old RP
        movw    (%esp),%dx
        andw    $0xfcff,%dx
        movw    4(%esp),%cx
        andw    $0x0300,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)
        add     $8,%esp

        ret

.z_integral:                            / here, z is integral
        fstp    %st(0)                  / ,z
        fld1                            / 1 = 2**0, z
        fscale                          / 2**(0 + z) = 2**z = 10**(arg), z
        fstp    %st(1)                  / 10**(arg)

        fstcw   (%esp)                  / restore old RP
        movw    (%esp),%dx
        andw    $0xfcff,%dx
        movw    4(%esp),%cx
        andw    $0x0300,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)
        add     $8,%esp

        ret

.check_tail:
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0x509f79fe,%edx        / Is |x| slightly > log10(2)?
        ja      .finite_non_special     / branch if |x| slightly > log10(2)
.shortcut:
        / Here, |x| < log10(2), so |z| = |x*log2(10)| < 1
        / whence z is in f2xm1's domain.
        fldl    4(%esp)                 / push x (=arg)
        fldl2t                          / push log2(10)  }NOT for xtndd_dbl
        fmulp   %st,%st(1)              / z = x*log2(10) }NOT for xtndd_dbl
        f2xm1                           / 2**z - 1
        fld1                            / 1,2**z - 1
        faddp   %st,%st(1)              / 2**z = 10**x
        ret

.not_finite:
        cmpl    $0x7ff00000,%ecx        / hi_32(|x|) > hi_32(INF)?
        ja      .NaN_or_pinf            / if so, x is NaN
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0,%edx                 / lo_32(x) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        andl    $0x80000000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
```

```
128         / Here, x = NaN or +inf, so load x and return immediately.
129         fldl    4(%esp)
130         fwait
131         ret
132         .align  4
133         SET_SIZE(exp10)
```

```
**********************************************************
    3135 Sat May 10 12:09:37 2014
new/usr/src/lib/libm/i386/src/exp10f.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file "exp10f.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(exp10f,function)
#include "libm_synonyms.h"

        ENTRY(exp10f)
        movl    4(%esp),%ecx            / ecx <-- x
        andl    $0x7fffffff,%ecx        / ecx <-- |x|
        cmpl    $0x3e9a209a,%ecx        / Is |x| < log10(2)?
        jbe     .shortcut               / If so, take a shortcut.
        cmpl    $0x7f800000,%ecx        / |x| >= INF?
        jae     .not_finite             / if so, x is not finite
        flds    4(%esp)                 / push x (=arg)

        subl    $8,%esp                 / save RP and set round-to-64-bits
        fstcw   (%esp)
        movw    (%esp),%ax
        movw    %ax,4(%esp)
        orw     $0x0300,%ax
        movw    %ax,(%esp)
        fldcw   (%esp)

        fldl2t                          / push log2(10)  }NOT for xtndd_dbl
        fmulp   %st,%st(1)              / z = x*log2(10) }NOT for xtndd_dbl
        fld     %st(0)                  / duplicate stack top
        frndint                         / [z],z
        fucom                           / z integral?
        fstsw   %ax
        sahf
        je      .z_integral             / branch if z integral
        fxch                            / z, [z]
        fsub    %st(1),%st              / z-[z], [z]
```



```
        f2xm1                           / 2**(z-[z])-1, [z]
        fld1                            / 1,2**(z-[z])-1, [z]
        faddp   %st,%st(1)              / 2**(z-[z]), [z]
        fscale                          / 2**z = 10**(arg), [z]
        fstp    %st(1)

        fstcw   (%esp)                  / restore old RP
        movw    (%esp),%dx
        andw    $0xfcff,%dx
        movw    4(%esp),%cx
        andw    $0x0300,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)
        add     $8,%esp

        ret

.z_integral:                            / here, z is integral
        fstp    %st(0)                  / ,z
        fld1                            / 1 = 2**0, z
        fscale                          / 2**(0 + z) = 2**z = 10**(arg), z
        fstp    %st(1)                  / 10**(arg)

        fstcw   (%esp)                  / restore old RP
        movw    (%esp),%dx
        andw    $0xfcff,%dx
        movw    4(%esp),%cx
        andw    $0x0300,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)
        add     $8,%esp

        ret

.shortcut:
        / Here, |x| < log10(2), so |z| = |x*log2(10)| < 1
        / whence z is in f2xm1's domain.
        flds    4(%esp)                 / push x (=arg)
        fldl2t                          / push log2(10)  }NOT for xtndd_dbl
        fmulp   %st,%st(1)              / z = x*log2(10) }NOT for xtndd_dbl
        f2xm1                           / 2**z - 1
        fld1                            / 1,2**z - 1
        faddp   %st,%st(1)              / 2**z = 10**x
        ret

.not_finite:
        ja      .NaN_or_pinf            / branch if x is NaN
        movl    4(%esp),%eax            / eax <-- x
        andl    $0x80000000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        flds    4(%esp)
        fwait
        ret
        .align  4
        SET_SIZE(exp10f)
```

```
**********************************************************
    3539 Sat May 10 12:09:37 2014
new/usr/src/lib/libm/i386/src/exp10l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "exp10l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(exp10l,function)
#include "libm_synonyms.h"

        .data
        .align  4
lt2_hi: .long   0xfbd00000, 0x9a209a84, 0x00003ffd
lt2_lo: .long   0x653f4837, 0x8677076a, 0x0000bfc9

        ENTRY(exp10l)
        movl    12(%esp),%ecx           / cx <--sign&bexp(x)
        andl    $0x00007fff,%ecx        / ecx <-- zero_xtnd(bexp(x))
        cmpl    $0x00003ffd,%ecx        / Is |x| < log10(2)?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / maybe |x| only slightly < log10(2)
        cmpl    $0x00007fff,%ecx        / bexp(|x|) = bexp(INF)?
        je      .not_finite             / if so, x is not finite
        cmpl    $0x0000400e,%ecx        / |x| < 32768 = 2^15?
        jb      .finite_non_special     / if so, proceed with argument reduction
        fldt    4(%esp)                 / x
        fld1                            / 1, x
        jmp     1f
.finite_non_special:                    / Here, log10(2) < |x| < 2^15
        fldt    4(%esp)                 / x
        fld     %st(0)                  / x, x
        fldl2t                          / log2(10), x, x
        fmulp                           / z := x*log2(10), x
        frndint                         / [z], x
        fst     %st(2)                  / [z], x, [z]
        PIC_SETUP(1)
        fldt    PIC_L(lt2_hi)           / lt2_hi, [z], x, [z]
```



```
        fmulp                           / [z]*lt2_hi, x, [z]
        fsubrp  %st,%st(1)              / x-[z]*lt2_hi, [z]
        fldt    PIC_L(lt2_lo)           / lt2_lo, x-[z]*lt2_hi, [z]
        PIC_WRAPUP
        fmul    %st(2),%st              / [z]*lt2_lo, x-[z]*lt2_hi, [z]
        fsubrp  %st,%st(1)              / r := x-[z]*log10(2), [z]
        fldl2t                          / log2(10), r, [z]
        fmulp                           / f := r*log2(10), [z]
        f2xm1                           / 2^f-1,[z]
        fld1                            / 1, 2^f-1, [z]
        faddp   %st,%st(1)              / 2^f, [z]
1:
        fscale                          / 10^x, [z]
        fstp    %st(1)
        ret

.check_tail:
        movl    8(%esp),%ecx            / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x9a209a84,%ecx        / Is |x| < log10(2)?
        ja      .finite_non_special
        jb      .shortcut
        movl    4(%esp),%edx            / edx <-- lo_32(sgnfcnd(x))
        cmpl    $0xfbcff798,%edx        / Is |x| slightly > log10(2)?
        ja      .finite_non_special     / branch if |x| slightly > log10(2)
.shortcut:
        / Here, |x| < log10(2), so |z| = |x/log10(2)| < 1
        / whence z is in f2xm1's domain.
        fldt    4(%esp)                 / x
        fldl2t                          / log2(10), x
        fmulp                           / z := x*log2(10)
        f2xm1                           / 2^z-1
        fld1                            / 1, 2^z-1
        faddp   %st,%st(1)              / 10^x
        ret

.not_finite:
        movl    8(%esp),%ecx            / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / hi_32(sgnfcnd(x)) = hi_32(sgnfcnd(INF)
        jne     .NaN_or_pinf            / if not, x is NaN or unsupp.
        movl    4(%esp),%edx            / edx <-- lo_32(sgnfcnd(x))
        cmpl    $0,%edx                 / lo_32(sgnfcnd(x)) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    12(%esp),%eax           / ax <-- sign&bexp((x))
        andl    $0x00008000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldt    4(%esp)
        ret
        .align  4
        SET_SIZE(exp10l)
```

```
**********************************************************
    2783 Sat May 10 12:09:37 2014
new/usr/src/lib/libm/i386/src/exp2.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "exp2.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(exp2,function)
#include "libm_synonyms.h"

        ENTRY(exp2)
        movl    8(%esp),%ecx            / ecx <-- hi_32(x)
        andl    $0x7fffffff,%ecx        / ecx <-- hi_32(|x|)
        cmpl    $0x3ff00000,%ecx        / Is |x| < 1?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / |x| may be only slightly < ln(2)
        cmpl    $0x7ff00000,%ecx        / hi_32(|x|) >= hi_32(INF)?
        jae     .not_finite             / if so, x is not finite
.finite_non_special:                    / Here, 1 < |x| < INF
        fldl    4(%esp)                 / push arg
        fld     %st(0)                  / duplicate stack top
        frndint                         / [x],x
        fucom                           / x integral?
        fstsw   %ax
        sahf
        je      .x_integral             / branch if x integral
        fxch                            / x, [x]
        fsub    %st(1),%st              / x-[x], [x]
        f2xm1                           / 2**(x-[x])-1, [x]
        fld1                            / 1,2**(x-[x])-1, [x]
        faddp   %st,%st(1)              / 2**(x-[x]), [x]
        fscale                          / 2**x = 2**(arg), [x]
        fstp    %st(1)
        ret

.x_integral:
        fstp    %st(0)                  / ,x
```



```
        fld1                            / 1 = 2**0, x
        fscale                          / 2**(0 + x) = 2**x, x
        fstp    %st(1)                  / 2**x
        ret

.check_tail:
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0x00000000,%edx        / Is |x| slightly > 1?
        ja      .finite_non_special     / branch if |x| slightly > 1
.shortcut:
        / Here, |x| <= 1,
        / whence x is in f2xm1's domain.
        fldl    4(%esp)                 / push x
        f2xm1                           / 2**x - 1
        fld1                            / 1,2**x - 1
        faddp   %st,%st(1)              / 2**x
        ret

.not_finite:
        cmpl    $0x7ff00000,%ecx        / hi_32(|x|) > hi_32(INF)?
        ja      .NaN_or_pinf            / if so, x is NaN
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0,%edx                 / lo_32(x) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        andl    $0x80000000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldl    4(%esp)
        fwait
        ret
        .align  4
        SET_SIZE(exp2)
```

```
**********************************************************
    2375 Sat May 10 12:09:37 2014
new/usr/src/lib/libm/i386/src/exp2f.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file "exp2f.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(exp2f,function)
#include "libm_synonyms.h"

        ENTRY(exp2f)
        movl    4(%esp),%ecx            / ecx <-- x
        andl    $0x7fffffff,%ecx        / ecx <-- |x|
        cmpl    $0x3f800000,%ecx        / Is |x| <= 1?
        jbe     .shortcut               / If so, take a shortcut.
        cmpl    $0x7f800000,%ecx        / |x| >= INF?
        jae     .not_finite             / if so, x is not finite
        flds    4(%esp)                 / push arg
        fld     %st(0)                  / duplicate stack top
        frndint                         / [x],x
        fucom                           / x integral?
        fstsw   %ax
        sahf
        je      .x_integral             / branch if x integral
        fxch                            / x, [x]
        fsub    %st(1),%st              / x-[x], [x]
        f2xm1                           / 2**(x-[x])-1, [x]
        fld1                            / 1,2**(x-[x])-1, [x]
        faddp   %st,%st(1)              / 2**(x-[x]), [x]
        fscale                          / 2**x = 2**(arg), [x]
        fstp    %st(1)
        ret

.x_integral:                            / here, x is integral
        fstp    %st(0)                  / ,x
        fld1                            / 1 = 2**0, x
        fscale                          / 2**(0 + x) = 2**x, x
```



```
        fstp    %st(1)                  / 2**x
        ret

.shortcut:
        / Here, |x| <= 1,
        / whence x is in f2xm1's domain.
        flds    4(%esp)                 / push x
        f2xm1                           / 2**x - 1
        fld1                            / 1,2**x - 1
        faddp   %st,%st(1)              / 2**x
        ret

.not_finite:
        ja      .NaN_or_pinf            / branch if x is NaN
        movl    4(%esp),%eax            / eax <-- x
        andl    $0x80000000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        flds    4(%esp)
        fwait
        ret
        .align  4
        SET_SIZE(exp2f)
```

```
**********************************************************
    2955 Sat May 10 12:09:37 2014
new/usr/src/lib/libm/i386/src/exp2l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "exp2l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(exp2l,function)
#include "libm_synonyms.h"

        ENTRY(exp2l)
        movl    12(%esp),%ecx           / cx <--sign&bexp(x)
        andl    $0x00007fff,%ecx        / ecx <-- zero_xtnd(bexp(x))
        cmpl    $0x00003fff,%ecx        / Is |x| <= 1?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / |x| may be slightly > 1
        cmpl    $0x00007fff,%ecx        / bexp(|x|) = bexp(INF)?
        je      .not_finite             / if so, x is not finite
.finite_non_special:                    / Here, 1 < |x| < INF
        fldt    4(%esp)                 / push arg
        fld     %st(0)                  / duplicate stack top
        frndint                         / [x],x
        fucom                           / x integral?
        fnstsw  %ax
        sahf
        je      .x_integral             / branch if x integral
        fxch                            / x, [x]
        fsub    %st(1),%st              / x-[x], [x]
        f2xm1                           / 2**(x-[x])-1, [x]
        fld1                            / 1,2**(x-[x])-1, [x]
        faddp   %st,%st(1)              / 2**(x-[x]), [x]
        fscale                          / 2**x = 2**(arg), [x]
        fstp    %st(1)
        ret

.x_integral:
        fstp    %st(0)                  / ,x
```



```
        fld1                            / 1 = 2**0, x
        fscale                          / 2**(0 + x) = 2**x, x
        fstp    %st(1)                  / 2**x
        ret

.check_tail:
        movl    8(%esp),%ecx            / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / Is |x| <= 1?
        ja      .finite_non_special
        movl    4(%esp),%edx            / edx <-- lo_32(sgnfcnd(x))
        cmpl    $0x00000000,%edx        / Is |x| slightly > 1?
        ja      .finite_non_special     / branch if |x| slightly > 1
.shortcut:
        / Here, |x| < 1,
        / whence x is in f2xm1's domain.
        fldt    4(%esp)                 / push x
        f2xm1                           / 2**x - 1
        fld1                            / 1,2**x - 1
        faddp   %st,%st(1)              / 2**x
        ret

.not_finite:
        movl    8(%esp),%ecx            / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / hi_32(|x|) = hi_32(INF)?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0,%edx                 / lo_32(x) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    12(%esp),%eax           / ax <-- sign&bexp((x))
        andl    $0x00008000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldt    4(%esp)
        ret
        .align  4
        SET_SIZE(exp2l)
```

```
**********************************************************
    3690 Sat May 10 12:09:37 2014
new/usr/src/lib/libm/i386/src/expl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "expl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(expl,function)
#include "libm_synonyms.h"

        .data
        .align  4
ln2_hi: .long   0xd1d00000, 0xb17217f7, 0x00003ffe
ln2_lo: .long   0x4c67fc0d, 0x8654361c, 0x0000bfce

        ENTRY(expl)
        movl    12(%esp),%ecx           / cx <--sign&bexp(x)
        andl    $0x7fff,%ecx            / ecx <-- zero_xtnd(bexp(x))
        cmpl    $0x3ffe,%ecx            / Is |x| < 0.5?
        jb      2f                      / If so, see which shortcut to take
        je      .check_tail             / More checking if 0.5 <= |x| < 1
        cmpl    $0x00007fff,%ecx        / bexp(|x|) = bexp(INF)?
        je      .not_finite             / if so, x is not finite
        cmpl    $0x0000400e,%ecx        / |x| < 32768 = 2^15?
        jb      .finite_non_special     / if so, proceed with argument reduction
        fldt    4(%esp)                 / x
        fld1                            / 1, x
        jmp     1f
.finite_non_special:                    / Here, ln(2) < |x| < 2^15
        fldt    4(%esp)                 / x
        fld     %st(0)                  / x, x
        fldl2e                          / log2(e), x, x
        fmulp                           / z := x*log2(e), x
        frndint                         / [z], x
        fst     %st(2)                  / [z], x, [z]
        PIC_SETUP(1)
        fldt    PIC_L(ln2_hi)           / ln2_hi, [z], x, [z]
```



```
        fmulp                           / [z]*ln2_hi, x, [z]
        fsubrp  %st,%st(1)              / x-[z]*ln2_hi, [z]
        fldt    PIC_L(ln2_lo)           / ln2_lo, x-[z]*ln2_hi, [z]
        PIC_WRAPUP
        fmul    %st(2),%st              / [z]*ln2_lo, x-[z]*ln2_hi, [z]
        fsubrp  %st,%st(1)              / r := x-[z]*ln(2), [z]
        fldl2e                          / log2(e), r, [z]
        fmulp                           / f := r*log2(e), [z]
        f2xm1                           / 2^f-1,[z]
        fld1                            / 1, 2^f-1, [z]
        faddp   %st,%st(1)              / 2^f, [z]
1:
        fscale                          / e^x, [z]
        fstp    %st(1)
        ret

2:                                      / Here, |x| < 0.5
        cmpl    $0x3fbe,%ecx            / Is |x| >= 2^-65?
        jae     .shortcut               / If so, take a shortcut
        fldt    4(%esp)                 / x
        fld1                            / 1, x
        faddp   %st,%st(1)              / 1+x (for inexact & directed rounding)
        ret

.check_tail:
        movl    8(%esp),%ecx            / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0xb17217f7,%ecx        / Is |x| < ln(2)?
        ja      .finite_non_special
        jb      .shortcut
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0xd1cf79ab,%edx        / Is |x| slightly < ln(2)?
        ja      .finite_non_special     / branch if |x| slightly > ln(2)
.shortcut:
        / Here, |x| < ln(2), so |z| = |x/ln(2)| < 1,
        / whence z is in f2xm1's domain.
        fldt    4(%esp)                 / x
        fldl2e                          / log2(e), x
        fmulp                           / x*log2(e)
        f2xm1                           / 2^(x*log2(e))-1 = e^x-1
        fld1                            / 1, e^x-1
        faddp   %st,%st(1)              / e^x
        ret

.not_finite:
        movl    8(%esp),%ecx            / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / hi_32(|x|) = hi_32(INF)?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0,%edx                 / lo_32(x) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    12(%esp),%eax           / ax <-- sign&bexp((x))
        andl    $0x00008000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fldz                            / Here, x = -inf, so return 0
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldt    4(%esp)
        fadd    %st(0),%st              / quiet SNaN
        ret
        .align  4
        SET_SIZE(expl)
```

```
**********************************************************
    3735 Sat May 10 12:09:38 2014
new/usr/src/lib/libm/i386/src/expm1.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "expm1.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(expm1,function)
#include "libm_synonyms.h"

        .data
        .align  4
.mhundred:      .float  -100.0

        ENTRY(expm1)
        movl    8(%esp),%ecx            / ecx <-- hi_32(x)
        andl    $0x7fffffff,%ecx        / ecx <-- hi_32(|x|)
        cmpl    $0x3fe62e42,%ecx        / Is |x| < ln(2)?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / |x| may be only slightly < ln(2)
        cmpl    $0x7ff00000,%ecx        / hi_32(|x|) >= hi_32(INF)?
        jae     .not_finite             / if so, x is not finite
.finite_non_special:                    / Here, ln(2) < |x| < INF
        fldl    4(%esp)                 / push x

        subl    $8,%esp                 / save RP and set round-to-64-bits
        fstcw   (%esp)
        movw    (%esp),%ax
        movw    %ax,4(%esp)
        orw     $0x0300,%ax
        movw    %ax,(%esp)
        fldcw   (%esp)

        fldl2e                          / push log2e   }not for xtndd_dbl
        fmulp   %st,%st(1)              / z = x*log2e  }not for xtndd_dbl
        fld     %st(0)                  / duplicate stack top
        frndint                         / [z],z
```



```
        / [z] != 0, compute exp(x) and then subtract one to get expm1(x)
        fxch                            / z,[z]
        fsub    %st(1),%st              / z-[z],[z]
        f2xm1                           / 2**(z-[z])-1,[z]
        / avoid spurious underflow when scaling to compute exp(x)
        PIC_SETUP(1)
        flds    PIC_L(.mhundred)
        PIC_WRAPUP
        fucom   %st(2)                  / if -100 !< [z], then use -100
        fstsw   %ax
        sahf
        jb      .got_int_part
        fxch    %st(2)
.got_int_part:
        fstp    %st(0)                  /   2**(z-[z])-1,max([z],-100)
        fld1                            / 1,2**(z-[z])-1,max([z],-100)
        faddp   %st,%st(1)              /   2**(z-[z])  ,max([z],-100)
        fscale                          /   exp(x)      ,max([z],-100)
        fld1                            / 1,exp(x)      ,max([z],-100)
        fxch                            / exp(x),1      ,max([z],-100)
        fsubp   %st,%st(1)              /   exp(x)-1    ,max([z],-100)
        fstp    %st(1)

        fstcw   (%esp)                  / restore old RP
        movw    (%esp),%dx
        andw    $0xfcff,%dx
        movw    4(%esp),%cx
        andw    $0x0300,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)
        add     $8,%esp

        ret

.check_tail:
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0xfefa39ef,%edx        / Is |x| slightly < ln(2)?
        ja      .finite_non_special     / branch if |x| slightly > ln(2)
.shortcut:
        / Here, |x| < ln(2), so |z| = |x*log2(e)| < 1,
        / whence z is in f2xm1's domain.
        fldl    4(%esp)                 / push x
        fldl2e                          / push log2e  }not for xtndd_dbl
        fmulp   %st,%st(1)              / z = x*log2e }not for xtndd_dbl
        f2xm1                           / 2**(x*log2(e))-1 = e**x - 1
        ret

.not_finite:
        / Here, flags still have settings from execution of
        /       cmpl    $0x7ff00000,%ecx        / hi_32(|x|) > hi_32(INF)?
        ja      .NaN_or_pinf            / if not, x may be +/- INF
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0,%edx                 / lo_32(x) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        andl    $0x80000000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fld1                            / Here, x = -inf, so return -1
        fchs
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldl    4(%esp)
        fwait
```

```
128         ret
129         .align  4
130         SET_SIZE(expm1)
```

```
**********************************************************
    4009 Sat May 10 12:09:38 2014
new/usr/src/lib/libm/i386/src/expm1f.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "expm1f.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(expm1f,function)
#include "libm_synonyms.h"

        .data
        .align  4
.mhundred:      .float  -100.0

        ENTRY(expm1f)
        movl    4(%esp),%ecx            / ecx <-- x
        andl    $0x7fffffff,%ecx        / ecx <-- |x|
        cmpl    $0x3f317217,%ecx        / Is |x| < ln(2)?
        jbe     .shortcut               / If so, take a shortcut.
        cmpl    $0x7f800000,%ecx        / |x| >= INF?
        jae     .not_finite             / if so, x is not finite
        flds    4(%esp)                 / push x

        subl    $8,%esp                 / save RP and set round-to-64-bits
        fstcw   (%esp)
        movw    (%esp),%ax
        movw    %ax,4(%esp)
        orw     $0x0300,%ax
        movw    %ax,(%esp)
        fldcw   (%esp)

        fldl2e                          / push log2e   }not for xtndd_dbl
        fmulp   %st,%st(1)              / z = x*log2e  }not for xtndd_dbl
        fld     %st(0)                  / duplicate stack top
        frndint                         / [z],z
        fucom                           / This and the next 3 instructions
        fstsw   %ax                     / add 10 clocks to runtime of the
```



```
        sahf                            / main branch, but save about 265
        je      .z_integral             / upon detection of integral z.
        / [z] != 0, compute exp(x) and then subtract one to get expm1(x)
        fxch                            / z,[z]
        fsub    %st(1),%st              / z-[z],[z]
        f2xm1                           / 2**(z-[z])-1,[z]
        / avoid spurious underflow when scaling to compute exp(x)
        PIC_SETUP(1)
        flds    PIC_L(.mhundred)
        PIC_WRAPUP
        fucom   %st(2)                  / if -100 !< [z], then use -100
        fstsw   %ax
        sahf
        jb      .got_int_part
        fxch    %st(2)
.got_int_part:
        fstp    %st(0)                  /   2**(z-[z])-1,max([z],-100)
        fld1                            / 1,2**(z-[z])-1,max([z],-100)
        faddp   %st,%st(1)              /   2**(z-[z])  ,max([z],-100)
        fscale                          /   exp(x)      ,max([z],-100)
        fld1                            / 1,exp(x)      ,max([z],-100)
        fsubrp  %st,%st(1)              /   exp(x)-1    ,max([z],-100)
        fstp    %st(1)

        fstcw   (%esp)                  / restore old RP
        movw    (%esp),%dx
        andw    $0xfcff,%dx
        movw    4(%esp),%cx
        andw    $0x0300,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)
        add     $8,%esp

        ret

.z_integral:                            / here, z is integral
        fstp    %st(0)                  / ,z
        / avoid spurious underflow when scaling to compute exp(x)
        PIC_SETUP(2)
        flds    PIC_L(.mhundred)
        PIC_WRAPUP
        fucom   %st(1)                  / if -100 !< [z], then use -100
        fstsw   %ax
        sahf
        jb      .scale_wont_ovfl
        fxch    %st(1)
.scale_wont_ovfl:
        fstp    %st(0)                  /   max([z],-100)
        fld1                            / 1,max([z],-100)
        fscale                          /   exp(x)      ,max([z],-100)
        fld1                            / 1,exp(x)      ,max([z],-100)
        fsubrp  %st,%st(1)              /   exp(x)-1    ,max([z],-100)
        fstp    %st(1)

        fstcw   (%esp)                  / restore old RP
        movw    (%esp),%dx
        andw    $0xfcff,%dx
        movw    4(%esp),%cx
        andw    $0x0300,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)
        add     $8,%esp

        ret
```

```
.shortcut:
        / Here, |x| < ln(2), so |z| = |x*log2(e)| < 1,
        / whence z is in f2xm1's domain.
        flds    4(%esp)                 / push x
        fldl2e                          / push log2e  }not for xtndd_dbl
        fmulp   %st,%st(1)              / z = x*log2e }not for xtndd_dbl
        f2xm1                           / 2**(x*log2(e))-1 = e**x - 1
        ret

.not_finite:
        ja      .NaN_or_pinf            / branch if x is NaN
        movl    4(%esp),%eax            / eax <-- x
        andl    $0x80000000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
        fld1                            / Here, x = -inf, so return -1
        fchs
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        flds    4(%esp)
        fwait
        ret
        .align  4
        SET_SIZE(expm1f)
```

```
**********************************************************
    3709 Sat May 10 12:09:38 2014
new/usr/src/lib/libm/i386/src/expm1l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file "expm1l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(expm1l,function)
#include "libm_synonyms.h"

        .data
        .align  4
ln2_hi: .long   0xd1d00000, 0xb17217f7, 0x00003ffe
ln2_lo: .long   0x4c67fc0d, 0x8654361c, 0x0000bfce

        ENTRY(expm1l)
        movl    12(%esp),%ecx           / cx <--sign&bexp(x)
        movl    %ecx,%eax               / ax <--sign&bexp(x)
        andl    $0x00007fff,%ecx        / ecx <-- zero_xtnd(bexp(x))
        cmpl    $0x00003ffe,%ecx        / Is |x| < ln(2)?
        jb      .shortcut               / If so, take a shortcut.
        je      .check_tail             / |x| may be only slightly < ln(2)
        cmpl    $0x00007fff,%ecx        / bexp(|x|) = bexp(INF)?
        je      .not_finite             / if so, x is not finite
        andl    $0x0000ffff,%eax        / eax <-- sign&bexp(x)
        cmpl    $0x0000c006,%eax        / x <= -128?
        jae     1f                      / if so, simply return -1
        cmpl    $0x0000400d,%ecx        / |x| < 16384 = 2^14?
        jb      .finite_non_special     / if so, proceed with argument reduction
        fldt    4(%esp)                 / x >= 16384; x
        fld1                            / 1, x
        fscale                          / +Inf, x
        fstp    %st(1)                  / +Inf
        ret

.finite_non_special:                    / -128 < x < -ln(2) || ln(2) < x < 2^14
        fldt    4(%esp)                 / x
```



```
        fld     %st(0)                  / x, x
        fldl2e                          / log2(e), x, x
        fmulp                           / z := x*log2(e), x
        frndint                         / [z], x
        fst     %st(2)                  / [z], x, [z]
        PIC_SETUP(1)
        fldt    PIC_L(ln2_hi)           / ln2_hi, [z], x, [z]
        fmulp                           / [z]*ln2_hi, x, [z]
        fsubrp  %st,%st(1)              / x-[z]*ln2_hi, [z]
        fldt    PIC_L(ln2_lo)           / ln2_lo, x-[z]*ln2_hi, [z]
        PIC_WRAPUP
        fmul    %st(2),%st              / [z]*ln2_lo, x-[z]*ln2_hi, [z]
        fsubrp  %st,%st(1)              / r := x-[z]*ln(2), [z]
        fldl2e                          / log2(e), r, [z]
        fmulp                           / f := r*log2(e), [z]
        f2xm1                           / 2^f-1,[z]
        fld1                            / 1, 2^f-1, [z]
        faddp   %st,%st(1)              / 2^f, [z]
        fscale                          / e^x, [z]
        fstp    %st(1)                  / e^x
        fld1                            / 1, e^x
        fsubrp  %st,%st(1)              / e^x-1
        ret

.check_tail:
        movl    8(%esp),%ecx            / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0xb17217f7,%ecx        / Is |x| < ln(2)?
        ja      .finite_non_special
        jb      .shortcut
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0xd1cf79ab,%edx        / Is |x| slightly < ln(2)?
        ja      .finite_non_special     / branch if |x| slightly > ln(2)
.shortcut:
        / Here, |x| < ln(2), so |z| = |x/ln(2)| < 1,
        / whence z is in f2xm1's domain.
        fldt    4(%esp)                 / x
        fldl2e                          / log2(e), x
        fmulp                           / z := x*log2(e)
        f2xm1                           / 2^(x*log2(e))-1 = e^x-1
        ret

.not_finite:
        movl    8(%esp),%ecx            / ecx <-- hi_32(sgnfcnd(x))
        cmpl    $0x80000000,%ecx        / hi_32(|x|) = hi_32(INF)?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    4(%esp),%edx            / edx <-- lo_32(x)
        cmpl    $0,%edx                 / lo_32(x) = 0?
        jne     .NaN_or_pinf            / if not, x is NaN
        movl    12(%esp),%eax           / ax <-- sign&bexp((x))
        andl    $0x00008000,%eax        / here, x is infinite, but +/-?
        jz      .NaN_or_pinf            / branch if x = +INF
1:
        fld1                            / Here, x = -inf, so return -1
        fchs
        ret

.NaN_or_pinf:
        / Here, x = NaN or +inf, so load x and return immediately.
        fldt    4(%esp)
        ret
        .align  4
        SET_SIZE(expm1l)
```

```
**********************************************************
    1175 Sat May 10 12:09:38 2014
new/usr/src/lib/libm/i386/src/fabs.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "fabs.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fabs,function)
#include "libm_synonyms.h"

        ENTRY(fabs)
        fldl    4(%esp)
#undef  fabs
        fabs
        ret
        .align  4
        SET_SIZE(fabs)
```

****
1180 Sat May 10 12:09:38 2014
new/usr/src/lib/libm/i386/src/fabsf.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file   "fabsf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fabsf,function)
#include "libm_synonyms.h"

        ENTRY(fabsf)
        flds    4(%esp)
#undef  fabs
        fabs
        ret
        .align  4
        SET_SIZE(fabsf)
```

****
1180 Sat May 10 12:09:38 2014
new/usr/src/lib/libm/i386/src/fabsl.s
patch01 - 693 import Sun Devpro Math Library
****

```
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        .file   "fabsl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fabsl,function)
#include "libm_synonyms.h"

        ENTRY(fabsl)
        fldt    4(%esp)
#undef  fabs
        fabs
        ret
        .align  4
        SET_SIZE(fabsl)
```

```
**********************************************************
    1440 Sat May 10 12:09:38 2014
new/usr/src/lib/libm/i386/src/finitef.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "finitef.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(finitef,function)
#include "libm_synonyms.h"

        ENTRY(finitef)
        movl    4(%esp),%eax            / eax <-- x
        notl    %eax                    / not(bexp) = 0 iff bexp = all 1's
        andl    $0x7f800000,%eax        / ZF <-- 1      iff not(bexp) = 0
        jz      .done                   / no jump if arg. is finite
        movl    $1,%eax                 / %ax was 0; ansi needs %eax = 1
.done:
        ret
        .align  4
        SET_SIZE(finitef)
```

```
**********************************************************
    1772 Sat May 10 12:09:38 2014
new/usr/src/lib/libm/i386/src/finitel.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file "finitel.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(finitel,function)
#include "libm_synonyms.h"

        ENTRY(finitel)
        movl    12(%esp),%eax           / %ax <-- sign&bexp(x)
        testl   $0x80000000,8(%esp)     / ZF = 1 iff hi_32(sgnfcnd(x))'s msb = 0
        jz      .chk_denormal_or_0
        notl    %eax                    / not(bexp) = 0 iff bexp = all 1's
        andl    $0x00007fff,%eax        / ZF <-- 1      iff not(bexp) = 0
        jz      .done                   / no jump if arg. is finite
        movl    $1,%eax                 / ansi needs %eax = 1
.done:
        ret

.chk_denormal_or_0:
        andl    $0x00007fff,%eax        / ZF <-- 1 iff bexp = 0 iff denormal or
        jnz     .unsupported            / jump if arg has unsupported format
        movl    $1,%eax                 / ansi needs %eax = 1
        ret

.unsupported:
        movl    $0,%eax                 / unsupported format does not represent
        ret                             / a finite number
        .align  4
        SET_SIZE(finitel)
```

```
**********************************************************
    1473 Sat May 10 12:09:39 2014
new/usr/src/lib/libm/i386/src/floor.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "floor.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(floor,function)
#include "libm_synonyms.h"

        ENTRY(floor)
        subl    $8,%esp
        fstcw   (%esp)
        fldl    12(%esp)
        movw    (%esp),%cx
        orw     $0x0c00,%cx
        xorw    $0x0800,%cx
        movw    %cx,4(%esp)
        fldcw   4(%esp)                 / set RD = down
        frndint
        fstcw   4(%esp)                 / restore RD
        movw    4(%esp),%dx
        andw    $0xf3ff,%dx
        movw    (%esp),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)                  / restore RD
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(floor)
```

```
**********************************************************
    1890 Sat May 10 12:09:39 2014
new/usr/src/lib/libm/i386/src/floorl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "floorl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(ceill,function)
LIBM_ANSI_PRAGMA_WEAK(floorl,function)
#include "libm_synonyms.h"

        ENTRY(ceill)
        subl    $8,%esp
        fstcw   (%esp)
        fldt    12(%esp)
        movw    (%esp),%cx
        orw     $0x0c00,%cx
        xorw    $0x0400,%cx
        movw    %cx,4(%esp)
        fldcw   4(%esp)                 / set RD = up
        frndint
        fstcw   4(%esp)                 / restore RD
        movw    4(%esp),%dx
        andw    $0xf3ff,%dx
        movw    (%esp),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)                  / restore RD
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(ceill)


        ENTRY(floorl)
        subl    $8,%esp
```



```
        fstcw   (%esp)
        fldt    12(%esp)
        movw    (%esp),%cx
        orw     $0x0c00,%cx
        xorw    $0x0800,%cx
        movw    %cx,4(%esp)
        fldcw   4(%esp)                 / set RD = down
        frndint
        fstcw   4(%esp)                 / restore RD
        movw    4(%esp),%dx
        andw    $0xf3ff,%dx
        movw    (%esp),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,(%esp)
        fldcw   (%esp)                  / restore RD
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(floorl)
```

```
**********************************************************
    1799 Sat May 10 12:09:39 2014
new/usr/src/lib/libm/i386/src/fmod.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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        .file "fmod.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fmod,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(fmod)
        movl    16(%esp),%eax           / eax <-- hi_32(y)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(|y|)
        orl     12(%esp),%eax           / eax <-- lo_32(y)|hi_32(|y|)
        je      .zero

        fldl    12(%esp)                / load arg y
        fldl    4(%esp)                 / load arg x
.mod_loop:
        fprem                           / partial fmod
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check for incomplete reduction
        jne     .mod_loop               / while incomplete, do fprem again
        fstp    %st(1)
        ret
.zero:
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(1)
        pushl   $27                     / case 27 in _SVID_libm_err
        pushl   20(%ebp)                / pass x
        pushl   16(%ebp)
        pushl   12(%ebp)                / pass y
        pushl   8(%ebp)
        call    PIC_F(_SVID_libm_err)
        addl    $20,%esp
```



```
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(fmod)
```

****
1393 Sat May 10 12:09:39 2014
new/usr/src/lib/libm/i386/src/fmodf.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file "fmodf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fmodf,function)
#include "libm_synonyms.h"

        ENTRY(fmodf)
        flds    8(%esp)                 / load arg y
        flds    4(%esp)                 / load arg x
.mod_loop:
        fprem                           / partial fmod
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check for incomplete reduction
        jne     .mod_loop               / while incomplete, do fprem again
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(fmodf)
```

```
**********************************************************
    1393 Sat May 10 12:09:39 2014
new/usr/src/lib/libm/i386/src/fmodl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "fmodl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fmodl,function)
#include "libm_synonyms.h"

        ENTRY(fmodl)
        fldt    16(%esp)               / load arg y
        fldt    4(%esp)                / load arg x
.mod_loop:
        fprem                          / partial fmod
        fstsw   %ax                    / store status word
        andw    $0x400,%ax             / check for incomplete reduction
        jne     .mod_loop              / while incomplete, do fprem again
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(fmodl)
```

```
**********************************************************
    3235 Sat May 10 12:09:39 2014
new/usr/src/lib/libm/i386/src/hypot.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "hypot.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(hypot,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

#undef fabs

        .data
        .align  4
inf:
        .long   0x7f800000

        ENTRY(hypot)
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(|x|)
        jz      .x_maybe_0              / if x = +/-0, return |y|
        subl    $0x7ff00000,%eax        / eax <-- hi_32(|x|) - hi_32(INF)
        jz      .x_maybe_inf
.check_y:
        movl    16(%esp),%eax           / eax <-- hi_32(y)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(|y|)
        jz      .y_maybe_0              / if y = +/-0, return |x|
        subl    $0x7ff00000,%eax        / eax <-- hi_32(|y|) - hi_32(INF)
        jz      .y_maybe_inf
.do_hypot:
        fldl    12(%esp)                / ,y
        fmul    %st(0),%st              / ,y*y
        fldl    4(%esp)                 / x,y*y
        fmul    %st(0),%st              / x*x,y*y
        faddp   %st,%st(1)              / x*x+y*y
        fsqrt                           / sqrt(x*x+y*y)
```



```
        subl    $8,%esp
        fstpl   (%esp)                  / round to double
        fldl    (%esp)                  / sqrt(x*x+y*y) rounded to double
        PIC_SETUP(1)
        flds    PIC_L(inf)              / inf , sqrt(x*x+y*y)
        PIC_WRAPUP
        addl    $8,%esp
        fucomp
        fstsw   %ax                     / store status in %ax
        sahf                            / 80387 flags in %ah to 80386 flags
        jz      .maybe_ovflw
        ret

.maybe_ovflw:
        jnp     .ovflw
        ret

.ovflw:
        /       overflow occurred
        fstp    %st(0)                  / stack empty
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(2)
        pushl   $4
        pushl   20(%ebp)                / high y
        pushl   16(%ebp)                / low y
        pushl   12(%ebp)                / high x
        pushl   8(%ebp)                 / low x
        call    PIC_F(_SVID_libm_err)
        addl    $20,%esp
        PIC_WRAPUP
        leave
        ret

.x_maybe_0:
        movl    4(%esp),%ecx            / ecx <-- lo_32(x)
        orl     %ecx,%eax               / is x = +/-0?
        jnz     .check_y                / branch if x is denormal
        /  x = +/-0, so return |y|
        fldl    12(%esp)
        fabs
        ret

.x_maybe_inf:
        movl    4(%esp),%ecx            / ecx <-- lo_32(x)
        orl     %ecx,%eax               / is x = +/-INF?
        jnz     .check_y                / branch if x is NaN
        / push&pop y in case y is a SNaN
        fldl    12(%esp)
        fstp    %st(0)
        / x = +/-INF, so return |x|
        fldl    4(%esp)
        fabs
        ret

.y_maybe_0:
        movl    12(%esp),%ecx           / ecx <-- lo_32(y)
        orl     %ecx,%eax               / is y = +/-0?
        jnz     .do_hypot               / branch if y is denormal
        /  y = +/-0, so return |x|
        fldl    4(%esp)
        fabs
        ret

.y_maybe_inf:
        movl    12(%esp),%ecx           / ecx <-- lo_32(y)
```

```
128         orl     %ecx,%eax               / is y = +/-INF?
129         jnz     .do_hypot               / branch if y is NaN
130         / push&pop x in case x is a SNaN
131         fldl    4(%esp)
132         fstp    %st(0)
133         /  y = +/-INF, so return |y|
134         fldl    12(%esp)
135         fabs
136         ret
137         .align  4
138         SET_SIZE(hypot)
```

```
**********************************************************
    1913 Sat May 10 12:09:39 2014
new/usr/src/lib/libm/i386/src/hypotf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "hypotf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(hypotf,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

#undef fabs

        ENTRY(hypotf)
        movl    4(%esp),%eax            / eax <-- x
        andl    $0x7fffffff,%eax        / eax <-- |x|
        jz      .return_abs_y           / if x = +/-0, return |y|
        subl    $0x7f800000,%eax        / eax <-- |x| - INF
        jz      .return_abs_x           / if x = +/-INF, return |x|
        movl    8(%esp),%eax            / eax <-- y
        andl    $0x7fffffff,%eax        / eax <-- |y|
        jz      .return_abs_x           / if y = +/-0, return |x|
        subl    $0x7f800000,%eax        / eax <-- |y| - INF
.return_abs_y:
        flds    8(%esp)                 / y
        jz      .take_abs               / if y = +/-INF, return |y|
        fmul    %st(0),%st              / y*y
        flds    4(%esp)                 / x,y*y
        fmul    %st(0),%st              / x*x,y*y
        faddp   %st,%st(1)              / x*x+y*y
        fsqrt                           / sqrt(x*x+y*y)
        subl    $4,%esp
        fstps   (%esp)                  / round to single
        flds    (%esp)
        fwait
        addl    $4,%esp
        ret
```



```
.return_abs_x:
        / returns |x|
        flds    4(%esp)
.take_abs:
        fabs
        ret
        .align  4
        SET_SIZE(hypotf)
```

```
**********************************************************
    3422 Sat May 10 12:09:39 2014
new/usr/src/lib/libm/i386/src/ieee_funcl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file "ieee_funcl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(isinfl,function)
LIBM_ANSI_PRAGMA_WEAK(isnormall,function)
LIBM_ANSI_PRAGMA_WEAK(issubnormall,function)
LIBM_ANSI_PRAGMA_WEAK(iszerol,function)
LIBM_ANSI_PRAGMA_WEAK(signbitl,function)
#include "libm_synonyms.h"

        ENTRY(isinfl)
        movl    12(%esp),%eax           / ax <-- sign and bexp of x
        notl    %eax
        andl    $0x00007fff,%eax
        jz      .L6
        movl    $0,%eax
.not_inf:
        ret

.L6:                                    / here, (eax) = 0.0
        movl    8(%esp),%ecx
        xorl    $0x80000000,%ecx        / handle unsupported implicitly
        orl     4(%esp), %ecx
        jnz     .not_inf
        movl    $1,%eax
        ret
        .align  4
        SET_SIZE(isinfl)

        ENTRY(isnormall)
                                        / TRUE iff (x is finite, but
                                        /           neither subnormal nor zero)
                                        /      iff (msb(sgnfcnd(x) /= 0
```



```
                                        /           &  0 < bexp(x) < 0x7fff)
        movl    8(%esp),%eax            / eax <-- hi_32(sgnfcnd(x))
        andl    $0x80000000,%eax        / eax[31]  <-- msb(sgnfcnd(x)),
                                        / rest_of(eax) <-- 0
        jz      .L8                     / jump iff msb(sgnfcnd(x)) = 0
        movl    12(%esp),%eax           / ax <-- sign and bexp of x
        notl    %eax                    / ax[0..14] <-- not(bexp(x))
        andl    $0x00007fff,%eax        / eax  <-- zero_xtnd(not(bexp(x)))
        jz      .L8                     / jump  iff bexp(x) = 0x7fff or 0
        xorl    $0x00007fff,%eax        / treat pseudo-denormal as subnormal
        jz      .L8
        movl    $1,%eax
.L8:
        ret
        .align  4
        SET_SIZE(isnormall)

        ENTRY(issubnormall)
                                        / TRUE iff (bexp(x) = 0 &
                                        / msb(sgnfcnd(x)) = 0 & frac(x) /= 0)
        movl    8(%esp),%eax            / eax <-- hi_32(sgnfcnd(x))
        testl   $0x80000000,%eax        / eax[31] = msb(sgnfcnd(x));
                                        / set ZF if it's 0.
        jz      .may_be_subnorm         / jump iff msb(sgnfcnd(x)) = 0
.not_subnorm:
        movl    $0,%eax
.quicker_out:
        ret
.may_be_subnorm:
        testl   $0x00007fff,12(%esp)    / set ZF iff bexp(x)  = 0
        jnz     .not_subnorm            / jump   iff bexp(x) /= 0
        orl     4(%esp),%eax            / (eax) = 0 iff sgnfcnd(x) = 0
        jz      .quicker_out
        movl    $1,%eax
        ret
        .align  4
        SET_SIZE(issubnormall)

        ENTRY(iszerol)
        movl    12(%esp),%eax           / ax <-- sign and bexp of x
        andl    $0x00007fff,%eax        / eax <-- zero_xtnd(bexp(x))
        jz      .may_be_zero            / jump iff bexp(x) = 0
.not_zero:
        movl    $0,%eax
        ret
.may_be_zero:                           / here, (eax) = 0
        orl     8(%esp),%eax            / is hi_32(sgnfcnd(x)) = 0?
        jnz     .not_zero               / jump iff hi_32(sgnfcnd(x)) /= 0
        orl     4(%esp),%eax            / is lo_32(sgnfcnd(x)) = 0?
        jnz     .not_zero               / jump iff lo_32(sgnfcnd(x)) /= 0
        movl    $1,%eax
        ret
        .align  4
        SET_SIZE(iszerol)

        ENTRY(signbitl)
        movl    10(%esp),%eax           / eax[31] <-- sign_bit(x)
        shrl    $31,%eax                / eax <-- zero_xtnd(sign_bit(x))
        ret
        .align  4
        SET_SIZE(signbitl)
```

```
**********************************************************
    2364 Sat May 10 12:09:40 2014
new/usr/src/lib/libm/i386/src/ilogb.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "ilogb.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(ilogb,function)
#include "libm_synonyms.h"
#include "xpg6.h"

        .data
        .align  8
two52:  .long   0x0,0x43300000  / 2**52

        ENTRY(ilogb)
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(abs(x))
        testl   $0x7ff00000,%eax        / is bexp(x) 0?
        jz      .bexp_0                 / jump if x is 0 or subnormal
                                        / biased exponent is non-zero
        cmpl    $0x7ff00000,%eax        / is bexp(x) 0x7ff?
        jae     .bexp_all_1             / jump if x is NaN or Inf
        shrl    $20,%eax                / eax <-- bexp(x)
        subl    $1023,%eax              / unbias exponent by 1023
        ret

.bexp_all_1:
        movl    $0x7fffffff,%eax        / x is NaN or inf, so return 0x7fffffff
        jmp     0f

.bexp_0:
        orl     4(%esp),%eax            / test whether x is 0
        jnz     .ilogb_subnorm
        movl    $0x80000001,%eax        / x is +/-0, so return 0x80000001
0:
        PIC_SETUP(0)
```



```
        PIC_G_LOAD(movzwl,__xpg6,ecx)
        PIC_WRAPUP
        andl    $_C99SUSv3_ilogb_0InfNaN_raises_invalid,%ecx
        cmpl    $0,%ecx
        je      1f
        fldz
        fdivp   %st,%st(0)              / raise invalid as per SUSv3
1:
        ret

.ilogb_subnorm:                         / subnormal input
        fldl    4(%esp)                 / push x
        PIC_SETUP(1)
        fmull   PIC_L(two52)            / x*2**52
        PIC_WRAPUP
        subl    $8,%esp                 / set up storage area
        fstpl   (%esp)                  / store x*2**52 in storage are
        movl    $0x7ff00000,%eax
        andl    4(%esp),%eax
        shrl    $20,%eax                / extract exponent of x*2**52
        subl    $1075,%eax              / unbias it by 1075 (= 1023 + 52)
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(ilogb)
```

```
**********************************************************
    2634 Sat May 10 12:09:40 2014
new/usr/src/lib/libm/i386/src/ilogbf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "ilogbf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(ilogbf,function)
#include "libm_synonyms.h"
#include "xpg6.h"

        .data
        .align  8
two23:  .long   0x4b000000              / 2**23

        ENTRY(ilogbf)
        movl    4(%esp),%eax            / eax <-- x
        testl   $0x7f800000,%eax        / is bexp(x) 0?
        jz      .bexp_0                 / jump if x is 0 or subnormal
                                        / here, biased exponent is non-zero
        andl    $0x7fffffff,%eax        / eax <-- abs(x)
        cmpl    $0x7f800000,%eax        / is bexp(x) 0xff?
        jae     .bexp_all_1             / jump if x is NaN or Inf
        shrl    $23,%eax                / eax <-- zero_xtnd(bexp(x))
        subl    $127,%eax               / unbias exponent by 127
        ret

.bexp_all_1:
        movl    $0x7fffffff,%eax        / x is NaN or inf, so return 0x7fffffff
        jmp     0f

.bexp_0:
        andl    $0x7fffffff,%eax        / eax <-- abs(x), and
                                        / ZF = 1 iff x = 0.0
        jnz     .ilogb_subnorm
        movl    $0x80000001,%eax        / x is +/-0, so return 0x80000001
0:
```



```
        PIC_SETUP(0)
        PIC_G_LOAD(movzwl,__xpg6,ecx)
        PIC_WRAPUP
        andl    $_C99SUSv3_ilogb_0InfNaN_raises_invalid,%ecx
        cmpl    $0,%ecx
        je      1f
        fldz
        fdivp   %st,%st(0)              / raise invalid as per SUSv3
1:
        ret

.ilogb_subnorm:                         / subnormal input
        flds    4(%esp)                 / push x
        PIC_SETUP(1)
        fmuls   PIC_L(two23)            / x*2**23; rebias x by 127+23,
                                        /          instead of 127
        PIC_WRAPUP
        subl    $4,%esp                 / set up storage area
        fstps   (%esp)                  / store x*2**23 in storage area
        fwait                           / (shouldn't raise exception, but
                                        / just in case)
        movl    $0x7f800000,%eax        / eax <-- single_bexp_mask
        andl    (%esp),%eax             / eax[23..30]  <-- bexp(x*2**23),
                                        / rest_of(eax) <-- 0
        shrl    $23,%eax                / eax <-- zero_xtnd(bexp(x*2**23))
        subl    $150,%eax               / unbias rebiased x by 150 (= 127 + 23)
        addl    $4,%esp                 / restore stack for caller
        ret
        .align  4
        SET_SIZE(ilogbf)
```

```
**********************************************************
    2448 Sat May 10 12:09:40 2014
new/usr/src/lib/libm/i386/src/ilogbl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "ilogbl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(ilogbl,function)
#include "libm_synonyms.h"
#include "xpg6.h"

        .data
        .align  8
two63:  .long   0x0,0x43d00000          / 2**63

        ENTRY(ilogbl)
        movl    12(%esp),%eax           / eax <-- sign and bexp of x
        andl    $0x00007fff,%eax        / eax <-- bexp(x)
        jz      .bexp_0                 / jump iff x is 0 or subnormal
                                        / here, biased exponent is non-zero
        testl   $0x80000000,8(%esp)     / test msb of hi_32(sgnfcnd(x))
        jz      .ilogbl_not_finite      / jump if unsupported format
        cmpl    $0x00007fff,%eax
        je      .ilogbl_not_finite
        subl    $16383,%eax             / unbias exponent by 16383 = 0x3fff
        ret

.ilogbl_not_finite:
        movl    $0x7fffffff,%eax        / x is NaN/inf/unsup
        jmp     0f

.bexp_0:
        movl    8(%esp),%eax            / eax <-- hi_32(sgnfcnd(x))
        orl     4(%esp),%eax            / test whether x is 0
        jnz     .ilogbl_subnorm         / jump iff x is subnormal
        movl    $0x80000001,%eax        / x is +/-0, so return 0x80000001
0:
```



```
        PIC_SETUP(0)
        PIC_G_LOAD(movzwl,__xpg6,ecx)
        PIC_WRAPUP
        andl    $_C99SUSv3_ilogb_0InfNaN_raises_invalid,%ecx
        cmpl    $0,%ecx
        je      1f
        fldz
        fdivp   %st,%st(0)              / raise invalid as per SUSv3
1:
        ret


.ilogbl_subnorm:                        / subnormal or pseudo-denormal input
        fldt    4(%esp)                 / push x, setting D-flag
        PIC_SETUP(1)
        fmull   PIC_L(two63)            / x*2**63
        PIC_WRAPUP
        subl    $12,%esp
        fstpt   (%esp)
        movl    $0x00007fff,%eax
        andl    8(%esp),%eax            / eax <-- sign and bexp of x*2**63
        subl    $16445,%eax             / unbias it by (16,383 + 63)
        addl    $12,%esp
        ret
        .align  4
        SET_SIZE(ilogbl)
```

```
**********************************************************
    1879 Sat May 10 12:09:40 2014
new/usr/src/lib/libm/i386/src/isnan.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "isnan.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(isnan,function)
        .weak _isnan
        .type _isnan,@function
_isnan  = __isnan
        .weak _isnand
        .type _isnand,@function
_isnand = __isnan
        .weak isnand
        .type isnand,@function
isnand  = __isnan
#include "libm_synonyms.h"

        ENTRY(isnan)
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(abs(x))
        subl    $0x7ff00000,%eax        / weed out finite values
        jae     .nan_or_inf             / no jump if arg. is finite
        movl    $0,%eax                 / ansi needs (eax) = 0
        ret
.nan_or_inf:
        ja      .got_nan                / no jump if arg. may be infinite;
                                        / let nan waste time
                                        / (eax) = 0 here
        testl   $0xffffffff,4(%esp)     / ZF <-- 1 iff lo_frac. = 0
                                        /          iff arg. is infinite
        jnz     .got_nan                / no jump if arg. is infinite;
        ret
.got_nan:
        movl    $1,%eax                 / %eax was 0, must be made 1 to
                                        / indicate TRUE
```



```
        ret
        .align  4
        SET_SIZE(isnan)
```

```
**********************************************************
    1602 Sat May 10 12:09:40 2014
new/usr/src/lib/libm/i386/src/isnanf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "isnanf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(isnanf,function)
        .weak _isnanf
        .type _isnanf,@function
_isnanf = __isnanf
#include "libm_synonyms.h"

        ENTRY(isnanf)
        movl    4(%esp),%eax            / eax <-- x
        andl    $0x7fffffff,%eax        / eax <-- abs(x)
        subl    $0x7f800000,%eax        / ZF <-- 1      iff x is infinite
        jae     .nan_or_inf             / no jump iff arg. is finite
        movl    $0,%eax
        ret
.nan_or_inf:
        jnz     .got_nan                / no jump if arg. infinite;
                                        / let nan waste time
        ret                             / %eax = 0 here
.got_nan:
        movl    $1,%eax                 / %eax was 0, must be made 1 to
                                        / indicate TRUE
        ret
        .align  4
        SET_SIZE(isnanf)
```

****
1732 Sat May 10 12:09:40 2014
new/usr/src/lib/libm/i386/src/isnanl.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file "isnanl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(isnanl,function)
#include "libm_synonyms.h"

        ENTRY(isnanl)
        movl    12(%esp),%eax           / ax <-- sign bit and exp
        andl    $0x00007fff,%eax
        jz      .not_nan                / jump if exp is all 0
        xorl    $0x00007fff,%eax
        jz      .nan_or_inf             / jump if exp is all 1
        testl   $0x80000000,8(%esp)
        jz      .got_nan                / jump if leading bit is 0
        movl    $0,%eax
.not_nan:
        ret
.nan_or_inf:                            / note that %eax = 0 from before
        cmpl    $0x80000000,8(%esp)     / what is first half of significand?
        jnz     .got_nan                / jump if not equal to 0x80000000
        testl   $0xffffffff,4(%esp)     / is second half of significand 0?
        jnz     .got_nan                / jump if not equal to 0
        ret
.got_nan:
        movl    $1,%eax
        ret
        .align  4
        SET_SIZE(isnanl)
```

```
**********************************************************
    5896 Sat May 10 12:09:40 2014
new/usr/src/lib/libm/i386/src/libm_inlines.h
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
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 */

/* Functions in this file are duplicated in locallibm.il.  Keep them in sync */

#ifndef _LIBM_INLINES_H
#define _LIBM_INLINES_H

#ifdef __GNUC__

#ifdef __cplusplus
extern "C" {
#endif

#include <sys/types.h>
#include <sys/ieeefp.h>

#define _LO_WORD(x)     ((uint32_t *)&x)[0]
#define _HI_WORD(x)     ((uint32_t *)&x)[1]
#define _HIER_WORD(x)   ((uint32_t *)&x)[2]

extern __inline__ double
__inline_sqrt(double a)
{
        double ret;

        __asm__ __volatile__("fsqrt\n\t" : "=t" (ret) : "0" (a) : "cc");
        return (ret);
}

extern __inline__ double
__ieee754_sqrt(double a)
{
```



```
        return (__inline_sqrt(a));
}

extern __inline__ float
__inline_sqrtf(float a)
{
        float ret;

        __asm__ __volatile__("fsqrt\n\t" : "=t" (ret) : "0" (a) : "cc");
        return (ret);
}

extern __inline__ double
__inline_rint(double a)
{
        __asm__ __volatile__(
            "andl $0x7fffffff,%1\n\t"
            "cmpl $0x43300000,%1\n\t"
            "jae  1f\n\t"
            "frndint\n\t"
            "1: fwait\n\t"
            : "+t" (a), "+&r" (_HI_WORD(a))
            :
            : "cc");

        return (a);
}

/*
 * 00 - 24 bits
 * 01 - reserved
 * 10 - 53 bits
 * 11 - 64 bits
 */
extern __inline__ int
__swapRP(int i)
{
        int ret;
        uint16_t cw;

        __asm__ __volatile__("fstcw %0\n\t" : "=m" (cw));

        ret = (cw >> 8) & 0x3;
        cw = (cw & 0xfcff) | ((i & 0x3) << 8);

        __asm__ __volatile__("fldcw %0\n\t" : : "m" (cw));

        return (ret);
}

/*
 * 00 - Round to nearest, with even preferred
 * 01 - Round down
 * 10 - Round up
 * 11 - Chop
 */
extern __inline__ enum fp_direction_type
__swap87RD(enum fp_direction_type i)
{
        int ret;
        uint16_t cw;

        __asm__ __volatile__("fstcw %0\n\t" : "=m" (cw));

        ret = (cw >> 10) & 0x3;
        cw = (cw & 0xf3ff) | ((i & 0x3) << 10);
```

```
128         __asm__ __volatile__("fldcw %0\n\t" : : "m" (cw));

130         return (ret);
131 }

133 extern __inline__ double
134 ceil(double d)
135 {
136         short rd = __swap87RD(fp_positive);

138         __asm__ __volatile__("frndint" : "+t" (d), "+r" (rd) : : "cc");
139         __swap87RD(rd);

141         return (d);
142 }

144 extern __inline__ double
145 copysign(double d1, double d2)
146 {
147         __asm__ __volatile__(
148             "andl $0x7fffffff,%0\n\t"   /* %0 <-- hi_32(abs(d)) */
149             "andl $0x80000000,%1\n\t"   /* %1[31] <-- sign_bit(d2) */
150             "orl  %1,%0\n\t"            /* %0 <-- hi_32(copysign(x,y)) */
151             : "+&r" (_HI_WORD(d1)), "+r" (_HI_WORD(d2))
152             :
153             : "cc");

155         return (d1);
156 }

158 extern __inline__ double
159 fabs(double d)
160 {
161         __asm__ __volatile__("fabs\n\t" : "+t" (d) : : "cc");
162         return (d);
163 }

165 extern __inline__ float
166 fabsf(float d)
167 {
168         __asm__ __volatile__("fabs\n\t" : "+t" (d) : : "cc");
169         return (d);
170 }

172 extern __inline__ long double
173 fabsl(long double d)
174 {
175         __asm__ __volatile__("fabs\n\t" : "+t" (d) : : "cc");
176         return (d);
177 }

179 extern __inline__ int
180 finite(double d)
181 {
182         int ret = _HI_WORD(d);

184         __asm__ __volatile__(
185             "notl %0\n\t"
186             "andl $0x7ff00000,%0\n\t"
187             "negl %0\n\t"
188             "shrl $31,%0\n\t"
189             : "+r" (ret)
190             :
191             : "cc");
192         return (ret);
```



```
193 }

195 extern __inline__ double
196 floor(double d)
197 {
198         short rd = __swap87RD(fp_negative);

200         __asm__ __volatile__("frndint" : "+t" (d), "+r" (rd) : : "cc");
201         __swap87RD(rd);

203         return (d);
204 }

206 extern __inline__ int
207 isnanf(float f)
208 {
209         __asm__ __volatile__(
210             "andl $0x7fffffff,%0\n\t"
211             "negl %0\n\t"
212             "addl $0x7f800000,%0\n\t"
213             "shrl $31,%0\n\t"
214             : "+r" (f)
215             :
216             : "cc");

218         return (f);
219 }

221 extern __inline__ double
222 rint(double a) {
223     return (__inline_rint(a));
224 }

226 extern __inline__ double
227 scalbn(double d, int n)
228 {
229         double dummy;

231         __asm__ __volatile__(
232             "fildl %2\n\t"      /* Convert N to extended */
233             "fxch\n\t"
234             "fscale\n\t"
235             : "+t" (d), "=u" (dummy)
236             : "m" (n)
237             : "cc");

239         return (d);
240 }

242 extern __inline__ int
243 signbit(double d)
244 {
245         return (_HI_WORD(d) >> 31);
246 }

248 extern __inline__ int
249 signbitf(float f)
250 {
251         return ((*(uint32_t *)&f) >> 31);
252 }

254 extern __inline__ double
255 sqrt(double d)
256 {
257         return (__inline_sqrt(d));
258 }
```

```
260 extern __inline__ float
261 sqrtf(float f)
262 {
263         return (__inline_sqrtf(f));
264 }

266 extern __inline__ long double
267 sqrtl(long double ld)
268 {
269         __asm__ __volatile__("fsqrt" : "+t" (ld) : : "cc");
270         return (ld);
271 }

273 extern __inline__ int
274 isnanl(long double ld)
275 {
276         int ret = _HIER_WORD(ld);

278         __asm__ __volatile__(
279             "andl  $0x00007fff,%0\n\t"
280             "jz    1f\n\t"              /* jump if exp is all 0 */
281             "xorl  $0x00007fff,%0\n\t"
282             "jz    2f\n\t"              /* jump if exp is all 1 */
283             "testl $0x80000000,%1\n\t"
284             "jz    3f\n\t"              /* jump if leading bit is 0 */
285             "movl  $0,%0\n\t"
286             "jmp   1f\n\t"
287             "2:\n\t"                    /* note that %0 = 0 from before */
288             "cmpl  $0x80000000,%1\n\t"  /* what is first half of significand? */
289             "jnz   3f\n\t"              /* jump if not equal to 0x80000000 */
290             "testl $0xffffffff,%2\n\t"  /* is second half of significand 0? */
291             "jnz   3f\n\t"              /* jump if not equal to 0 */
292             "jmp   1f\n\t"
293             "3:\n\t"
294             "movl  $1,%0\n\t"
295             "1:\n\t"
296             : "+&r" (ret)
297             : "r" (_HI_WORD(ld)), "r" (_LO_WORD(ld))
298             : "cc");

300         return (ret);
301 }

303 #ifdef __cplusplus
304 }
305 #endif

307 #endif  /* __GNUC__ */

309 #endif /* _LIBM_INLINES_H */
```

```
**********************************************************
    1289 Sat May 10 12:09:40 2014
new/usr/src/lib/libm/i386/src/llrint.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "llrint.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(llrint,function)
#include "libm_synonyms.h"

        ENTRY(llrint)
        movl    %esp,%ecx
        subl    $8,%esp
        fldl    4(%ecx)                 / load x
        fistpll -8(%ecx)                / [x]
        fwait
        movl    -8(%ecx),%eax
        movl    -4(%ecx),%edx
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(llrint)
```

```
**********************************************************
    1293 Sat May 10 12:09:41 2014
new/usr/src/lib/libm/i386/src/llrintf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "llrintf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(llrintf,function)
#include "libm_synonyms.h"

        ENTRY(llrintf)
        movl    %esp,%ecx
        subl    $8,%esp
        flds    4(%ecx)                 / load x
        fistpll -8(%ecx)                / [x]
        fwait
        movl    -8(%ecx),%eax
        movl    -4(%ecx),%edx
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(llrintf)
```

```
**********************************************************
    1293 Sat May 10 12:09:41 2014
new/usr/src/lib/libm/i386/src/llrintl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "llrintl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(llrintl,function)
#include "libm_synonyms.h"

        ENTRY(llrintl)
        movl    %esp,%ecx
        subl    $8,%esp
        fldt    4(%ecx)                 / load x
        fistpll -8(%ecx)                / [x]
        fwait
        movl    -8(%ecx),%eax
        movl    -4(%ecx),%edx
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(llrintl)
```

```
**********************************************************
    7507 Sat May 10 12:09:41 2014
new/usr/src/lib/libm/i386/src/locallibm.il
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
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/

/ Portions of this file are duplicated as GCC inline assembly in
/ libm_inlines.h.  Keep them in sync.

        .inline __ieee754_sqrt,0
        fldl    (%esp)
        fsqrt
        .end

        .inline __inline_rint,0
        fldl    (%esp)
        movl    4(%esp),%eax
        andl    $0x7fffffff,%eax
        cmpl    $0x43300000,%eax
        jae     1f
        frndint
1:
        fwait           / in case we jumped around the frndint
        .end

        .inline __inline_sqrtf,0
        flds    (%esp)
        fsqrt
        .end

        .inline __inline_sqrt,0
        fldl    (%esp)
        fsqrt
        .end

        .inline __inline_fstsw,0
        fstsw   %ax
        .end

/
```



```
/ 00 - 24 bits
/ 01 - reserved
/ 10 - 53 bits
/ 11 - 64 bits
/
        .inline __swapRP,0
        subl    $4,%esp
        fstcw   (%esp)
        movw    (%esp),%ax
        movw    %ax,%cx
        andw    $0xfcff,%cx
        movl    4(%esp),%edx            ///
        andl    $0x3,%edx
        shlw    $8,%dx
        orw     %dx,%cx
        movl    %ecx,(%esp)
        fldcw   (%esp)
        shrw    $8,%ax
        andl    $0x3,%eax
        addl    $4,%esp
        .end

/
/ 00 - Round to nearest, with even preferred
/ 01 - Round down
/ 10 - Round up
/ 11 - Chop
/
        .inline __swap87RD,0
        subl    $4,%esp
        fstcw   (%esp)
        movw    (%esp),%ax
        movw    %ax,%cx
        andw    $0xf3ff,%cx
        movl    4(%esp),%edx
        andl    $0x3,%edx
        shlw    $10,%dx
        orw     %dx,%cx
        movl    %ecx,(%esp)
        fldcw   (%esp)
        shrw    $10,%ax
        andl    $0x3,%eax
        addl    $4,%esp
        .end

/
/       Convert Top-of-Stack to long
/
        .inline __xtol,0
        subl    $8,%esp                 / 8 bytes of stack space
        fstcw   2(%esp)                 / byte[2:3] = old_cw
        movw    2(%esp),%ax
        andw    $0xf3ff,%ax
        orw     $0x0c00,%ax             / RD set to Chop
        movw    %ax,(%esp)              / byte[0:1] = new_cw
        fldcw   (%esp)                  / set new_cw
        fistpl  4(%esp)                 / byte[4:7] = converted long
        fstcw   (%esp)                  / restore old RD
        movw    (%esp),%ax
        andw    $0xf3ff,%ax
        movw    2(%esp),%dx
        andw    $0x0c00,%dx
        orw     %ax,%dx
        movw    %dx,2(%esp)
        fldcw   2(%esp)
        movl    4(%esp),%eax
```

```
127         addl    $8,%esp
128         .end

130         .inline __ceil,0
131         subl    $8,%esp
132         fstcw   (%esp)
133         fldl    8(%esp)                 ///
134         movw    (%esp),%cx
135         orw     $0x0c00,%cx
136         xorw    $0x0400,%cx
137         movw    %cx,4(%esp)
138         fldcw   4(%esp)                 / set RD = up
139         frndint
140         fstcw   4(%esp)                 / restore RD
141         movw    4(%esp),%dx
142         andw    $0xf3ff,%dx
143         movw    (%esp),%cx
144         andw    $0x0c00,%cx
145         orw     %dx,%cx
146         movw    %cx,(%esp)
147         fldcw   (%esp)
148         addl    $8,%esp
149         .end

151         .inline __copysign,0
152         movl    4(%esp),%eax            /// eax <-- hi_32(x)
153         movl    12(%esp),%ecx           /// ecx <-- hi_32(y)
154         andl    $0x7fffffff,%eax        / eax <-- hi_32(abs(x))
155         andl    $0x80000000,%ecx        / ecx[31] <-- sign_bit(y)
156         orl     %ecx,%eax               / eax <-- hi_32(__copysign(x,y))
157         movl    (%esp),%ecx             /// ecx <-- lo_32(x)
158                                         /       = lo_32(__copysign(x,y))
159         subl    $8,%esp                 / set up loading dock for result
160         movl    %ecx,(%esp)             / copy lo_32(result) to loading dock
161         movl    %eax,4(%esp)            / copy hi_32(result) to loading dock
162         fldl    (%esp)                  / load __copysign(x,y)
163         fwait                           / in case fldl causes exception
164         addl    $8,%esp                 / restore stack-pointer
165         .end

167         .inline __d_sqrt_,0
168         movl    (%esp),%eax
169         fldl    (%eax)
170         fsqrt
171         .end

173         .inline __fabs,0
174         fldl    (%esp)                  ///
175         fabs
176         .end

178         .inline __fabsf,0
179         flds    (%esp)
180         fabs
181         .end

183         .inline __fabsl,0
184         fldt    (%esp)
185         fabs
186         .end

188 /
189 /       branchless _finite
190 /
191         .inline _finite,0
192         movl    4(%esp),%eax            /// eax <-- hi_32(x)
```



```
193         notl    %eax                    / not(bexp) = 0 iff bexp = all 1's
194         andl    $0x7ff00000,%eax
195         negl    %eax
196         shrl    $31,%eax
197         .end

199         .inline __floor,0
200         subl    $8,%esp
201         fstcw   (%esp)
202         fldl    8(%esp)                 ///
203         movw    (%esp),%cx
204         orw     $0x0c00,%cx
205         xorw    $0x0800,%cx
206         movw    %cx,4(%esp)
207         fldcw   4(%esp)                 / set RD = down
208         frndint
209         fstcw   4(%esp)                 / restore RD
210         movw    4(%esp),%dx
211         andw    $0xf3ff,%dx
212         movw    (%esp),%cx
213         andw    $0x0c00,%cx
214         orw     %dx,%cx
215         movw    %cx,(%esp)
216         fldcw   (%esp)                  / restore RD
217         addl    $8,%esp
218         .end

220         .inline __isnanf,0
221         movl    (%esp),%eax
222         andl    $0x7fffffff,%eax
223         negl    %eax
224         addl    $0x7f800000,%eax
225         shrl    $31,%eax
226         .end


229         .inline __isnormal,0
230                                         / TRUE iff (x is _finite, but
231                                         /       neither subnormal nor +/-0)
232                                         /     iff (0 < bexp(x) < 0x7ff)
233         movl    4(%esp),%eax            / eax <-- hi_32(x)
234         andl    $0x7ff00000,%eax        / eax[20..30]  <-- bexp(x),
235                                         / rest_of(eax) <-- 0
236         pushfl
237         popl    %ecx                    / bit 6 of ecx <-- not bexp(x)
238         subl    $0x7ff00000,%eax
239         pushfl
240         popl    %eax                    / bit 6 of eax <-- not bexp(x)
241         orl     %ecx,%eax
242         andl    $0x40,%eax
243         xorl    $0x40,%eax
244         shrl    $6,%eax
245         .end

247         .inline __issubnormal,0
248                                         / TRUE iff (bexp(x) = 0 and
249                                         /           frac(x) /= 0)
250         movl    $0,%eax
251         movl    4(%esp),%ecx            / ecx <-- hi_32(x)
252         andl    $0x7fffffff,%ecx        / ecx <-- hi_32(abs(x))
253         cmpl    $0x00100000,%ecx        / is bexp(x) = 0?
254         adcl    $0,%eax                 / jump if bexp(x) = 0
255         orl     (%esp),%ecx             / = 0 iff sgnfcnd(x) = 0
256                                         /     iff x = +/- 0.0 here
257         pushfl
258         popl    %ecx
```

```
259         andl    $0x40,%ecx
260         xorl    $0x40,%ecx
261         shrl    $6,%ecx
262         andl    %ecx,%eax
263         .end

265         .inline __iszero,0
266         movl    4(%esp),%eax            / eax <-- hi_32(x)
267         andl    $0x7fffffff,%eax        / eax <-- hi_32(abs(x))
268         orl     (%esp),%eax             / = 0 iff x = +/- 0.0
269         pushfl
270         popl    %eax
271         andl    $0x40,%eax
272         shrl    $6,%eax
273         .end

275         .inline __r_sqrt_,0
276         movl    (%esp),%eax
277         flds    (%eax)
278         fsqrt
279         .end

281         .inline __rint,0
282         fldl    (%esp)
283         movl    4(%esp),%eax
284         andl    $0x7fffffff,%eax
285         cmpl    $0x43300000,%eax
286         jae     1f
287         frndint
288 1:
289         fwait                   / in case we jumped around frndint
290         .end

292         .inline __scalbn,0
293         fildl   8(%esp)                 /// convert N to extended
294         fldl    (%esp)                  /// push x
295         fscale
296         fstp    %st(1)
297         .end

299         .inline __signbit,0
300         movl    4(%esp),%eax            /// high part of x
301         shrl    $31,%eax
302         .end

304         .inline __signbitf,0
305         movl    (%esp),%eax
306         shrl    $31,%eax
307         .end

309         .inline __sqrt,0
310         fldl    (%esp)
311         fsqrt
312         .end

314         .inline __sqrtf,0
315         flds    (%esp)
316         fsqrt
317         .end

319         .inline __sqrtl,0
320         fldt    (%esp)
321         fsqrt
322         .end

324         .inline __isnanl,0
```



```
325         movl    8(%esp),%eax            / ax <-- sign bit and __exp
326         andl    $0x00007fff,%eax
327         jz      1f                      / jump if __exp is all 0
328         xorl    $0x00007fff,%eax
329         jz      2f                      / jump if __exp is all 1
330         testl   $0x80000000,4(%esp)
331         jz      3f                      / jump if leading bit is 0
332         movl    $0,%eax
333         jmp     1f
334 2:                                      / note that %eax = 0 from before
335         cmpl    $0x80000000,4(%esp)     / what is first half of __significand?
336         jnz     3f                      / jump if not equal to 0x80000000
337         testl   $0xffffffff,(%esp)      / is second half of __significand 0?
338         jnz     3f                      / jump if not equal to 0
339         jmp     1f
340 3:
341         movl    $1,%eax
342 1:
343         .end

345         .inline __f95_signf,0
346         sub     $4,%esp
347         mov     4(%esp),%edx
348         mov     (%edx),%eax
349         and     $0x7fffffff,%eax
350         mov     8(%esp),%edx
351         mov     (%edx),%ecx
352         and     $0x80000000,%ecx
353         or      %ecx,%eax
354         mov     %eax,(%esp)
355         flds    (%esp)
356         add     $4,%esp
357         .end

359         .inline __f95_sign,0
360         mov     (%esp),%edx
361         fldl    (%edx)
362         fabs
363         mov     4(%esp),%edx
364         mov     4(%edx),%eax
365         test    %eax,%eax
366         jns     1f
367         fchs
368 1:
369         .end
```

```
**********************************************************
    2309 Sat May 10 12:09:41 2014
new/usr/src/lib/libm/i386/src/log.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "log.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(log,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(log)
        fldln2                          / loge(2)
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        testl   $0x80000000,%eax
        jnz     .maybe_0_or_less
        testl   $0x7fffffff,%eax
        jz      .maybe_0
        fldl    4(%esp)                 / arg, loge(2)
        fyl2x                           / loge(2)*log2(arg); ln(arg)
        ret

.maybe_0:
        movl    4(%esp),%ecx            / ecx <-- lo_32(x)
        cmpl    $0,%ecx
        je      .zero                   / no branch if x is +denormal
.neg_nan_reentry:
        fldl    4(%esp)                 / arg, loge(2)
        fyl2x                           / loge(2)*log2(arg); ln(arg)
        ret

.zero_or_less:
        / x =< 0
        testl   $0x7fffffff,%eax
        jnz     .less_than_0
        movl    4(%esp),%ecx            / ecx <-- lo_32(x)
        cmpl    $0,%ecx
```



```
        jne     .less_than_0            / branch if x is -denormal
.zero:
        / x = +/-0
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(1)
        pushl   $16
        jmp     .merge

.maybe_0_or_less:
        cmpl    $0xfff00000,%eax        / -INF below hi_32(x)?
        ja      .neg_nan_reentry
        jb      .zero_or_less
        movl    4(%esp),%ecx            / ecx <-- lo_32(x)
        cmpl    $0,%ecx                 / is x NaN or -INF?
        jne     .neg_nan_reentry        / branch if x is NaN with signbit = 1
        / x = -INF
.less_than_0:
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(2)
        pushl   $17
.merge:
        fstp    %st(0)                  / stack empty
        pushl   12(%ebp)
        pushl   8(%ebp)
        pushl   12(%ebp)
        pushl   8(%ebp)
        call    PIC_F(_SVID_libm_err)
        addl    $20,%esp
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(log)
```

```
**********************************************************
    2327 Sat May 10 12:09:41 2014
new/usr/src/lib/libm/i386/src/log10.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "log10.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(log10,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(log10)
        fldlg2                          / log10(2)
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        testl   $0x80000000,%eax
        jnz     .maybe_0_or_less
        testl   $0x7fffffff,%eax
        jz      .maybe_0
        fldl    4(%esp)                 / arg, log10(2)
        fyl2x                           / log10(2)*log2(arg); log10(arg)
        ret

.maybe_0:
        movl    4(%esp),%ecx            / ecx <-- lo_32(x)
        cmpl    $0,%ecx
        je      .zero                   / no branch if x is +denormal
.neg_nan_reentry:
        fldl    4(%esp)                 / arg, log10(2)
        fyl2x                           / log10(2)*log2(arg); log10(arg)
        ret

.zero_or_less:
        / x =< 0
        testl   $0x7fffffff,%eax
        jnz     .less_than_0
        movl    4(%esp),%ecx            / ecx <-- lo_32(x)
        cmpl    $0,%ecx
```



```
        jne     .less_than_0            / branch if x is -denormal
.zero:
        / x = +/-0
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(1)
        pushl   $18
        jmp     .merge

.maybe_0_or_less:
        cmpl    $0xfff00000,%eax        / -INF below hi_32(x)?
        ja      .neg_nan_reentry
        jb      .zero_or_less
        movl    4(%esp),%ecx            / ecx <-- lo_32(x)
        cmpl    $0,%ecx                 / is x NaN or -INF?
        jne     .neg_nan_reentry        / branch if x is NaN with signbit = 1
        / x = -INF
.less_than_0:
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(2)
        pushl   $19
.merge:
        fstp    %st(0)                  / stack empty
        pushl   12(%ebp)
        pushl   8(%ebp)
        pushl   12(%ebp)
        pushl   8(%ebp)
        call    PIC_F(_SVID_libm_err)
        addl    $20,%esp
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(log10)
```

```
**********************************************************
    1283 Sat May 10 12:09:41 2014
new/usr/src/lib/libm/i386/src/log10f.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "log10f.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(log10f,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(log10f)
        fldlg2
        flds    4(%esp)                 / st = arg, st(1) = log10(2)
        fyl2x                           / st = log10(arg) = log10(2)*log2(arg)
        ret
        .align  4
        SET_SIZE(log10f)
```

```
**********************************************************
    1258 Sat May 10 12:09:41 2014
new/usr/src/lib/libm/i386/src/log10l.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file "log10l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(log10l,function)
#include "libm_synonyms.h"

        ENTRY(log10l)
        fldlg2
        fldt    4(%esp)                 / st = arg, st(1) = log10(2)
        fyl2x                           / st = log10(arg) = log10(2)*log2(arg)
        ret
        .align  4
        SET_SIZE(log10l)
```

```
**********************************************************
    1213 Sat May 10 12:09:41 2014
new/usr/src/lib/libm/i386/src/log2.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "log2.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(log2,function)
#include "libm_synonyms.h"

        ENTRY(log2)
        fld1                    / push 1.0
        fldl    4(%esp)         / push x
        fyl2x                   / st = 1.0*log2(arg)
        ret
        .align  4
        SET_SIZE(log2)
```

```
**********************************************************
    1217 Sat May 10 12:09:42 2014
new/usr/src/lib/libm/i386/src/log2f.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "log2f.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(log2f,function)
#include "libm_synonyms.h"

        ENTRY(log2f)
        fld1                    / push 1.0
        flds    4(%esp)         / push x
        fyl2x                   / st = 1.0*log2(arg)
        ret
        .align  4
        SET_SIZE(log2f)
```

****
1217 Sat May 10 12:09:42 2014
new/usr/src/lib/libm/i386/src/log2l.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file   "log2l.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(log2l,function)
#include "libm_synonyms.h"

        ENTRY(log2l)
        fld1                    / push 1.0
        fldt    4(%esp)         / push x
        fyl2x                   / st = 1.0*log2(arg)
        ret
        .align  4
        SET_SIZE(log2l)
```

****
1245 Sat May 10 12:09:42 2014
new/usr/src/lib/libm/i386/src/logl.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file "logl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(logl,function)
#include "libm_synonyms.h"

        ENTRY(logl)
        fldln2
        fldt    4(%esp)                 / st = arg, st(1) = loge(2)
        fyl2x                           / st = ln(arg) = loge(2)*log2(arg)
        ret
        .align  4
        SET_SIZE(logl)
```

****
1264 Sat May 10 12:09:42 2014
new/usr/src/lib/libm/i386/src/lrint.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file   "lrint.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(lrint,function)
#include "libm_synonyms.h"

        ENTRY(lrint)
        movl    %esp,%ecx
        subl    $8,%esp
        fldl    4(%ecx)                 / load x
        fistpl  -8(%ecx)                / [x]
        fwait
        movl    -8(%ecx),%eax
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(lrint)
```

****
1268 Sat May 10 12:09:42 2014
new/usr/src/lib/libm/i386/src/lrintf.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file   "lrintf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(lrintf,function)
#include "libm_synonyms.h"

        ENTRY(lrintf)
        movl    %esp,%ecx
        subl    $8,%esp
        flds    4(%ecx)                 / load x
        fistpl  -8(%ecx)                / [x]
        fwait
        movl    -8(%ecx),%eax
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(lrintf)
```

****
1268 Sat May 10 12:09:42 2014
new/usr/src/lib/libm/i386/src/lrintl.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file   "lrintl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(lrintl,function)
#include "libm_synonyms.h"

        ENTRY(lrintl)
        movl    %esp,%ecx
        subl    $8,%esp
        fldt    4(%ecx)                 / load x
        fistpl  -8(%ecx)                / [x]
        fwait
        movl    -8(%ecx),%eax
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(lrintl)
```

```
**********************************************************
    2197 Sat May 10 12:09:42 2014
new/usr/src/lib/libm/i386/src/lround.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "lround.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(lround,function)
#include "libm_synonyms.h"
#undef fabs

        .section .rodata
        .align  4
.Lhalf: .float  0.5

        ENTRY(lround)
        movl    %esp,%ecx
        subl    $8,%esp
        fstcw   -8(%ecx)
        fldl    4(%ecx)
        movw    -8(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    %dx,-4(%ecx)
        fldcw   -4(%ecx)                / set RD = to_nearest
        fld     %st(0)
        frndint                         / [x],x
        fstcw   -4(%ecx)
        movw    -4(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    -8(%ecx),%ax
        andw    $0x0c00,%ax
        orw     %dx,%ax
        movw    %ax,-8(%ecx)
        fldcw   -8(%ecx)                / restore RD
        fucom                           / check if x is already an integer
        fstsw   %ax
        sahf
```



```
        jp      0f
        je      0f
        fxch                            / x,[x]
        fsub    %st(1),%st              / x-[x],[x]
        fabs                            / |x-[x]|,[x]
        PIC_SETUP(1)
        fcoms   PIC_L(.Lhalf)
        PIC_WRAPUP
        fnstsw  %ax
        sahf
        jae     2f                      / if |x-[x]| = 0.5 goto halfway,
                                        / most cases will not take branch.
0:
        fstp    %st(0)
1:
        fistpl  -8(%ecx)
        fwait
        movl    -8(%ecx),%eax
        addl    $8,%esp
        ret
2:
    / x = n+0.5, recompute lround(x) as x+sign(x)*0.5
        fldl    4(%ecx)                 / x, 0.5, [x]
        movl    8(%ecx),%eax            / high part of x
        andl    $0x80000000,%eax
        jnz     3f
        faddp
        fstp    %st(1)
        jmp     1b
3:
        / here, x is negative, so return x-0.5
        fsubp   %st,%st(1)              / x-0.5,[x]
        fstp    %st(1)
        jmp     1b
        .align  4
        SET_SIZE(lround)
```

```
**********************************************************
    2221 Sat May 10 12:09:42 2014
new/usr/src/lib/libm/i386/src/lroundl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "lroundl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(lroundl,function)
#include "libm_synonyms.h"
#undef fabs

        .section .rodata
        .align  4
.Lhalf: .float  0.5

        ENTRY(lroundl)
        movl    %esp,%ecx
        subl    $8,%esp
        fstcw   -8(%ecx)
        fldt    4(%ecx)
        movw    -8(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    %dx,-4(%ecx)
        fldcw   -4(%ecx)                / set RD = to_nearest
        fld     %st(0)
        frndint                         / [x],x
        fstcw   -4(%ecx)
        movw    -4(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    -8(%ecx),%ax
        andw    $0x0c00,%ax
        orw     %dx,%ax
        movw    %ax,-8(%ecx)
        fldcw   -8(%ecx)                / restore RD
        fucom                           / check if x is already an integer
        fstsw   %ax
        sahf
```



```
        jp      0f
        je      0f
        fxch                            / x,[x]
        fsub    %st(1),%st              / x-[x],[x]
        fabs                            / |x-[x]|,[x]
        PIC_SETUP(1)
        fcoms   PIC_L(.Lhalf)
        PIC_WRAPUP
        fnstsw  %ax
        sahf
        jae     2f                      / if |x-[x]| = 0.5 goto halfway,
                                        / most cases will not take branch.
0:
        fstp    %st(0)
1:
        fistpl  -8(%ecx)
        fwait
        movl    -8(%ecx),%eax
        addl    $8,%esp
        ret
2:
    / x = n+0.5, recompute lroundl(x) as x+sign(x)*0.5
        fldt    4(%ecx)                 / x, 0.5, [x]
        movw    12(%ecx),%ax            / sign+exp part of x
        andw    $0x8000,%ax             / look at sign bit
        jnz     3f
        faddp
        fstp    %st(1)
        jmp     1b
3:
        / here, x is negative, so return x-0.5
        fsubp   %st,%st(1)              / x-0.5,[x]
        fstp    %st(1)
        jmp     1b
        .align  4
        SET_SIZE(lroundl)
```

```
**********************************************************
    2733 Sat May 10 12:09:42 2014
new/usr/src/lib/libm/i386/src/nextafter.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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        .file "nextafter.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(nextafter,function)
        .weak _nextafter
        .type _nextafter,@function
_nextafter      = __nextafter
#include "libm_synonyms.h"
#include "libm_protos.h"

        .data
        .align  8
Fmin:   .long   0x1,0x0
ftmp:   .long   0,0             /// WILL WRITE INTO


        ENTRY(nextafter)
        pushl   %ebp
        movl    %esp,%ebp
        fldl    16(%ebp)        / y
        subl    $8,%esp
        fldl    8(%ebp)         / load x
        fucom                   / x : y
        fstsw   %ax
        sahf
        jp      .NaN
        je      .equal
        fstp    %st(1)          / x
        ja      .bigger
        / x < y
        ftst
        movl    $1,%ecx         /// Fmin
        movl    %ecx,-8(%ebp)
```



```
        movl    $0,%ecx         /// Fmin+4
        movl    %ecx,-4(%ebp)
        fnstsw  %ax
        sahf
        je      .final
        ja      .addulp
        jb      .subulp
.bigger:
        / x > y
        ftst
        movl    $1,%ecx         /// Fmin
        movl    %ecx,-8(%ebp)
        movl    $0,%ecx         /// Fmin+4
        xorl    $0x80000000,%ecx
        movl    %ecx,-4(%ebp)
        fnstsw  %ax
        sahf
        je      .final
        jb      .addulp
.subulp:
        movl    8(%ebp),%eax    / low x
        movl    12(%ebp),%ecx   / high x
        subl    $1,%eax         / low x - ulp
        movl    %eax,-8(%ebp)
        sbbl    $0x0,%ecx
        movl    %ecx,-4(%ebp)
        jmp     .final
.addulp:
        movl    8(%ebp),%eax    / low x
        movl    12(%ebp),%ecx   / high x
        addl    $1,%eax         / low x + ulp
        movl    %eax,-8(%ebp)
        adcl    $0x0,%ecx
        movl    %ecx,-4(%ebp)

.final:
        fstp    %st(0)
        fldl    -8(%ebp)
        andl    $0x7ff00000,%ecx
        jz      .underflow
        cmpl    $0x7ff00000,%ecx
        je      .overflow
        jmp     .return
.overflow:
        PIC_SETUP(1)
        pushl   $46
        fstp    %st(0)          / stack empty
        pushl   -4(%ebp)
        pushl   -8(%ebp)
        pushl   -4(%ebp)
        pushl   -8(%ebp)
        call    PIC_F(_SVID_libm_err)
        addl    $20,%esp
        PIC_WRAPUP
        jmp     .return
.underflow:
        PIC_SETUP(2)
        fldl    PIC_L(Fmin)
        fmul    %st(0),%st
        fstpl   PIC_L(ftmp)     / create underflow signal
        PIC_WRAPUP
        jmp     .return
.equal:
        fstp    %st(0)          / C99 says to return y when x == y
        jmp     .return
.NaN:
```

```
128         faddp   %st,%st(1)      / x+y,x
129 .return:
130         fwait
131         leave
132         ret
133         .align  4
134         SET_SIZE(nextafter)
```

```
**********************************************************
    2487 Sat May 10 12:09:43 2014
new/usr/src/lib/libm/i386/src/nextafterf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "nextafterf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(nextafterf,function)
#include "libm_synonyms.h"

        .data
        .align  4
Fmaxf:  .long   0x7f7fffff
Fminf:  .long   0x1
ftmpf:  .long   0


        ENTRY(nextafterf)
        pushl   %ebp
        movl    %esp,%ebp
        movl    $0,%eax         /// upper half of %eax must be initialized
        flds    12(%ebp)        / y
        subl    $4,%esp
        flds    8(%ebp)         / x, y
        fucom                   / x : y
        fstsw   %ax
        sahf
        jp      .NaN
        je      .equal
        fstp    %st(1)          / x
        ja      .bigger
        / x < y
        ftst                    / x : 0
        movl    $0x1,-4(%ebp)           / -4(%ebp) contains Fminf
        fnstsw  %ax
        sahf
        je      .final
```



```
        ja      .addulp
        jb      .subulp
.bigger:
        / x > y
        ftst                    / x : 0
        movl    $0x80000001,-4(%ebp)    / -4(%ebp) contains -Fminf
        fnstsw  %ax
        sahf
        je      .final
        jb      .addulp
.subulp:
        movl    8(%ebp),%eax    / x
        subl    $1,%eax         / x - ulp
        movl    %eax,-4(%ebp)
        jmp     .final
.addulp:
        movl    8(%ebp),%eax    / x
        addl    $1,%eax         / x + ulp
        movl    %eax,-4(%ebp)

.final:
        fstp    %st(0)          / empty
        flds    -4(%ebp)        / z
        andl    $0x7f800000,%eax
        jz      .underflow
        cmpl    $0x7f800000,%eax
        je      .overflow
        jmp     .return
.overflow:
        PIC_SETUP(1)
        flds    PIC_L(Fmaxf)    / Fmaxf, z
        fmul    %st(0),%st      / overflow-to-Inf, z
        fstps   PIC_L(ftmpf)    / z & create overflow signal
        PIC_WRAPUP
        jmp     .return
.underflow:
        PIC_SETUP(2)
        flds    PIC_L(Fminf)    / Fminf, z
        fmul    %st(0),%st      / underflow-to-0, z
        fstps   PIC_L(ftmpf)    / z & create underflow signal
        PIC_WRAPUP
        jmp     .return
.equal:
        fstp    %st(0)          / C99 says to return y when x == y
        jmp     .return
.NaN:
        faddp   %st,%st(1)      / x+y
.return:
        fwait
        leave
        ret
        .align  4
        SET_SIZE(nextafterf)
```

```
**********************************************************
    4228 Sat May 10 12:09:43 2014
new/usr/src/lib/libm/i386/src/nextafterl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "nextafterl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(nextafterl,function)
#include "libm_synonyms.h"

        .section .rodata
        .align  4
.LFmaxl:        .long   0xffffffff,0xffffffff,0x00007ffe
.LFminl:        .long   0x1,0x0,0x0


        ENTRY(nextafterl)
        pushl   %ebp
        movl    %esp,%ebp
        fldt    20(%ebp)        / y
        subl    $12,%esp
        fldt    8(%ebp)         / load x
        fucom                   / x : y
        fstsw   %ax
        sahf
        jp      .LNaN
        je      .Lequal
        fstp    %st(1)          / x
        ja      .Lbigger
        / x < y
        ftst
        movl    $1,-12(%ebp)    /// -12(%ebp) contains Fminl
        movl    $0,-8(%ebp)
        movl    $0,%ecx                 /// final needs this
        movl    %ecx,-4(%ebp)
        fnstsw  %ax
        sahf
```



```
        je      .Lfinal
        ja      .Laddulp
        jb      .Lsubulp
.Lbigger:
        / x > y
        ftst
        movl    $1,-12(%ebp)    /// -12(%ebp) contains -Fminl
        movl    $0,-8(%ebp)
        movl    $0x00008000,%ecx        /// final needs this
        movl    %ecx,-4(%ebp)
        fnstsw  %ax
        sahf
        je      .Lfinal
        jb      .Laddulp
.Lsubulp:
        movl    12(%ebp),%edx   / high word of significand of x
        movl    16(%ebp),%ecx   / x's exponent
        andl    $0x0000ffff,%ecx
        movl    %edx,%eax
        not     %eax
        andl    $0x80000000,%eax        / look at explicit leading bit
        orl     %ecx,%eax
        andl    $0x80007fff,%eax
        jnz     .Lnot_pseudonormal      / zero value implies pseudonormal
        addl    $1,%ecx         / if pseudonormal, turn into equivalent normal
.Lnot_pseudonormal:
        movl    8(%ebp),%eax    / low x
        subl    $1,%eax         / low x - ulp
        movl    %eax,-12(%ebp)
        cmpl    $0xffffffff,%eax        / this means low x was 0
        jz      .Lborrow
        movl    %edx,-8(%ebp)
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Lborrow:
        cmpl    $0x80000000,%edx        / look at high x
        je      .Lsecond_borrow
        subl    $1,%edx
        movl    %edx,-8(%ebp)
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Lsecond_borrow:
        movl    %ecx,%eax
        andl    $0x7fff,%eax    / look at exp x without sign bit
        cmpl    $1,%eax
        jbe     .Lsubnormal_result      / exp > 1 ==> result will be normal
        movl    $0xffffffff,-8(%ebp)
        subl    $1,%ecx
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Lsubnormal_result:
        movl    $0x7fffffff,-8(%ebp)
        movl    %ecx,%eax
        andl    $0x8000,%eax    / look at sign bit
        jz      .Lpositive
        movl    $0x8000,%ecx
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Lpositive:
        movl    $0,%ecx
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Laddulp:
        movl    12(%ebp),%edx   / high x
        movl    16(%ebp),%ecx   / x's exponent
        andl    $0x0000ffff,%ecx
```

```
128         movl    %edx,%eax
129         not     %eax
130         andl    $0x80000000,%eax        / look at explicit leading bit
131         orl     %ecx,%eax
132         andl    $0x80007fff,%eax
133         jnz     .Lnot_pseudonormal_2    / zero value implies pseudonormal
134         addl    $1,%ecx
135 .Lnot_pseudonormal_2:
136         movl    8(%ebp),%eax    / low x
137         addl    $1,%eax         / low x + ulp
138         movl    %eax,-12(%ebp)
139         jz      .Lcarry         / jump if the content of %eax is 0
140         movl    %edx,-8(%ebp)
141         movl    %ecx,-4(%ebp)
142         jmp .Lfinal
143 .Lcarry:
144         movl    %edx,%eax
145         andl    $0x7fffffff,%eax
146         cmpl    $0x7fffffff,%eax        / look at high x
147         je      .Lsecond_carry
148         addl    $1,%edx
149         movl    %edx,-8(%ebp)
150         movl    %ecx,-4(%ebp)
151         jmp     .Lfinal
152 .Lsecond_carry:
153         movl    $0x80000000,-8(%ebp)
154         addl    $1,%ecx
155         movl    %ecx,-4(%ebp)
156 .Lfinal:
157         fstp    %st(0)
158         fldt    -12(%ebp)
159         andl    $0x00007fff,%ecx
160         jz      .Lunderflow
161         cmpw    $0x7fff,%cx
162         je      .Loverflow
163         jmp     .Lreturn
164 .Loverflow:
165         PIC_SETUP(1)
166         fldt    PIC_L(.LFmaxl)
167         PIC_WRAPUP
168         fmulp   %st,%st(0)      / create overflow signal
169         jmp     .Lreturn
170 .Lunderflow:
171         PIC_SETUP(2)
172         fldt    PIC_L(.LFminl)
173         PIC_WRAPUP
174         fmulp   %st,%st(0)      / create underflow signal
175         jmp     .Lreturn
176 .Lequal:
177         fstp    %st(0)          / C99 says to return y when x == y
178         jmp     .Lreturn
179 .LNaN:
180         faddp   %st,%st(1)      / x+y,x
181 .Lreturn:
182         fwait
183         leave
184         ret
185         .align  4
186         SET_SIZE(nextafterl)
```

```
**********************************************************
    4232 Sat May 10 12:09:43 2014
new/usr/src/lib/libm/i386/src/nexttowardl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */
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 */

        .file   "nexttowardl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(nexttowardl,function)
#include "libm_synonyms.h"

        .section .rodata
        .align  4
.LFmaxl:        .long   0xffffffff,0xffffffff,0x00007ffe
.LFminl:        .long   0x1,0x0,0x0


        ENTRY(nexttowardl)
        pushl   %ebp
        movl    %esp,%ebp
        fldt    20(%ebp)        / y
        subl    $12,%esp
        fldt    8(%ebp)         / load x
        fucom                   / x : y
        fstsw   %ax
        sahf
        jp      .LNaN
        je      .Lequal
        fstp    %st(1)          / x
        ja      .Lbigger
        / x < y
        ftst
        movl    $1,-12(%ebp)    /// -12(%ebp) contains Fminl
        movl    $0,-8(%ebp)
        movl    $0,%ecx                 /// final needs this
        movl    %ecx,-4(%ebp)
        fnstsw  %ax
        sahf
```



```
        je      .Lfinal
        ja      .Laddulp
        jb      .Lsubulp
.Lbigger:
        / x > y
        ftst
        movl    $1,-12(%ebp)    /// -12(%ebp) contains -Fminl
        movl    $0,-8(%ebp)
        movl    $0x00008000,%ecx        /// final needs this
        movl    %ecx,-4(%ebp)
        fnstsw  %ax
        sahf
        je      .Lfinal
        jb      .Laddulp
.Lsubulp:
        movl    12(%ebp),%edx   / high word of significand of x
        movl    16(%ebp),%ecx   / x's exponent
        andl    $0x0000ffff,%ecx
        movl    %edx,%eax
        not     %eax
        andl    $0x80000000,%eax        / look at explicit leading bit
        orl     %ecx,%eax
        andl    $0x80007fff,%eax
        jnz     .Lnot_pseudonormal      / zero value implies pseudonormal
        addl    $1,%ecx         / if pseudonormal, turn into equivalent normal
.Lnot_pseudonormal:
        movl    8(%ebp),%eax    / low x
        subl    $1,%eax         / low x - ulp
        movl    %eax,-12(%ebp)
        cmpl    $0xffffffff,%eax        / this means low x was 0
        jz      .Lborrow
        movl    %edx,-8(%ebp)
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Lborrow:
        cmpl    $0x80000000,%edx        / look at high x
        je      .Lsecond_borrow
        subl    $1,%edx
        movl    %edx,-8(%ebp)
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Lsecond_borrow:
        movl    %ecx,%eax
        andl    $0x7fff,%eax    / look at exp x without sign bit
        cmpl    $1,%eax
        jbe     .Lsubnormal_result      / exp > 1 ==> result will be normal
        movl    $0xffffffff,-8(%ebp)
        subl    $1,%ecx
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Lsubnormal_result:
        movl    $0x7fffffff,-8(%ebp)
        movl    %ecx,%eax
        andl    $0x8000,%eax    / look at sign bit
        jz      .Lpositive
        movl    $0x8000,%ecx
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Lpositive:
        movl    $0,%ecx
        movl    %ecx,-4(%ebp)
        jmp     .Lfinal
.Laddulp:
        movl    12(%ebp),%edx   / high x
        movl    16(%ebp),%ecx   / x's exponent
        andl    $0x0000ffff,%ecx
```

```
128         movl    %edx,%eax
129         not     %eax
130         andl    $0x80000000,%eax        / look at explicit leading bit
131         orl     %ecx,%eax
132         andl    $0x80007fff,%eax
133         jnz     .Lnot_pseudonormal_2    / zero value implies pseudonormal
134         addl    $1,%ecx
135 .Lnot_pseudonormal_2:
136         movl    8(%ebp),%eax    / low x
137         addl    $1,%eax         / low x + ulp
138         movl    %eax,-12(%ebp)
139         jz      .Lcarry         / jump if the content of %eax is 0
140         movl    %edx,-8(%ebp)
141         movl    %ecx,-4(%ebp)
142         jmp .Lfinal
143 .Lcarry:
144         movl    %edx,%eax
145         andl    $0x7fffffff,%eax
146         cmpl    $0x7fffffff,%eax        / look at high x
147         je      .Lsecond_carry
148         addl    $1,%edx
149         movl    %edx,-8(%ebp)
150         movl    %ecx,-4(%ebp)
151         jmp     .Lfinal
152 .Lsecond_carry:
153         movl    $0x80000000,-8(%ebp)
154         addl    $1,%ecx
155         movl    %ecx,-4(%ebp)
156 .Lfinal:
157         fstp    %st(0)
158         fldt    -12(%ebp)
159         andl    $0x00007fff,%ecx
160         jz      .Lunderflow
161         cmpw    $0x7fff,%cx
162         je      .Loverflow
163         jmp     .Lreturn
164 .Loverflow:
165         PIC_SETUP(1)
166         fldt    PIC_L(.LFmaxl)
167         PIC_WRAPUP
168         fmulp   %st,%st(0)      / create overflow signal
169         jmp     .Lreturn
170 .Lunderflow:
171         PIC_SETUP(2)
172         fldt    PIC_L(.LFminl)
173         PIC_WRAPUP
174         fmulp   %st,%st(0)      / create underflow signal
175         jmp     .Lreturn
176 .Lequal:
177         fstp    %st(0)          / C99 says to return y when x == y
178         jmp     .Lreturn
179 .LNaN:
180         faddp   %st,%st(1)      / x+y,x
181 .Lreturn:
182         fwait
183         leave
184         ret
185         .align  4
186         SET_SIZE(nexttowardl)
```

```
**********************************************************
   11191 Sat May 10 12:09:43 2014
new/usr/src/lib/libm/i386/src/pow.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */
/*
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 */
/*
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 */

        .file "pow.s"

/ Note: 0^NaN should not signal "invalid" but this implementation
/ does because y is placed on the NPX stack.

/ Special cases:
/
/ x ** 0 is 1                           _SVID_libm_err if x is 0 or NaN
/ 1 ** y is 1                           (C99)
/ x ** NaN is NaN
/ NaN ** y (except 0) is NaN
/ x ** 1 is x
/ +-(|x| > 1) **  +inf is +inf
/ +-(|x| > 1) **  -inf is +0
/ +-(|x| < 1) **  +inf is +0
/ +-(|x| < 1) **  -inf is +inf
/ (-1) ** +-inf is +1                   (C99)
/ +0 ** +y (except 0, NaN)              is +0
/ -0 ** +y (except 0, NaN, odd int)     is +0
/ -0 ** +y (odd int)                    is -0
/ +-0 ** -y (except 0, NaN)             _SVID_libm_err
/ +inf ** +y (except 0, NaN)            is +inf
/ +inf ** -y (except 0, NaN)            is +0
/ -inf ** +-y (except 0, NaN)           is -0 ** -+y (NO z flag)
/ x ** -1 is 1/x
/ x ** 2 is x*x
/ -x ** y (an integer) is (-1)**(y) * (+x)**(y)
/ x ** y (x negative & y not integer)   _SVID_libm_err
/ if x and y are finite and x**y = 0    _SVID_libm_err (underflow)
/ if x and y are finite and x**y = inf  _SVID_libm_err (overflow)

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(pow,function)
```



```
#include "libm_synonyms.h"
#include "libm_protos.h"
#include "xpg6.h"

#undef fabs

        .data
        .align  4
negzero:
        .float  -0.0
one:
        .float  1.0
negone:
        .float  -1.0
two:
        .float  2.0
Snan:
        .long   0x7f800001
pinfinity:
        .long   0x7f800000
ninfinity:
        .long   0xff800000


        ENTRY(pow)
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(1)

        fldl    8(%ebp)                 / x
        fxam                            / determine class of x
        fnstsw  %ax                     / store status in %ax
        movb    %ah,%dh                 / %dh <- condition code of x

        fldl    16(%ebp)                / y , x
        fxam                            / determine class of y
        fnstsw  %ax                     / store status in %ax
        movb    %ah,%dl                 / %dl <- condition code of y

        call    .pow_main               /// LOCAL
        PIC_WRAPUP
        leave
        ret

.pow_main:
        / x ** 0 is 1 unless x is 0 or a NaN
        movb    %dl,%cl
        andb    $0x45,%cl
        cmpb    $0x40,%cl               / C3=1 C2=0 C1=? C0=0 when +-0
        jne     1f
        movb    %dh,%cl
        andb    $0x45,%cl
        cmpb    $0x40,%cl               / C3=1 C2=0 C1=? C0=0 when +-0
        jne     2f
        / 0^0
        pushl   $20
        jmp     .SVIDerr                / SVID error handler
2:
        cmpb    $0x01,%cl               /// C3=0 C2=0 C1=? C0=1 when +-NaN
        jne     2f
        / NaN^0
        pushl   $42
        jmp     .SVIDerr
2:
        / (not 0 or NaN)^0
        fstp    %st(0)                  / x
```

```
128         fstp    %st(0)                  / stack empty
129         fld1                            / 1
130         ret
131
132 1:      / y is not zero
133         PIC_G_LOAD(movzwl,__xpg6,eax)
134         andl    $_C99SUSv3_pow_treats_Inf_as_an_even_int,%eax
135         cmpl    $0,%eax
136         je      1f
137
138         / C99: 1 ** anything is 1
139         fld1                            / 1, y, x
140         fucomp  %st(2)                  / y, x
141         fnstsw  %ax                     / store status in %ax
142         sahf                            / 80387 flags in %ax to 80386 flags
143         jp      1f                      / so that pow(NaN1,NaN2) returns NaN2
144         jne     1f
145         fstp    %st(0)                  / x
146         ret
147
148 1:
149         / x ** NaN is NaN
150         movb    %dl,%cl
151         andb    $0x45,%cl
152         cmpb    $0x01,%cl               / C3=0 C2=0 C1=? C0=1 when +-NaN
153         jne     1f
154         fstp    %st(1)                  / y
155         ret
156
157 1:      / y is not NaN
158         / NaN ** y (except 0) is NaN
159         movb    %dh,%cl
160         andb    $0x45,%cl
161         cmpb    $0x01,%cl               / C3=0 C2=0 C1=? C0=1 when +-NaN
162         jne     1f
163         fstp    %st(0)                  / x
164         ret
165
166 1:      / x is not NaN
167         / x ** 1 is x
168         fcoms   PIC_L(one)              / y , x
169         fnstsw  %ax                     / store status in %ax
170         sahf                            / 80387 flags in %ax to 80386 flags
171         jne     1f
172         fstp    %st(0)                  / x
173         ret
174
175 1:      / y is not 1
176         / +-(|x| > 1) **  +inf is +inf
177         / +-(|x| > 1) **  -inf is +0
178         / +-(|x| < 1) **  +inf is +0
179         / +-(|x| < 1) **  -inf is +inf
180         / +-(|x| = 1) ** +-inf is NaN
181         movb    %dl,%cl
182         andb    $0x47,%cl
183         cmpb    $0x05,%cl               / C3=0 C2=1 C1=0 C0=1 when +inf
184         je      .yispinf
185         cmpb    $0x07,%cl               / C3=0 C2=1 C1=1 C0=1 when -inf
186         je      .yisninf
187
188         / +0 ** +y (except 0, NaN)              is +0
189         / -0 ** +y (except 0, NaN, odd int)     is +0
190         / +0 ** -y (except 0, NaN)              is +inf (z flag)
191         / -0 ** -y (except 0, NaN, odd int)     is +inf (z flag)
192         / -0 ** y (odd int)                     is - (+0 ** x)
193         movb    %dh,%cl
```



```
194         andb    $0x47,%cl
195         cmpb    $0x40,%cl               / C3=1 C2=0 C1=0 C0=0 when +0
196         je      .xispzero
197         cmpb    $0x42,%cl               / C3=1 C2=0 C1=1 C0=0 when -0
198         je      .xisnzero
199
200         / +inf ** +y (except 0, NaN)    is +inf
201         / +inf ** -y (except 0, NaN)    is +0
202         / -inf ** +-y (except 0, NaN)   is -0 ** -+y (NO z flag)
203         movb    %dh,%cl
204         andb    $0x47,%cl
205         cmpb    $0x05,%cl               / C3=0 C2=1 C1=0 C0=1 when +inf
206         je      .xispinf
207         cmpb    $0x07,%cl               / C3=0 C2=1 C1=1 C0=1 when -inf
208         je      .xisninf
209
210         / x ** -1 is 1/x
211         fcoms   PIC_L(negone)           / y , x
212         fnstsw  %ax                     / store status in %ax
213         sahf                            / 80387 flags in %ax to 80386 flags
214         jne     1f
215         fld     %st(1)                  / x , y , x
216         fdivrs  PIC_L(one)              / 1/x , y , x
217         jmp     .signok                 / check for over/underflow
218
219 1:      / y is not -1
220         / x ** 2 is x*x
221         fcoms   PIC_L(two)              / y , x
222         fnstsw  %ax                     / store status in %ax
223         sahf                            / 80387 flags in %ax to 80386 flags
224         jne     1f
225         fld     %st(1)                  / x , y , x
226         fld     %st(0)                  / x , x , y , x
227         fmulp                           / x^2 , y , x
228         jmp     .signok                 / check for over/underflow
229
230 1:      / y is not 2
231         / make copies of x & y
232         fld     %st(1)                  / x , y , x
233         fld     %st(1)                  / y , x , y , x
234
235         / -x ** y (an integer) is (-1)**(y) * (+x)**(y)
236         / x ** y (x negative & y not integer) is  NaN
237         movl    $0,%ecx                 / track whether to flip sign of result
238         fld     %st(1)                  / x , y , x , y , x
239         ftst                            / compare %st(0) with 0
240         fnstsw  %ax                     / store status in %ax
241         sahf                            / 80387 flags in %ax to 80386 flags
242         fstp    %st(0)                  / y , x , y , x
243         ja      .merge                  / x > 0
244         / x < 0
245         call    .y_is_int
246         cmpl    $0,%ecx
247         jne     1f
248         / x < 0, y is non-integral
249         fstp    %st(0)                  / x , y , x
250         fstp    %st(0)                  / y , x
251         pushl   $24
252         jmp     .SVIDerr                / SVID error handler
253
254 1:      / x < 0 & y = int
255         fxch                            / x , y , y , x
256         fchs                            / px = -x , y , y , x
257         fxch                            / y , px , y , x
258 .merge:
259         / px > 0
```

```
260         fxch                            / px , y , y , x

262         / x**y   =   exp(y*ln(x))
263         fyl2x                           / t=y*log2(px) , y , x
264         fld     %st(0)                  / t , t , y , x
265         frndint                         / [t] , t , y , x
266         fxch                            / t , [t] , y , x
267         fucom
268         fnstsw  %ax                     / store status in %ax
269         sahf                            / 80387 flags in %ax to 80386 flags
270         je      1f                      / t is integral
271         fsub    %st(1),%st              / t-[t] , [t] , y , x
272         f2xm1                           / 2**(t-[t])-1 , [t] , y , x
273         fadds   PIC_L(one)              / 2**(t-[t]) , [t] , y , x
274         fscale                          / 2**t = px**y , [t] , y , x
275         jmp     2f
276 1:
277         fstp    %st(0)                  / t=[t] , y , x
278         fld1                            / 1 , t , y , x
279         fscale                          / 1*2**t = x**y , t , y , x
280 2:
281         fstp    %st(1)                  / x**y , y , x
282         cmpl    $1,%ecx
283         jne     .signok
284         fchs                            / change sign since x<0 & y=-int
285 .signok:
286         subl    $8,%esp
287         fstpl   (%esp)                  / round to double precision
288         fldl    (%esp)                  / place result on NPX stack
289         addl    $8,%esp

291         fxam                            / determine class of x**y
292         fnstsw  %ax                     / store status in %ax
293         andw    $0x4500,%ax
294         / check for overflow
295         cmpw    $0x0500,%ax             / C0=0 C1=1 C2=? C3=1 then +-inf
296         jne     1f
297         / x^y overflows
298         fstp    %st(0)                  / y , x
299         pushl   $21
300         jmp     .SVIDerr
301 1:
302         / check for underflow
303         cmpw    $0x4000,%ax             / C0=1 C1=0 C2=? C3=0 then +-0
304         jne     1f
305         / x^y underflows
306         fstp    %st(0)                  / y , x
307         pushl   $22
308         jmp     .SVIDerr
309 1:
310         fstp    %st(2)                  / y , x**y
311         fstp    %st(0)                  / x**y
312         ret

314 / ------------------------------------------------------------------------

316 .xispinf:
317         ftst                            / compare %st(0) with 0
318         fnstsw  %ax                     / store status in %ax
319         sahf                            / 80387 flags in %ax to 80386 flags
320         ja      .retpinf                / y > 0
321         jmp     .retpzero               / y < 0

323 .xisninf:
324         / -inf ** +-y is -0 ** -+y
325         fchs                            / -y , x
```



```
326         flds    PIC_L(negzero)          / -0 , -y , x
327         fstp    %st(2)                  / -y , -0
328         jmp     .xisnzero

330 .yispinf:
331         fld     %st(1)                  / x , y , x
332         fabs                            / |x| , y , x
333         fcomps  PIC_L(one)              / y , x
334         fnstsw  %ax                     / store status in %ax
335         sahf                            / 80387 flags in %ax to 80386 flags
336         je      .retponeorinvalid       / x == -1       C99
337         ja      .retpinf                / |x| > 1
338         jmp     .retpzero               / |x| < 1

340 .yisninf:
341         fld     %st(1)                  / x , y , x
342         fabs                            / |x| , y , x
343         fcomps  PIC_L(one)              / y , x
344         fnstsw  %ax                     / store status in %ax
345         sahf                            / 80387 flags in %ax to 80386 flags
346         je      .retponeorinvalid       / x == -1       C99
347         ja      .retpzero               / |x| > 1
348         jmp     .retpinf                / |x| < 1

350 .xispzero:
351         / y cannot be 0 or NaN ; stack has      y , x
352         ftst                            / compare %st(0) with 0
353         fnstsw  %ax                     / store status in %ax
354         sahf                            / 80387 flags in %ax to 80386 flags
355         ja      .retpzero               / y > 0
356         / x = +0 & y < 0
357         jmp     .SVIDzerotoneg

359 .xisnzero:
360         / y cannot be 0 or NaN ; stack has      y , x
361         call    .y_is_int
362         cmpl    $1,%ecx
363         jne     1f                      / y is not an odd integer
364         / y is an odd integer
365         ftst                            / compare %st(0) with 0
366         fnstsw  %ax                     / store status in %ax
367         sahf                            / 80387 flags in %ax to 80386 flags
368         ja      .retnzero               / y > 0
369         / x = -0 & y < 0 (odd int)      return -inf (z flag)
370         / x = -inf & y != 0 or NaN      return -inf (NO z flag)
371         movb    %dh,%cl
372         andb    $0x45,%cl
373         cmpb    $0x05,%cl               / C3=0 C2=1 C1=? C0=1 when +-inf
374         jne     .SVIDzerotoneg
375         fstp    %st(0)                  / x
376         fstp    %st(0)                  / stack empty
377         flds    PIC_L(ninfinity)        / -inf
378         ret

380 1:      / y is not an odd integer
381         ftst                            / compare %st(0) with 0
382         fnstsw  %ax                     / store status in %ax
383         sahf                            / 80387 flags in %ax to 80386 flags
384         ja      .retpzero               / y > 0
385         / x = -0 & y < 0 (not odd int)  return +inf (z flag)
386         / x = -inf & y not 0 or NaN     return +inf (NO z flag)
387         movb    %dh,%cl
388         andb    $0x45,%cl
389         cmpb    $0x05,%cl               / C3=0 C2=1 C1=? C0=1 when +-inf
390         jne     .SVIDzerotoneg
391         jmp     .retpinf                / return +inf (NO z flag)
```

```
393 .retpzero:
394         fstp    %st(0)                  / x
395         fstp    %st(0)                  / stack empty
396         fldz                            / +0
397         ret

399 .retnzero:
400         fstp    %st(0)                  / x
401         fstp    %st(0)                  / stack empty
402         flds    PIC_L(negzero)          / -0
403         ret

405 .retponeorinvalid:
406         PIC_G_LOAD(movzwl,__xpg6,eax)
407         andl    $_C99SUSv3_pow_treats_Inf_as_an_even_int,%eax
408         cmpl    $0,%eax
409         je      1f
410         fstp    %st(0)                  / x
411         fstp    %st(0)                  / stack empty
412         fld1                            / 1
413         ret

415 1:
416         fstp    %st(0)                  / x
417         fstp    %st(0)                  / stack empty
418         flds    PIC_L(Snan)             / Q NaN (i flag)
419         fwait
420         ret

422 .retpinf:
423         fstp    %st(0)                  / x
424         fstp    %st(0)                  / stack empty
425         flds    PIC_L(pinfinity)        / +inf
426         ret

428 .SVIDzerotoneg:
429         pushl   $23
430 .SVIDerr:
431         / At this point the fp stack contains  y , x  and the number
432         / of the error case has been pushed on the memory stack.
433         subl    $16,%esp
434         fstpl   8(%esp)                 / push y
435         fstpl   (%esp)                  / push x; NPX stack empty
436         call    PIC_F(_SVID_libm_err)   / report result/error according to SVID
437         addl    $20,%esp
438         ret

440 / Set %ecx to 2 if y is an even integer, 1 if y is an odd integer,
441 / 0 otherwise.  Assume y is not zero.  Do not raise inexact or modify
442 / %edx.
443 .y_is_int:
444         movl    20(%ebp),%eax
445         andl    $0x7fffffff,%eax        / |y|
446         cmpl    $0x43400000,%eax
447         jae     1f                      / |y| >= 2^53, an even int
448         cmpl    $0x3ff00000,%eax
449         jb      2f                      / |y| < 1, can't be an int
450         movl    %eax,%ecx
451         sarl    $20,%ecx
452         subl    $0x433,%ecx
453         negl    %ecx                    / 52 - unbiased exponent of y
454         movl    16(%ebp),%eax
455         bsfl    %eax,%eax               / index of least sig. 1 bit
456         jne     3f                      / jump if 1 bit found
457         movl    20(%ebp),%eax
```



```
458         bsfl    %eax,%eax
459         addl    $32,%eax                / 32 + index of least sig. 1 bit
460 3:
461         cmpl    %ecx,%eax
462         jb      2f
463         ja      1f
464         movl    $1,%ecx
465         ret
466 1:
467         movl    $2,%ecx
468         ret
469 2:
470         xorl    %ecx,%ecx
471         ret
472         .align  4
473         SET_SIZE(pow)
```

```
**********************************************************
   10512 Sat May 10 12:09:43 2014
new/usr/src/lib/libm/i386/src/powf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
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 * Common Development and Distribution License (the "License").
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 * Copyright 2011 Nexenta Systems, Inc.  All rights reserved.
 */
/*
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 * Use is subject to license terms.
 */

        .file "powf.s"

/ Note: 0^SNaN should not signal "invalid" but this implementation
/ does because y is placed on the NPX stack.

/ Special cases:
/
/ x ** 0 is 1
/ 1 ** y is 1                           (C99)
/ x ** NaN is NaN
/ NaN ** y (except 0) is NaN
/ x ** 1 is x
/ +-(|x| > 1) **  +inf is +inf
/ +-(|x| > 1) **  -inf is +0
/ +-(|x| < 1) **  +inf is +0
/ +-(|x| < 1) **  -inf is +inf
/ (-1) ** +-inf is +1                   (C99)
/ +0 ** +y (except 0, NaN)              is +0
/ -0 ** +y (except 0, NaN, odd int)     is +0
/ +0 ** -y (except 0, NaN)              is +inf (z flag)
/ -0 ** -y (except 0, NaN, odd int)     is +inf (z flag)
/ -0 ** y (odd int)                     is - (+0 ** x)
/ +inf ** +y (except 0, NaN)            is +inf
/ +inf ** -y (except 0, NaN)            is +0
/ -inf ** +-y (except 0, NaN)           is -0 ** -+y (NO z flag)
/ x ** -1 is 1/x
/ x ** 2 is x*x
/ -x ** y (an integer) is (-1)**(y) * (+x)**(y)
/ x ** y (x negative & y not integer) is NaN (i flag)

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(powf,function)
#include "libm_synonyms.h"
```



```
#include "libm_protos.h"
#include "xpg6.h"

#undef fabs

        .data
        .align  4
negzero:
        .float  -0.0
half:
        .float  0.5
one:
        .float  1.0
negone:
        .float  -1.0
two:
        .float  2.0
Snan:
        .long   0x7f800001
pinfinity:
        .long   0x7f800000
ninfinity:
        .long   0xff800000


        ENTRY(powf)
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(1)

        flds    8(%ebp)                 / x
        fxam                            / determine class of x
        fnstsw  %ax                     / store status in %ax
        movb    %ah,%dh                 / %dh <- condition code of x

        flds    12(%ebp)                / y , x
        fxam                            / determine class of y
        fnstsw  %ax                     / store status in %ax
        movb    %ah,%dl                 / %dl <- condition code of y

        call    .pow_main               /// LOCAL
        PIC_WRAPUP
        leave
        ret

.pow_main:
        / x ** 0 is 1
        movb    %dl,%cl
        andb    $0x45,%cl
        cmpb    $0x40,%cl               / C3=1 C2=0 C1=? C0=0 when +-0
        jne     1f
        fstp    %st(0)                  / x
        fstp    %st(0)                  / stack empty
        fld1                            / 1
        ret

1:      / y is not zero
        PIC_G_LOAD(movzwl,__xpg6,eax)
        andl    $_C99SUSv3_pow_treats_Inf_as_an_even_int,%eax
        cmpl    $0,%eax
        je      1f

        / C99: 1 ** anything is 1
        fld1                            / 1, y, x
        fucomp  %st(2)                  / y, x
        fnstsw  %ax                     / store status in %ax
```

```
128         sahf                            / 80387 flags in %ax to 80386 flags
129         jp      1f                      / so that pow(NaN1,NaN2) returns NaN2
130         jne     1f
131         fstp    %st(0)                  / x
132         ret

134 1:
135         / x ** NaN is NaN
136         movb    %dl,%cl
137         andb    $0x45,%cl
138         cmpb    $0x01,%cl               / C3=0 C2=0 C1=? C0=1 when +-NaN
139         jne     1f
140         fstp    %st(1)                  / y
141         ret

143 1:      / y is not NaN
144         / NaN ** y (except 0) is NaN
145         movb    %dh,%cl
146         andb    $0x45,%cl
147         cmpb    $0x01,%cl               / C3=0 C2=0 C1=? C0=1 when +-NaN
148         jne     1f
149         fstp    %st(0)                  / x
150         ret

152 1:      / x is not NaN
153         / x ** 1 is x
154         fcoms   PIC_L(one)              / y , x
155         fnstsw  %ax                     / store status in %ax
156         sahf                            / 80387 flags in %ax to 80386 flags
157         jne     1f
158         fstp    %st(0)                  / x
159         ret

161 1:      / y is not 1
162         / +-(|x| > 1) **  +inf is +inf
163         / +-(|x| > 1) **  -inf is +0
164         / +-(|x| < 1) **  +inf is +0
165         / +-(|x| < 1) **  -inf is +inf
166         / +-(|x| = 1) ** +-inf is NaN
167         movb    %dl,%cl
168         andb    $0x47,%cl
169         cmpb    $0x05,%cl               / C3=0 C2=1 C1=0 C0=1 when +inf
170         je      .yispinf
171         cmpb    $0x07,%cl               / C3=0 C2=1 C1=1 C0=1 when -inf
172         je      .yisninf

174         / +0 ** +y (except 0, NaN)              is +0
175         / -0 ** +y (except 0, NaN, odd int)     is +0
176         / +0 ** -y (except 0, NaN)              is +inf (z flag)
177         / -0 ** -y (except 0, NaN, odd int)     is +inf (z flag)
178         / -0 ** y (odd int)                     is - (+0 ** x)
179         movb    %dh,%cl
180         andb    $0x47,%cl
181         cmpb    $0x40,%cl               / C3=1 C2=0 C1=0 C0=0 when +0
182         je      .xispzero
183         cmpb    $0x42,%cl               / C3=1 C2=0 C1=1 C0=0 when -0
184         je      .xisnzero

186         / +inf ** +y (except 0, NaN)    is +inf
187         / +inf ** -y (except 0, NaN)    is +0
188         / -inf ** +-y (except 0, NaN)   is -0 ** -+y (NO z flag)
189         movb    %dh,%cl
190         andb    $0x47,%cl
191         cmpb    $0x05,%cl               / C3=0 C2=1 C1=0 C0=1 when +inf
192         je      .xispinf
193         cmpb    $0x07,%cl               / C3=0 C2=1 C1=1 C0=1 when -inf
```



```
194         je      .xisninf

196         / x ** -1 is 1/x
197         fcoms   PIC_L(negone)           / y , x
198         fnstsw  %ax                     / store status in %ax
199         sahf                            / 80387 flags in %ax to 80386 flags
200         jne     1f
201         fld     %st(1)                  / x , y , x
202         fdivrs  PIC_L(one)              / 1/x , y , x
203         jmp     .signok                 / check for over/underflow

205 1:      / y is not -1
206         / x ** 2 is square(x)
207         fcoms   PIC_L(two)              / y , x
208         fnstsw  %ax                     / store status in %ax
209         sahf                            / 80387 flags in %ax to 80386 flags
210         jne     1f
211         fld     %st(1)                  / x , y , x
212         fld     %st(0)                  / x , x , y , x
213         fmulp                           / x^2 , y , x
214         jmp     .signok                 / check for over/underflow

216 1:      / y is not 2
217         / x ** 1/2 is sqrt(x)
218         fcoms   PIC_L(half)             / y , x
219         fnstsw  %ax                     / store status in %ax
220         sahf                            / 80387 flags in %ax to 80386 flags
221         jne     1f
222         fld     %st(1)                  / x , y , x
223         fsqrt                           / sqrt(x) , y , x
224         jmp     .signok                 / check for over/underflow

226 1:      / y is not 2
227         / make copies of x & y
228         fld     %st(1)                  / x , y , x
229         fld     %st(1)                  / y , x , y , x

231         / -x ** y (an integer) is (-1)**(y) * (+x)**(y)
232         / x ** y (x negative & y not integer) is  NaN
233         movl    $0,%ecx                 / track whether to flip sign of result
234         fld     %st(1)                  / x , y , x , y , x
235         ftst                            / compare %st(0) with 0
236         fnstsw  %ax                     / store status in %ax
237         sahf                            / 80387 flags in %ax to 80386 flags
238         fstp    %st(0)                  / y , x , y , x
239         ja      .merge                  / x > 0
240         / x < 0
241         call    .y_is_int
242         cmpl    $0,%ecx
243         jne     1f
244         / x < 0 & y != int so x**y = NaN (i flag)
245         fstp    %st(0)                  / x , y , x
246         fstp    %st(0)                  / y , x
247         fstp    %st(0)                  / y , x
248         fstp    %st(0)                  / y , x
249         fldz
250         fdiv    %st,%st(0)              / 0/0
251         ret

253 1:      / x < 0 & y = int
254         fxch                            / x , y , y , x
255         fchs                            / px = -x , y , y , x
256         fxch                            / y , px , y , x
257 .merge:
258         / px > 0
259         fxch                            / px , y , y , x
```

```
261         / x**y   =   exp(y*ln(x))
262         fyl2x                       / t=y*log2(px) , y , x
263         fld     %st(0)              / t , t , y , x
264         frndint                     / [t] , t , y , x
265         fxch                        / t , [t] , y , x
266         fucom
267         fnstsw  %ax                 / store status in %ax
268         sahf                        / 80387 flags in %ax to 80386 flags
269         je      1f                  / px = int
270         fsub    %st(1),%st          / t-[t] , [t] , y , x
271         f2xm1                       / 2**(t-[t])-1 , [t] , y , x
272         fadds   PIC_L(one)          / 2**(t-[t]) , [t] , y , x
273         fscale                      / 2**t = px**y , [t] , y , x
274         jmp     2f
275 1:
276         fstp    %st(0)              / t=[t] , y , x
277         fld1                        / 1 , t , y , x
278         fscale                      / 1*2**t = x**y , t , y , x
279 2:
280         fstp    %st(1)              / x**y , y , x
281         cmpl    $1,%ecx
282         jne     .signok
283         fchs                        / change sign since x<0 & y=-int
284 .signok:
285         subl    $4,%esp
286         fstps   (%esp)              / round to single precision
287         flds    (%esp)              / place result on NPX stack
288         addl    $4,%esp
289         fstp    %st(2)              / y , x**y
290         fstp    %st(0)              / x**y
291         ret

293 / ------------------------------------------------------------------------

295 .xispinf:
296         ftst                        / compare %st(0) with 0
297         fnstsw  %ax                 / store status in %ax
298         sahf                        / 80387 flags in %ax to 80386 flags
299         ja      .retpinf            / y > 0
300         jmp     .retpzero           / y < 0

302 .xisninf:
303         / -inf ** +-y is -0 ** -+y
304         fchs                        / -y , x
305         flds    PIC_L(negzero)      / -0 , -y , x
306         fstp    %st(2)              / -y , -0
307         jmp     .xisnzero

309 .yispinf:
310         fld     %st(1)              / x , y , x
311         fabs                        / |x| , y , x
312         fcomps  PIC_L(one)          / y , x
313         fnstsw  %ax                 / store status in %ax
314         sahf                        / 80387 flags in %ax to 80386 flags
315         je      .retponeorinvalid   / x == -1       C99
316         ja      .retpinf            / |x| > 1
317         jmp     .retpzero           / |x| < 1

319 .yisninf:
320         fld     %st(1)              / x , y , x
321         fabs                        / |x| , y , x
322         fcomps  PIC_L(one)          / y , x
323         fnstsw  %ax                 / store status in %ax
324         sahf                        / 80387 flags in %ax to 80386 flags
325         je      .retponeorinvalid   / x == -1       C99
```



```
326         ja      .retpzero           / |x| > 1
327         jmp     .retpinf            / |x| < 1

329 .xispzero:
330         / y cannot be 0 or NaN ; stack has      y , x
331         ftst                        / compare %st(0) with 0
332         fnstsw  %ax                 / store status in %ax
333         sahf                        / 80387 flags in %ax to 80386 flags
334         ja      .retpzero           / y > 0
335         / x = +0 & y < 0 so x**y = +inf
336         jmp     .retpinfzflag       / ret +inf & z flag

338 .xisnzero:
339         / y cannot be 0 or NaN ; stack has      y , x
340         call    .y_is_int
341         cmpl    $1,%ecx
342         jne     1f                  / y is not an odd integer
343         / y is an odd integer
344         ftst                        / compare %st(0) with 0
345         fnstsw  %ax                 / store status in %ax
346         sahf                        / 80387 flags in %ax to 80386 flags
347         ja      .retnzero           / y > 0
348         / x = -0 & y < 0 (odd int)      return -inf (z flag)
349         / x = -inf & y != 0 or NaN      return -inf (NO z flag)
350         movb    %dh,%cl
351         andb    $0x45,%cl
352         cmpb    $0x05,%cl           / C3=0 C2=1 C1=? C0=1 when +-inf
353         je      2f
354         fdiv    %st,%st(1)          / y / x, x (raise z flag)
355 2:
356         fstp    %st(0)              / x
357         fstp    %st(0)              / stack empty
358         flds    PIC_L(ninfinity)    / -inf
359         ret

361 1:      / y is not an odd integer
362         ftst                        / compare %st(0) with 0
363         fnstsw  %ax                 / store status in %ax
364         sahf                        / 80387 flags in %ax to 80386 flags
365         ja      .retpzero           / y > 0
366         / x = -0 & y < 0 (not odd int)  return +inf (z flag)
367         / x = -inf & y not 0 or NaN     return +inf (NO z flag)
368         movb    %dh,%cl
369         andb    $0x45,%cl
370         cmpb    $0x05,%cl           / C3=0 C2=1 C1=? C0=1 when +-inf
371         jne     .retpinfzflag       / ret +inf & divide-by-0 flag
372         jmp     .retpinf            / return +inf (NO z flag)

374 .retpzero:
375         fstp    %st(0)              / x
376         fstp    %st(0)              / stack empty
377         fldz                        / +0
378         ret

380 .retnzero:
381         fstp    %st(0)              / x
382         fstp    %st(0)              / stack empty
383         flds    PIC_L(negzero)      / -0
384         ret

386 .retponeorinvalid:
387         PIC_G_LOAD(movzwl,__xpg6,eax)
388         andl    $_C99SUSv3_pow_treats_Inf_as_an_even_int,%eax
389         cmpl    $0,%eax
390         je      1f
391         fstp    %st(0)              / x
```

```
392         fstp    %st(0)                  / stack empty
393         fld1                            / 1
394         ret

396 1:
397         fstp    %st(0)                  / x
398         fstp    %st(0)                  / stack empty
399         flds    PIC_L(Snan)             / Q NaN (i flag)
400         fwait
401         ret

403 .retpinf:
404         fstp    %st(0)                  / x
405         fstp    %st(0)                  / stack empty
406         flds    PIC_L(pinfinity)        / +inf
407         ret

409 .retpinfzflag:
410         fstp    %st(0)                  / x
411         fstp    %st(0)                  / stack empty
412         fldz
413         fdivrs  PIC_L(one)              / 1/0
414         ret

416 / Set %ecx to 2 if y is an even integer, 1 if y is an odd integer,
417 / 0 otherwise.  Assume y is not zero.  Do not raise inexact or modify
418 / %edx.
419 .y_is_int:
420         movl    12(%ebp),%eax
421         andl    $0x7fffffff,%eax        / |y|
422         cmpl    $0x4b800000,%eax
423         jae     1f                      / |y| >= 2^24, an even int
424         cmpl    $0x3f800000,%eax
425         jb      2f                      / |y| < 1, can't be an int
426         movl    %eax,%ecx
427         sarl    $23,%ecx
428         subl    $150,%ecx
429         negl    %ecx                    / 23 - unbiased exponent of y
430         bsfl    %eax,%eax               / index of least sig. 1 bit
431         cmpl    %ecx,%eax
432         jb      2f
433         ja      1f
434         movl    $1,%ecx
435         ret
436 1:
437         movl    $2,%ecx
438         ret
439 2:
440         xorl    %ecx,%ecx
441         ret
442         .align  4
443         SET_SIZE(powf)
```

```
**********************************************************
   10389 Sat May 10 12:09:43 2014
new/usr/src/lib/libm/i386/src/powl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */
/*
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 */

        .file "powl.s"

/ Special cases:
/
/ x ** 0 is 1
/ 1 ** y is 1                           (C99)
/ x ** NaN is NaN
/ NaN ** y (except 0) is NaN
/ x ** 1 is x
/ +-(|x| > 1) **  +inf is +inf
/ +-(|x| > 1) **  -inf is +0
/ +-(|x| < 1) **  +inf is +0
/ +-(|x| < 1) **  -inf is +inf
/ (-1) ** +-inf is +1                   (C99)
/ +0 ** +y (except 0, NaN)              is +0
/ -0 ** +y (except 0, NaN, odd int)     is +0
/ +0 ** -y (except 0, NaN)              is +inf (z flag)
/ -0 ** -y (except 0, NaN, odd int)     is +inf (z flag)
/ -0 ** y (odd int)                     is - (+0 ** x)
/ +inf ** +y (except 0, NaN)            is +inf
/ +inf ** -y (except 0, NaN)            is +0
/ -inf ** +-y (except 0, NaN)           is -0 ** -+y (NO z flag)
/ x ** -1 is 1/x
/ x ** 2 is x*x
/ -x ** y (an integer) is (-1)**(y) * (+x)**(y)
/ x ** y (x negative & y not integer) is NaN (i flag)

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(powl,function)
#include "libm_synonyms.h"
#include "xpg6.h"

#undef fabs
```



```
        .data
        .align  4
negzero:
        .float  -0.0
half:
        .float  0.5
one:
        .float  1.0
negone:
        .float  -1.0
two:
        .float  2.0
Snan:
        .long   0x7f800001
pinfinity:
        .long   0x7f800000
ninfinity:
        .long   0xff800000


        ENTRY(powl)
        pushl   %ebp
        movl    %esp,%ebp
        PIC_SETUP(1)

        fldt    8(%ebp)                 / x
        fxam                            / determine class of x
        fnstsw  %ax                     / store status in %ax
        movb    %ah,%dh                 / %dh <- condition code of x

        fldt    20(%ebp)                / y , x
        fxam                            / determine class of y
        fnstsw  %ax                     / store status in %ax
        movb    %ah,%dl                 / %dl <- condition code of y

        call    .pow_main               /// LOCAL
        PIC_WRAPUP
        leave
        ret

.pow_main:
        / x ** 0 is 1
        movb    %dl,%cl
        andb    $0x45,%cl
        cmpb    $0x40,%cl               / C3=1 C2=0 C1=? C0=0 when +-0
        jne     1f
        fstp    %st(0)                  / x
        fstp    %st(0)                  / stack empty
        fld1                            / 1
        ret

1:      / y is not zero
        PIC_G_LOAD(movzwl,__xpg6,eax)
        andl    $_C99SUSv3_pow_treats_Inf_as_an_even_int,%eax
        cmpl    $0,%eax
        je      1f

        / C99: 1 ** anything is 1
        fld1                            / 1, y, x
        fucomp  %st(2)                  / y, x
        fnstsw  %ax                     / store status in %ax
        sahf                            / 80387 flags in %ax to 80386 flags
        jp      1f                      / so that pow(NaN1,NaN2) returns NaN2
        jne     1f
        fstp    %st(0)                  / x
```

```
128         ret
129
130 1:
131         / x ** NaN is NaN
132         movb    %dl,%cl
133         andb    $0x45,%cl
134         cmpb    $0x01,%cl               / C3=0 C2=0 C1=? C0=1 when +-NaN
135         jne     1f
136         fstp    %st(1)                  / y
137         ret
138
139 1:      / y is not NaN
140         / NaN ** y (except 0) is NaN
141         movb    %dh,%cl
142         andb    $0x45,%cl
143         cmpb    $0x01,%cl               / C3=0 C2=0 C1=? C0=1 when +-NaN
144         jne     1f
145         fstp    %st(0)                  / x
146         ret
147
148 1:      / x is not NaN
149         / x ** 1 is x
150         fcoms   PIC_L(one)              / y , x
151         fnstsw  %ax                     / store status in %ax
152         sahf                            / 80387 flags in %ax to 80386 flags
153         jne     1f
154         fstp    %st(0)                  / x
155         ret
156
157 1:      / y is not 1
158         / +-(|x| > 1) **  +inf is +inf
159         / +-(|x| > 1) **  -inf is +0
160         / +-(|x| < 1) **  +inf is +0
161         / +-(|x| < 1) **  -inf is +inf
162         / +-(|x| = 1) ** +-inf is NaN
163         movb    %dl,%cl
164         andb    $0x47,%cl
165         cmpb    $0x05,%cl               / C3=0 C2=1 C1=0 C0=1 when +inf
166         je      .yispinf
167         cmpb    $0x07,%cl               / C3=0 C2=1 C1=1 C0=1 when -inf
168         je      .yisninf
169
170         / +0 ** +y (except 0, NaN)              is +0
171         / -0 ** +y (except 0, NaN, odd int)     is +0
172         / +0 ** -y (except 0, NaN)              is +inf (z flag)
173         / -0 ** -y (except 0, NaN, odd int)     is +inf (z flag)
174         / -0 ** y (odd int)                     is - (+0 ** x)
175         movb    %dh,%cl
176         andb    $0x47,%cl
177         cmpb    $0x40,%cl               / C3=1 C2=0 C1=0 C0=0 when +0
178         je      .xispzero
179         cmpb    $0x42,%cl               / C3=1 C2=0 C1=1 C0=0 when -0
180         je      .xisnzero
181
182         / +inf ** +y (except 0, NaN)    is +inf
183         / +inf ** -y (except 0, NaN)    is +0
184         / -inf ** +-y (except 0, NaN)   is -0 ** -+y (NO z flag)
185         movb    %dh,%cl
186         andb    $0x47,%cl
187         cmpb    $0x05,%cl               / C3=0 C2=1 C1=0 C0=1 when +inf
188         je      .xispinf
189         cmpb    $0x07,%cl               / C3=0 C2=1 C1=1 C0=1 when -inf
190         je      .xisninf
191
192         / x ** -1 is 1/x
193         fcoms   PIC_L(negone)           / y , x
```



```
194         fnstsw  %ax                     / store status in %ax
195         sahf                            / 80387 flags in %ax to 80386 flags
196         jne     1f
197         fld     %st(1)                  / x , y , x
198         fdivrs  PIC_L(one)              / 1/x , y , x
199         jmp     .signok                 / check for over/underflow
200
201 1:      / y is not -1
202         / x ** 2 is x*x
203         fcoms   PIC_L(two)              / y , x
204         fnstsw  %ax                     / store status in %ax
205         sahf                            / 80387 flags in %ax to 80386 flags
206         jne     1f
207         fld     %st(1)                  / x , y , x
208         fld     %st(0)                  / x , x , y , x
209         fmulp                           / x^2 , y , x
210         jmp     .signok                 / check for over/underflow
211
212 1:      / y is not 2
213         / x ** 1/2 is sqrt(x)
214         fcoms   PIC_L(half)             / y , x
215         fnstsw  %ax                     / store status in %ax
216         sahf                            / 80387 flags in %ax to 80386 flags
217         jne     1f
218         fld     %st(1)                  / x , y , x
219         fsqrt                           / sqrt(x) , y , x
220         jmp     .signok                 / check for over/underflow
221
222 1:      / y is not 1/2
223         / make copies of x & y
224         fld     %st(1)                  / x , y , x
225         fld     %st(1)                  / y , x , y , x
226
227         / -x ** y (an integer) is (-1)**(y) * (+x)**(y)
228         / x ** y (x negative & y not integer) is  NaN
229         movl    $0,%ecx                 / track whether to flip sign of result
230         fld     %st(1)                  / x , y , x , y , x
231         ftst                            / compare %st(0) with 0
232         fnstsw  %ax                     / store status in %ax
233         sahf                            / 80387 flags in %ax to 80386 flags
234         fstp    %st(0)                  / y , x , y , x
235         ja      .merge                  / x > 0
236         / x < 0
237         call    .y_is_int
238         cmpl    $0,%ecx
239         jne     1f
240         / x < 0 & y != int so x**y = NaN (i flag)
241         fstp    %st(0)                  / x , y , x
242         fstp    %st(0)                  / y , x
243         fstp    %st(0)                  / x
244         fstp    %st(0)                  / stack empty
245         fldz
246         fdiv    %st,%st(0)              / 0/0
247         ret
248
249 1:      / x < 0 & y = int
250         fxch                            / x , y , y , x
251         fchs                            / px = -x , y , y , x
252         fxch                            / y , px , y , x
253 .merge:
254         / px > 0
255         fxch                            / px , y , y , x
256
257         / x**y   =   exp(y*ln(x))
258         fyl2x                           / t=y*log2(px) , y , x
259         fld     %st(0)                  / t , t , y , x
```

```
260         frndint                         / [t] , t , y , x
261         fxch                            / t , [t] , y , x
262         fucom
263         fnstsw  %ax                     / store status in %ax
264         sahf                            / 80387 flags in %ax to 80386 flags
265         je      1f                      / t is integral
266         fsub    %st(1),%st              / t-[t] , [t] , y , x
267         f2xm1                           / 2**(t-[t])-1 , [t] , y , x
268         fadds   PIC_L(one)              / 2**(t-[t]) , [t] , y , x
269         fscale                          / 2**t = px**y , [t] , y , x
270         jmp     2f
271 1:
272         fstp    %st(0)                  / t=[t] , y , x
273         fld1                            / 1 , t , y , x
274         fscale                          / 1*2**t = x**y , t , y , x
275 2:
276         fstp    %st(1)                  / x**y , y , x
277         cmpl    $1,%ecx
278         jne     .signok
279         fchs                            / change sign since x<0 & y=-int
280 .signok:
281         fstp    %st(2)                  / y , x**y
282         fstp    %st(0)                  / x**y
283         ret

285 / ---------------------------------------------------------------------

287 .xispinf:
288         ftst                            / compare %st(0) with 0
289         fnstsw  %ax                     / store status in %ax
290         sahf                            / 80387 flags in %ax to 80386 flags
291         ja      .retpinf                / y > 0
292         jmp     .retpzero               / y < 0

294 .xisninf:
295         / -inf ** +-y is -0 ** -+y
296         fchs                            / -y , x
297         flds    PIC_L(negzero)          / -0 , -y , x
298         fstp    %st(2)                  / -y , -0
299         jmp     .xisnzero

301 .yispinf:
302         fld     %st(1)                  / x , y , x
303         fabs                            / |x| , y , x
304         fcomps  PIC_L(one)              / y , x
305         fnstsw  %ax                     / store status in %ax
306         sahf                            / 80387 flags in %ax to 80386 flags
307         je      .retponeorinvalid       / x == -1       C99
308         ja      .retpinf                / |x| > 1
309         jmp     .retpzero               / |x| < 1

311 .yisninf:
312         fld     %st(1)                  / x , y , x
313         fabs                            / |x| , y , x
314         fcomps  PIC_L(one)              / y , x
315         fnstsw  %ax                     / store status in %ax
316         sahf                            / 80387 flags in %ax to 80386 flags
317         je      .retponeorinvalid       / x == -1       C99
318         ja      .retpzero               / |x| > 1
319         jmp     .retpinf                / |x| < 1

321 .xispzero:
322         / y cannot be 0 or NaN ; stack has      y , x
323         ftst                            / compare %st(0) with 0
324         fnstsw  %ax                     / store status in %ax
325         sahf                            / 80387 flags in %ax to 80386 flags
```



```
326         ja      .retpzero               / y > 0
327         / x = +0 & y < 0 so x**y = +inf
328         jmp     .retpinfzflag           / ret +inf & z flag

330 .xisnzero:
331         / y cannot be 0 or NaN ; stack has      y , x
332         call    .y_is_int
333         cmpl    $1,%ecx
334         jne     1f                      / y is not an odd integer
335         / y is an odd integer
336         ftst                            / compare %st(0) with 0
337         fnstsw  %ax                     / store status in %ax
338         sahf                            / 80387 flags in %ax to 80386 flags
339         ja      .retnzero               / y > 0
340         / x = -0 & y < 0 (odd int)      return -inf (z flag)
341         / x = -inf & y != 0 or NaN      return -inf (NO z flag)
342         movb    %dh,%cl
343         andb    $0x45,%cl
344         cmpb    $0x05,%cl               / C3=0 C2=1 C1=? C0=1 when +-inf
345         je      2f
346         fdiv    %st,%st(1)              / y / x, x (raise z flag)
347 2:
348         fstp    %st(0)                  / x
349         fstp    %st(0)                  / stack empty
350         flds    PIC_L(ninfinity)        / -inf
351         ret

353 1:      / y is not an odd integer
354         ftst                            / compare %st(0) with 0
355         fnstsw  %ax                     / store status in %ax
356         sahf                            / 80387 flags in %ax to 80386 flags
357         ja      .retpzero               / y > 0
358         / x = -0 & y < 0 (not odd int)  return +inf (z flag)
359         / x = -inf & y not 0 or NaN     return +inf (NO z flag)
360         movb    %dh,%cl
361         andb    $0x45,%cl
362         cmpb    $0x05,%cl               / C3=0 C2=1 C1=? C0=1 when +-inf
363         jne     .retpinfzflag           / ret +inf & divide-by-0 flag
364         jmp     .retpinf                / return +inf (NO z flag)

366 .retpzero:
367         fstp    %st(0)                  / x
368         fstp    %st(0)                  / stack empty
369         fldz                            / +0
370         ret

372 .retnzero:
373         fstp    %st(0)                  / x
374         fstp    %st(0)                  / stack empty
375         flds    PIC_L(negzero)          / -0
376         ret

378 .retponeorinvalid:
379         PIC_G_LOAD(movzwl,__xpg6,eax)
380         andl    $_C99SUSv3_pow_treats_Inf_as_an_even_int,%eax
381         cmpl    $0,%eax
382         je      1f
383         fstp    %st(0)                  / x
384         fstp    %st(0)                  / stack empty
385         fld1                            / 1
386         ret

388 1:
389         fstp    %st(0)                  / x
390         fstp    %st(0)                  / stack empty
391         flds    PIC_L(Snan)             / Q NaN (i flag)
```

```
392         fwait
393         ret

395 .retpinf:
396         fstp    %st(0)                  / x
397         fstp    %st(0)                  / stack empty
398         flds    PIC_L(pinfinity)        / +inf
399         ret

401 .retpinfzflag:
402         fstp    %st(0)                  / x
403         fstp    %st(0)                  / stack empty
404         fldz
405         fdivrs  PIC_L(one)              / 1/0
406         ret

408 / Set %ecx to 2 if y is an even integer, 1 if y is an odd integer,
409 / 0 otherwise.  Assume y is not zero.  Do not raise inexact or modify
410 / %edx.
411 .y_is_int:
412         movl    28(%ebp),%eax
413         andl    $0x7fff,%eax            / exponent of y
414         cmpl    $0x403f,%eax
415         jae     1f                      / |y| >= 2^64, an even int
416         cmpl    $0x3fff,%eax
417         jb      2f                      / |y| < 1, can't be an int
418         movl    %eax,%ecx
419         subl    $0x403e,%ecx
420         negl    %ecx                    / 63 - unbiased exponent of y
421         movl    20(%ebp),%eax
422         bsfl    %eax,%eax               / index of least sig. 1 bit
423         jne     3f                      / jump if 1 bit found
424         movl    24(%ebp),%eax
425         bsfl    %eax,%eax
426         addl    $32,%eax                / 32 + index of least sig. 1 bit
427 3:
428         cmpl    %ecx,%eax
429         jb      2f
430         ja      1f
431         movl    $1,%ecx
432         ret
433 1:
434         movl    $2,%ecx
435         ret
436 2:
437         xorl    %ecx,%ecx
438         ret
439         .align  4
440         SET_SIZE(powl)
```

```
**********************************************************
    2128 Sat May 10 12:09:43 2014
new/usr/src/lib/libm/i386/src/remainder.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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        .file "remainder.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remainder,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(remainder)
        pushl   %ebp
        movl    %esp,%ebp
        fldl    16(%esp)                / load arg y
        fldl    8(%esp)                 / load arg x
        fucom
        fnstsw  %ax
        sahf
        jp      .rem_loop               / if x or y is NaN, use fprem1

        movl    20(%esp),%eax           / eax <-- hi_32(y)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(|y|)
        orl     16(%esp),%eax           / eax <-- lo_32(y)|hi_32(|y|)
        je      .yzero_or_xinf

        movl    12(%esp),%eax           / eax <-- hi_32(x)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(|x|)
        cmpl    $0x7ff00000,%eax
        jne     .rem_loop
        cmpl    $0,8(%esp)
        je      .yzero_or_xinf

.rem_loop:
        fprem1                          / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check for incomplete reduction
```



```
        jne     .rem_loop               / while incomplete, do fprem1 again
        fstp    %st(1)
        leave
        ret

.yzero_or_xinf:
        PIC_SETUP(1)
        fstp    %st(0)                  / x
        fstp    %st(0)                  / empty NPX stack
        pushl   $28                     / case 28 in _SVID_libm_err
        pushl   20(%ebp)                / pass y
        pushl   16(%ebp)
        pushl   12(%ebp)                / pass x
        pushl   8(%ebp)
        call    PIC_F(_SVID_libm_err)
        addl    $20,%esp
        PIC_WRAPUP
        leave
        ret
        .align  4
        SET_SIZE(remainder)
```

```
**********************************************************
    1426 Sat May 10 12:09:43 2014
new/usr/src/lib/libm/i386/src/remainderf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "remainderf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remainderf,function)
#include "libm_synonyms.h"

        ENTRY(remainderf)
        flds    8(%esp)                 / load arg y
        flds    4(%esp)                 / load arg x
.rem_loop:
        fprem1                          / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check whether reduction complete
        jne     .rem_loop               / while reduction incomplete, do fprem1
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(remainderf)
```

```
**********************************************************
    1426 Sat May 10 12:09:44 2014
new/usr/src/lib/libm/i386/src/remainderl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "remainderl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remainderl,function)
#include "libm_synonyms.h"

        ENTRY(remainderl)
        fldt    16(%esp)                / load arg y
        fldt    4(%esp)                 / load arg x
.rem_loop:
        fprem1                          / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check whether reduction complete
        jne     .rem_loop               / while reduction incomplete, do fprem1
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(remainderl)
```

```
**********************************************************
    1931 Sat May 10 12:09:44 2014
new/usr/src/lib/libm/i386/src/remquo.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file "remquo.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remquo,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(remquo)
        fldl    12(%esp)                / load arg y
        fldl    4(%esp)                 / load arg x
.Lrem_loop:
        fprem1                          / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check whether reduction complete
        jne     .Lrem_loop              / while reduction incomplete, do fprem1
        fstsw   %ax
        fwait
        fstp    %st(1)
        movw    %ax,%dx
        andw    $0x4000,%dx             / get C3
        sarw    $13,%dx
        movw    %ax,%cx
        andw    $0x100,%cx              / get C0
        sarw    $6,%cx
        addw    %cx,%dx
        andw    $0x200,%ax              / get C1
        sarw    $9,%ax
        addw    %dx,%ax
        cwtl
        movl    8(%esp),%edx            / sign and bexp of x
        movl    16(%esp),%ecx           / sign and bexp of y
        andl    $0x80000000,%edx        / edx <- sign(x)
        andl    $0x80000000,%ecx        / ecx <- sign(y)
```



```
        cmpl    %edx,%ecx
        je      .pos
        negl    %eax                    / negative n
.pos:
        movl    20(%esp),%ecx
        movl    %eax,0(%ecx)            / last 3 significant bits of quotient
        ret
        .align  4
        SET_SIZE(remquo)
```

```
**********************************************************
    1936 Sat May 10 12:09:44 2014
new/usr/src/lib/libm/i386/src/remquof.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "remquof.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remquof,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(remquof)
        flds    8(%esp)                 / load arg y
        flds    4(%esp)                 / load arg x
.Lremf_loop:
        fprem1                          / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check whether reduction complete
        jne     .Lremf_loop             / while reduction incomplete, do fprem1
        fstsw   %ax
        fwait
        fstp    %st(1)
        movw    %ax,%dx
        andw    $0x4000,%dx             / get C3
        sarw    $13,%dx
        movw    %ax,%cx
        andw    $0x100,%cx              / get C0
        sarw    $6,%cx
        addw    %cx,%dx
        andw    $0x200,%ax              / get C1
        sarw    $9,%ax
        addw    %dx,%ax
        cwtl
        movl    4(%esp),%edx            / sign and bexp of x
        movl    8(%esp),%ecx            / sign and bexp of y
        andl    $0x80000000,%edx        / edx <- sign(x)
        andl    $0x80000000,%ecx        / ecx <- sign(y)
```



```
        cmpl    %edx,%ecx
        je      .pos
        negl    %eax                    / negative n
.pos:
        movl    12(%esp),%ecx
        movl    %eax,0(%ecx)            / last 3 significant bits of quotient
        ret
        .align  4
        SET_SIZE(remquof)
```

```
**********************************************************
    1938 Sat May 10 12:09:44 2014
new/usr/src/lib/libm/i386/src/remquol.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "remquol.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(remquol,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(remquol)
        fldt    16(%esp)                / load arg y
        fldt    4(%esp)                 / load arg x
.Lreml_loop:
        fprem1                          / partial remainder
        fstsw   %ax                     / store status word
        andw    $0x400,%ax              / check whether reduction complete
        jne     .Lreml_loop             / while reduction incomplete, do fprem1
        fstsw   %ax
        fwait
        fstp    %st(1)
        movw    %ax,%dx
        andw    $0x4000,%dx             / get C3
        sarw    $13,%dx
        movw    %ax,%cx
        andw    $0x100,%cx              / get C0
        sarw    $6,%cx
        addw    %cx,%dx
        andw    $0x200,%ax              / get C1
        sarw    $9,%ax
        addw    %dx,%ax
        cwtl
        movl    12(%esp),%edx           / sign and bexp of x
        movl    24(%esp),%ecx           / sign and bexp of y
        andl    $0x00008000,%edx        / edx <- sign(x)
        andl    $0x00008000,%ecx        / ecx <- sign(y)
```



```
        cmpl    %edx,%ecx
        je      .pos
        negl    %eax                    / negative n
.pos:
        movl    28(%esp),%ecx
        movl    %eax,0(%ecx)            / last 3 significant bits of quotient
        ret
        .align  4
        SET_SIZE(remquol)
```

```
**********************************************************
    1396 Sat May 10 12:09:44 2014
new/usr/src/lib/libm/i386/src/rint.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "rint.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(rint,function)
#include "libm_synonyms.h"

        ENTRY(rint)
        fldl    4(%esp)                 / load x
        movl    8(%esp),%eax            / eax <-- hi_32(x)
        andl    $0x7fffffff,%eax        / eax <-- hi_32(|x|)
        cmpl    $0x43300000,%eax        / is |x| >= 2**52?
        jae     .done                   / if so, branch (already integral)
        frndint                         / [x], per rounding mode
.done:
        fwait
        ret
        .align  4
        SET_SIZE(rint)
```

```
**********************************************************
    1386 Sat May 10 12:09:44 2014
new/usr/src/lib/libm/i386/src/rintf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "rintf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(rintf,function)
#include "libm_synonyms.h"

        ENTRY(rintf)
        flds    4(%esp)                 / load x
        movl    4(%esp),%eax            / eax <-- x
        andl    $0x7fffffff,%eax        / eax <-- |x|
        cmpl    $0x4b000000,%eax        / is |x| >= 2**23?
        jae     .done                   / if so, branch (already integral)
        frndint                         / [x], per rounding mode
.done:
        fwait
        ret
        .align  4
        SET_SIZE(rintf)
```

****
1213 Sat May 10 12:09:44 2014
new/usr/src/lib/libm/i386/src/rintl.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file   "rintl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(rintl,function)
#include "libm_synonyms.h"

        ENTRY(rintl)
        fldt    4(%esp)                 / load x
        frndint                         / [x], per rounding mode
        fwait
        ret
        .align  4
        SET_SIZE(rintl)
```

```
**********************************************************
    3085 Sat May 10 12:09:44 2014
new/usr/src/lib/libm/i386/src/rndintl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "rndintl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(aintl,function)
LIBM_ANSI_PRAGMA_WEAK(irintl,function)
LIBM_ANSI_PRAGMA_WEAK(anintl,function)
LIBM_ANSI_PRAGMA_WEAK(nintl,function)
#include "libm_synonyms.h"
#undef fabs

        ENTRY(aintl)
        movl    %esp,%eax
        subl    $8,%esp
        fstcw   -8(%eax)
        fldt    4(%eax)
        movw    -8(%eax),%cx
        orw     $0x0c00,%cx
        movw    %cx,-4(%eax)
        fldcw   -4(%eax)                / set RD = to_zero
        frndint
        fstcw   -4(%eax)
        movw    -4(%eax),%dx
        andw    $0xf3ff,%dx
        movw    -8(%eax),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,-8(%eax)
        fldcw   -8(%eax)                / restore RD
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(aintl)
```



```
        ENTRY(irintl)
        movl    %esp,%ecx
        subl    $8,%esp
        fldt    4(%ecx)                 / load x
        fistpl  -8(%ecx)                / [x]
        fwait
        movl    -8(%ecx),%eax
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(irintl)

        .data
        .align  4
half:   .float  0.5

        ENTRY(anintl)
.Lanintl:
        movl    %esp,%ecx
        subl    $8,%esp
        fstcw   -8(%ecx)
        fldt    4(%ecx)
        movw    -8(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    %dx,-4(%ecx)
        fldcw   -4(%ecx)                / set RD = to_nearest
        fld     %st(0)
        frndint                         / [x],x
        fstcw   -4(%ecx)
        movw    -4(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    -8(%ecx),%ax
        andw    $0x0c00,%ax
        orw     %dx,%ax
        movw    %ax,-8(%ecx)
        fldcw   -8(%ecx)                / restore RD
        fucom                           / check if x is already an integer
        fstsw   %ax
        sahf
        jp      .L0
        je      .L0
        fxch                            / x,[x]
        fsub    %st(1),%st              / x-[x],[x]
        fabs                            / |x-[x]|,[x]
        PIC_SETUP(1)
        fcoms   PIC_L(half)
        PIC_WRAPUP
        fnstsw  %ax
        sahf
        jae     .halfway                / if |x-[x]| = 0.5 goto halfway,
                                        / most cases will not take branch.
.L0:
        addl    $8,%esp
        fstp    %st(0)
        ret
.halfway:
        / x = n+0.5, recompute anint(x) as x+sign(x)*0.5
        fldt    4(%ecx)                 / x, 0.5, [x]
        movw    12(%ecx),%ax            / sign+exp part of x
        andw    $0x8000,%ax             / look at sign bit
        jnz     .x_neg
        faddp
        addl    $8,%esp
        fstp    %st(1)
        ret
.x_neg:
```

```
128         / here, x is negative, so return x-0.5
129         fsubp   %st,%st(1)              / x-0.5,[x]
130         addl    $8,%esp
131         fstp    %st(1)
132         ret
133         .align  4
134         SET_SIZE(anintl)

136         ENTRY(nintl)
137         pushl   %ebp
138         movl    %esp,%ebp
139         subl    $8,%esp
140         pushl   16(%ebp)
141         pushl   12(%ebp)
142         pushl   8(%ebp)
143         call    .Lanintl                /// LOCAL
144         fistpl  -8(%ebp)
145         fwait
146         movl    -8(%ebp),%eax
147         leave
148         ret
149         .align  4
150         SET_SIZE(nintl)
```

```
**********************************************************
    2167 Sat May 10 12:09:45 2014
new/usr/src/lib/libm/i386/src/round.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "round.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(round,function)
#include "libm_synonyms.h"
#undef fabs

        .section .rodata
        .align  4
.Lhalf: .float  0.5

        ENTRY(round)
        movl    %esp,%ecx
        subl    $8,%esp
        fstcw   -8(%ecx)
        fldl    4(%ecx)
        movw    -8(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    %dx,-4(%ecx)
        fldcw   -4(%ecx)                / set RD = to_nearest
        fld     %st(0)
        frndint                         / [x],x
        fstcw   -4(%ecx)
        movw    -4(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    -8(%ecx),%ax
        andw    $0x0c00,%ax
        orw     %dx,%ax
        movw    %ax,-8(%ecx)
        fldcw   -8(%ecx)                / restore RD
        fucom                           / check if x is already an integer
        fstsw   %ax
        sahf
```



```
        jp      0f
        je      0f
        fxch                            / x,[x]
        fsub    %st(1),%st              / x-[x],[x]
        fabs                            / |x-[x]|,[x]
        PIC_SETUP(1)
        fcoms   PIC_L(.Lhalf)
        PIC_WRAPUP
        fnstsw  %ax
        sahf
        jae     2f                      / if |x-[x]| = 0.5 goto halfway,
                                        / most cases will not take branch.
0:
        addl    $8,%esp
        fstp    %st(0)
        ret
2:
    / x = n+0.5, recompute round(x) as x+sign(x)*0.5
        fldl    4(%ecx)                 / x, 0.5, [x]
        movl    8(%ecx),%eax            / high part of x
        andl    $0x80000000,%eax
        jnz     3f
        faddp
        addl    $8,%esp
        fstp    %st(1)
        ret
3:
        / here, x is negative, so return x-0.5
        fsubp   %st,%st(1)              / x-0.5,[x]
        addl    $8,%esp
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(round)
```

```
**********************************************************
    2186 Sat May 10 12:09:45 2014
new/usr/src/lib/libm/i386/src/roundl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

        .file   "roundl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(roundl,function)
#include "libm_synonyms.h"
#undef fabs

        .section .rodata
        .align  4
.Lhalf: .float  0.5

        ENTRY(roundl)
        movl    %esp,%ecx
        subl    $8,%esp
        fstcw   -8(%ecx)
        fldt    4(%ecx)
        movw    -8(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    %dx,-4(%ecx)
        fldcw   -4(%ecx)                / set RD = to_nearest
        fld     %st(0)
        frndint                         / [x],x
        fstcw   -4(%ecx)
        movw    -4(%ecx),%dx
        andw    $0xf3ff,%dx
        movw    -8(%ecx),%ax
        andw    $0x0c00,%ax
        orw     %dx,%ax
        movw    %ax,-8(%ecx)
        fldcw   -8(%ecx)                / restore RD
        fucom                           / check if x is already an integer
        fstsw   %ax
        sahf
```



```
        jp      0f
        je      0f
        fxch                            / x,[x]
        fsub    %st(1),%st              / x-[x],[x]
        fabs                            / |x-[x]|,[x]
        PIC_SETUP(1)
        fcoms   PIC_L(.Lhalf)
        PIC_WRAPUP
        fnstsw  %ax
        sahf
        jae     2f                      / if |x-[x]| = 0.5 goto halfway,
                                        / most cases will not take branch.
0:
        addl    $8,%esp
        fstp    %st(0)
        ret
2:
    / x = n+0.5, recompute roundl(x) as x+sign(x)*0.5
        fldt    4(%ecx)                 / x, 0.5, [x]
        movw    12(%ecx),%ax            / sign+exp of x
        andw    $0x8000,%ax             / look at sign bit
        jnz     3f
        faddp
        addl    $8,%esp
        fstp    %st(1)
        ret
3:
        / here, x is negative, so return x-0.5
        fsubp   %st,%st(1)              / x-0.5,[x]
        addl    $8,%esp
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(roundl)
```

```
**********************************************************
    1239 Sat May 10 12:09:45 2014
new/usr/src/lib/libm/i386/src/scalbln.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "scalbln.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(scalbln,function)
#include "libm_synonyms.h"

        ENTRY(scalbln)
        fildl   12(%esp)                / convert N to extended
        fldl    4(%esp)                 / push x
        fscale
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(scalbln)
```

```
**********************************************************
    1243 Sat May 10 12:09:45 2014
new/usr/src/lib/libm/i386/src/scalblnf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "scalblnf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(scalblnf,function)
#include "libm_synonyms.h"

        ENTRY(scalblnf)
        fildl   8(%esp)                 / convert N to extended
        flds    4(%esp)                 / push x
        fscale
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(scalblnf)
```

```
**********************************************************
    1272 Sat May 10 12:09:45 2014
new/usr/src/lib/libm/i386/src/scalblnl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "scalblnl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(scalblnl,function)
#include "libm_synonyms.h"

        ENTRY(scalblnl)
        fildl   16(%esp)                / convert 32-bit integer N
                                        / to extended-double
        fldt    4(%esp)                 / push x
        fscale
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(scalblnl)
```

```
**********************************************************
    1235 Sat May 10 12:09:45 2014
new/usr/src/lib/libm/i386/src/scalbn.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "scalbn.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(scalbn,function)
#include "libm_synonyms.h"

        ENTRY(scalbn)
        fildl   12(%esp)                / convert N to extended
        fldl    4(%esp)                 / push x
        fscale
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(scalbn)
```

```
**********************************************************
    1239 Sat May 10 12:09:45 2014
new/usr/src/lib/libm/i386/src/scalbnf.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "scalbnf.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(scalbnf,function)
#include "libm_synonyms.h"

        ENTRY(scalbnf)
        fildl   8(%esp)                 / convert N to extended
        flds    4(%esp)                 / push x
        fscale
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(scalbnf)
```

```
**********************************************************
    1268 Sat May 10 12:09:46 2014
new/usr/src/lib/libm/i386/src/scalbnl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "scalbnl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(scalbnl,function)
#include "libm_synonyms.h"

        ENTRY(scalbnl)
        fildl   16(%esp)                / convert 32-bit integer N
                                        / to extended-double
        fldt    4(%esp)                 / push x
        fscale
        fstp    %st(1)
        ret
        .align  4
        SET_SIZE(scalbnl)
```

```
**********************************************************
    1349 Sat May 10 12:09:46 2014
new/usr/src/lib/libm/i386/src/sin.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file "sin.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(sin,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(sin)
        PIC_SETUP(1)
        call    PIC_F(__reduction)
        PIC_WRAPUP
        cmpl    $1,%eax
        jl      .sin0
        je      .sin1
        cmpl    $2,%eax
        je      .sin2
        fcos
        fchs
        ret
.sin2:
        fsin
        fchs
        ret
.sin1:
        fcos
        ret
.sin0:
        fsin
        ret
        .align  4
        SET_SIZE(sin)
```

```
**********************************************************
    1712 Sat May 10 12:09:46 2014
new/usr/src/lib/libm/i386/src/sincos.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "sincos.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(sincos,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(sincos)
        PIC_SETUP(1)
        call    PIC_F(__reduction)
        PIC_WRAPUP
        fsincos
        cmpl    $1,%eax
        jl      .sincos0
        je      .sincos1
        cmpl    $2,%eax
        je      .sincos2
        / n=3
        fchs
        movl    12(%esp),%eax
        fstpl   0(%eax)
        movl    16(%esp),%eax
        fstpl   0(%eax)
        fwait
        ret
.sincos2:
        / n=2
        fchs
        movl    16(%esp),%eax
        fstpl   0(%eax)
        fchs
        movl    12(%esp),%eax
        fstpl   0(%eax)
```



```
        fwait
        ret
.sincos1:
        / n=1
        movl    12(%esp),%eax
        fstpl   0(%eax)
        fchs
        movl    16(%esp),%eax
        fstpl   0(%eax)
        fwait
        ret
.sincos0:
        / n=0
        movl    16(%esp),%eax
        fstpl   0(%eax)
        movl    12(%esp),%eax
        fstpl   0(%eax)
        fwait
        ret
        .align  4
        SET_SIZE(sincos)
```

****
1172 Sat May 10 12:09:46 2014
new/usr/src/lib/libm/i386/src/sqrtl.s
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file "sqrtl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(sqrtl,function)
#include "libm_synonyms.h"

        ENTRY(sqrtl)
        fldt    4(%esp)
        fsqrt
        ret
        .align  4
        SET_SIZE(sqrtl)
```

```
**********************************************************
    1320 Sat May 10 12:09:46 2014
new/usr/src/lib/libm/i386/src/tan.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file "tan.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(tan,function)
#include "libm_synonyms.h"
#include "libm_protos.h"

        ENTRY(tan)
        PIC_SETUP(1)
        call    PIC_F(__reduction)
        PIC_WRAPUP
        andl    $1,%eax
        cmpl    $0,%eax
        je      .tan1
        fptan
        fdivp   %st,%st(1)
        fchs
        ret
.tan1:
        fptan
        fstp    %st(0)
        ret
        .align  4
        SET_SIZE(tan)
```

```
**********************************************************
    1470 Sat May 10 12:09:46 2014
new/usr/src/lib/libm/i386/src/trunc.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "trunc.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(trunc,function)
#include "libm_synonyms.h"

        ENTRY(trunc)
        movl    %esp,%eax
        subl    $8,%esp
        fstcw   -8(%eax)
        fldl    4(%eax)
        movw    -8(%eax),%cx
        orw     $0x0c00,%cx
        movw    %cx,-4(%eax)
        fldcw   -4(%eax)                / set RD = to_zero
        frndint
        fstcw   -4(%eax)
        movw    -4(%eax),%dx
        andw    $0xf3ff,%dx
        movw    -8(%eax),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,-8(%eax)
        fldcw   -8(%eax)                / restore RD
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(trunc)
```

```
**********************************************************
    1474 Sat May 10 12:09:46 2014
new/usr/src/lib/libm/i386/src/truncl.s
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

        .file   "truncl.s"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(truncl,function)
#include "libm_synonyms.h"

        ENTRY(truncl)
        movl    %esp,%eax
        subl    $8,%esp
        fstcw   -8(%eax)
        fldt    4(%eax)
        movw    -8(%eax),%cx
        orw     $0x0c00,%cx
        movw    %cx,-4(%eax)
        fldcw   -4(%eax)                / set RD = to_zero
        frndint
        fstcw   -4(%eax)
        movw    -4(%eax),%dx
        andw    $0xf3ff,%dx
        movw    -8(%eax),%cx
        andw    $0x0c00,%cx
        orw     %dx,%cx
        movw    %cx,-8(%eax)
        fldcw   -8(%eax)                / restore RD
        addl    $8,%esp
        ret
        .align  4
        SET_SIZE(truncl)
```

```
**********************************************************
     605 Sat May 10 12:09:46 2014
new/usr/src/lib/libm/sparc/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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  16 TARGET_ARCH= sparc
  17 include ../Makefile.com

  19 CHIP            = ultra

  21 install:        all $(ROOTLIBS) $(ROOTLINKS) $(ROOTLINT)

  23 include ../Makefile.targ
```

```
**********************************************************
    1266 Sat May 10 12:09:46 2014
new/usr/src/lib/libm/sparc/src/copysign.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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        .file   "copysign.S"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(copysign,function)
#include "libm_synonyms.h"

        ENTRY(copysign)
        sethi   %hi(0x80000000),%o3
        andn    %o0,%o3,%o0
        and     %o2,%o3,%o2
        or      %o2,%o0,%o0
        std     %o0,[%sp+0x48]
        retl
        ldd     [%sp+0x48],%f0

        SET_SIZE(copysign)
```

****
1247 Sat May 10 12:09:47 2014
new/usr/src/lib/libm/sparc/src/fabs.S
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

        .file   "fabs.S"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(fabs,function)
#include "libm_synonyms.h"

        ENTRY(fabs)
        sethi   %hi(0x80000000),%o2
        andn    %o0,%o2,%o0
        std     %o0,[%sp+0x48]
        nop
        nop
        nop
        nop
        nop
        nop
        retl
        ldd     [%sp+0x48],%f0

        SET_SIZE(fabs)
```

```
**********************************************************
    6972 Sat May 10 12:09:47 2014
new/usr/src/lib/libm/sparc/src/libm_inlines.h
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
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 */

/* Functions in this file are duplicated in locallibm.il.  Keep them in sync */

#ifndef _LIBM_INLINES_H
#define _LIBM_INLINES_H

#ifdef __GNUC__

#include <sys/types.h>
#include <sys/ieeefp.h>

#ifdef __cplusplus
extern "C" {
#endif

extern __inline__ double
__inline_sqrt(double d)
{
        double ret;

        __asm__ __volatile__("fsqrtd %1,%0\n\t" : "=e" (ret) : "e" (d));
        return (ret);
}

extern __inline__ float
__inline_sqrtf(float f)
{
        float ret;

        __asm__ __volatile__("fsqrts %1,%0\n\t" : "=f" (ret) : "f" (f));
        return (ret);
```



```
}

extern __inline__ enum fp_class_type
fp_classf(float f)
{
        enum fp_class_type ret;
        uint32_t tmp;

        /* XXX: Separate input and output */
        __asm__ __volatile__(
            "sethi  %%hi(0x80000000),%1\n\t"
            "andncc %3,%1,%0\n\t"
            "bne    1f\n\t"
            "nop\n\t"
            "mov    0,%0\n\t"
            "ba 2f\n\t"         /* x is 0 */
            "nop\n\t"
            "1:\n\t"
            "sethi  %%hi(0x7f800000),%1\n\t"
            "andcc  %0,%1,%%g0\n\t"
            "bne    1f\n\t"
            "nop\n\t"
            "mov    1,%0\n\t"
            "ba     2f\n\t"     /* x is subnormal */
            "nop\n\t"
            "1:\n\t"
            "cmp    %0,%1\n\t"
            "bge    1f\n\t"
            "nop\n\t"
            "mov    2,%0\n\t"
            "ba     2f\n\t"     /* x is normal */
            "nop\n\t"
            "1:\n\t"
            "bg     1f\n\t"
            "nop\n\t"
            "mov    3,%0\n\t"
            "ba     2f\n\t"     /* x is __infinity */
            "nop\n\t"
            "1:\n\t"
            "sethi  %%hi(0x00400000),%1\n\t"
            "andcc  %0,%1,%%g0\n\t"
            "mov    4,%0\n\t"   /* x is quiet NaN */
            "bne    2f\n\t"
            "nop\n\t"
            "mov    5,%0\n\t"   /* x is signaling NaN */
            "2:\n\t"
            : "+r" (ret), "=&r" (tmp)
            : "r" (f)
            : "cc");
        return (ret);
}

#define _HI_WORD(x)     ((uint32_t *)&x)[0]
#define _LO_WORD(x)     ((uint32_t *)&x)[1]

extern __inline__ enum fp_class_type
fp_class(double d)
{
        enum fp_class_type ret;
        uint32_t tmp;

        __asm__ __volatile__(
            "sethi %%hi(0x80000000),%1\n\t"     /* %1 gets 80000000 */
            "andn  %2,%1,%0\n\t"                /* %2-%0 gets abs(x) */
            "orcc  %0,%3,%%g0\n\t"              /* set cc as x is zero/nonzero *
            "bne   1f\n\t"                      /* branch if x is nonzero */
```

```
127             "nop\n\t"
128             "mov   0,%0\n\t"
129             "ba    2f\n\t"                      /* x is 0 */
130             "nop\n\t"
131             "1:\n\t"
132             "sethi %%hi(0x7ff00000),%1\n\t"     /* %1 gets 7ff00000 */
133             "andcc %0,%1,%%g0\n\t"              /* cc set by __exp field of x */
134             "bne   1f\n\t"                      /* branch if normal or max __exp
135             "nop\n\t"
136             "mov   1,%0\n\t"
137             "ba    2f\n\t"                      /* x is subnormal */
138             "nop\n\t"
139             "1:\n\t"
140             "cmp   %0,%1\n\t"
141             "bge   1f\n\t"                      /* branch if x is max __exp */
142             "nop\n\t"
143             "mov   2,%0\n\t"
144             "ba    2f\n\t"                      /* x is normal */
145             "nop\n\t"
146             "1:\n\t"
147             "andn  %0,%1,%0\n\t"                /* o0 gets msw __significand fie
148             "orcc  %0,%3,%%g0\n\t"              /* set cc by OR __significand */
149             "bne   1f\n\t"                      /* Branch if __nan */
150             "nop\n\t"
151             "mov   3,%0\n\t"
152             "ba    2f\n\t"                      /* x is __infinity */
153             "nop\n\t"
154             "1:\n\t"
155             "sethi %%hi(0x00080000),%1\n\t"
156             "andcc %0,%1,%%g0\n\t"              /* set cc by quiet/sig bit */
157             "be    1f\n\t"                      /* Branch if signaling */
158             "nop\n\t"
159             "mov   4,%0\n\t"                    /* x is quiet NaN */
160             "ba    2f\n\t"
161             "nop\n\t"
162             "1:\n\t"
163             "mov   5,%0\n\t"                    /* x is signaling NaN */
164             "2:\n\t"
165             : "=&r" (ret), "=&r" (tmp)
166             : "r" (_HI_WORD(d)), "r" (_LO_WORD(d))
167             : "cc");

169         return (ret);
170 }

172 extern __inline__ int
173 __swapEX(int i)
174 {
175         int ret;
176         uint32_t fsr;
177         uint32_t tmp1, tmp2;

179         __asm__ __volatile__(
180             "and  %4,0x1f,%3\n\t"
181             "sll  %3,5,%3\n\t"  /* shift input to aexc bit location */
182             ".volatile\n\t"
183             "st   %%fsr,%1\n\t"
184             "ld   %1,%0\n\t"    /* %0 = fsr */
185             "andn %0,0x3e0,%4\n\t"
186             "or   %3,%4,%3\n\t" /* %3 = new fsr */
187             "st   %3,%1\n\t"
188             "ld   %1,%%fsr\n\t"
189             "srl  %0,5,%0\n\t"
190             "and  %0,0x1f,%0\n\t"
191             ".nonvolatile\n\t"
192             : "=r" (ret), "=m" (fsr), "=r" (tmp1), "=r" (tmp2)
```



```
193             : "r" (i)
194             : "cc");

196         return (ret);
197 }

199 /*
200  * On the SPARC, __swapRP is a no-op; always return 0 for backward
201  * compatibility
202  */
203 /* ARGSUSED */
204 extern __inline__ enum fp_precision_type
205 __swapRP(enum fp_precision_type i)
206 {
207         return (0);
208 }

210 extern __inline__ enum fp_direction_type
211 __swapRD(enum fp_direction_type d)
212 {
213         enum fp_direction_type ret;
214         uint32_t fsr;
215         uint32_t tmp1, tmp2, tmp3;

217         __asm__ __volatile__(
218             "and  %5,0x3,%0\n\t"
219             "sll  %0,30,%2\n\t"         /* shift input to RD bit location */
220             ".volatile\n\t"
221             "st   %%fsr,%1\n\t"
222             "ld   %1,%0\n\t"            /* %0 = fsr */
223             "set  0xc0000000,%4\n\t"    /* mask of rounding direction bits */
224             "andn %0,%4,%3\n\t"
225             "or   %2,%3,%2\n\t"         /* %2 = new fsr */
226             "st   %2,%1\n\t"
227             "ld   %1,%%fsr\n\t"
228             "srl  %0,30,%0\n\t"
229             "and  %0,0x3,%0\n\t"
230             ".nonvolatile\n\t"
231             : "=r" (ret), "=m" (fsr), "=r" (tmp1), "=r" (tmp2), "=r" (tmp3)
232             : "r" (d)
233             : "cc");

235         return (ret);
236 }

238 extern __inline__ int
239 __swapTE(int i)
240 {
241         int ret;
242         uint32_t fsr, tmp1, tmp2;

244         __asm__ __volatile__(
245             "and  %4,0x1f,%0\n\t"
246             "sll  %0,23,%2\n\t"         /* shift input to TEM bit location */
247             ".volatile\n\t"
248             "st   %%fsr,%1\n\t"
249             "ld   %1,%0\n\t"            /* %0 = fsr */
250             "set  0x0f800000,%%o4\n\t"  /* mask of TEM (Trap Enable Mode bits) *
251             "andn %0,%%o4,%3\n\t"
252             "or   %2,%3,%2\n\t"         /* %2 = new fsr */
253             "st   %2,%1\n\t"
254             "ld   %1,%%fsr\n\t"
255             "srl  %0,23,%0\n\t"
256             "and  %0,0x1f,%0\n\t"
257             ".nonvolatile\n\t"
258             : "=r" (ret), "=m" (fsr), "=r" (tmp1), "=r" (tmp2)
```

```
259             : "r" (i)
260             : "cc");

262         return (ret);
263 }

265 extern __inline__ double
266 sqrt(double d)
267 {
268         return (__inline_sqrt(d));
269 }

271 extern __inline__ float
272 sqrtf(float f)
273 {
274         return (__inline_sqrtf(f));
275 }

277 extern __inline__ double
278 fabs(double d)
279 {
280         double ret;

282         __asm__ __volatile__("fabsd %1,%0\n\t" : "=e" (ret) : "e" (d));
283         return (ret);
284 }

286 extern __inline__ float
287 fabsf(float f)
288 {
289         float ret;

291         __asm__ __volatile__("fabss %1,%0\n\t" : "=f" (ret) : "f" (f));
292         return (ret);
293 }

295 #ifdef __cplusplus
296 }
297 #endif

299 #endif  /* __GNUC */

301 #endif /* _LIBM_INLINES_H */
```

```
**********************************************************
   32674 Sat May 10 12:09:47 2014
new/usr/src/lib/libm/sparc/src/locallibm.il
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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!

! Portions of this file are duplicated as GCC inline assembly in
! libm_inlines.h.  Keep them in sync.

        .inline __r_hypot_,2
        ld      [%o0],%o4
        sethi   0x1fffff,%o5
        or      %o5,1023,%o5
        and     %o4,%o5,%o4
        sethi   0x1fe000,%o3
        cmp     %o4,%o3
        ld      [%o0],%f0       ! load result with first argument
        bne     2f
        nop
        fabss   %f0,%f0
        ld      [%o1],%f1
        .volatile
        fcmps   %f0,%f1         ! generate invalid for Snan
        .nonvolatile
        nop
        fba     5f
        nop
2:
        ld      [%o1],%o4
        sethi   0x1fffff,%o5
        or      %o5,1023,%o5
        and     %o4,%o5,%o4
        sethi   0x1fe000,%o3
        cmp     %o4,%o3
        bne     4f
        nop
        ld      [%o1],%f0       ! second argument inf
        fabss   %f0,%f0
        ld      [%o0],%f1
        .volatile
```



```
        fcmps   %f0,%f1         ! generate invalid for Snan
        .nonvolatile
        nop
        fba     5f
        nop
4:
        ld      [%o1],%f3
        fsmuld  %f0,%f0,%f0
        fsmuld  %f3,%f3,%f2
        faddd   %f2,%f0,%f0
        fsqrtd  %f0,%f0
        fdtos   %f0,%f0
5:
        .end

        .inline __c_abs,1
        ld      [%o0],%o4
        sethi   0x1fffff,%o5
        or      %o5,1023,%o5
        and     %o4,%o5,%o4
        sethi   0x1fe000,%o3
        cmp     %o4,%o3
        ld      [%o0],%f0
        bne     2f
        nop
        fabss   %f0,%f0
        ld      [%o0+4],%f1
        .volatile
        fcmps   %f0,%f1         ! generate invalid for Snan
        .nonvolatile
        nop
        fba     5f
        nop
2:
        ld      [%o0+4],%o4
        sethi   0x1fffff,%o5
        or      %o5,1023,%o5
        and     %o4,%o5,%o4
        sethi   0x1fe000,%o3
        cmp     %o4,%o3
        bne     4f
        nop
        ld      [%o0+4],%f0
        fabss   %f0,%f0
        ld      [%o0],%f1
        .volatile
        fcmps   %f0,%f1         ! generate invalid for Snan
        .nonvolatile
        nop
        fba     5f
        nop
! store to 8-aligned address
4:
        ld      [%o0+4],%f3
        fsmuld  %f0,%f0,%f0
        fsmuld  %f3,%f3,%f2
        faddd   %f2,%f0,%f0
        fsqrtd  %f0,%f0
        fdtos   %f0,%f0
5:
        .end
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! void
! __Fc_mult(c, a, b)
! complex *c, *a, *b;
! {
```

```
128         .inline __Fc_mult,3
129 !    21         c->real = (a->real *  b->real) - (a->imag *  b->imag)
130         ld      [%o1+4],%f0     ! f0 = a->imag
131         ld      [%o2+4],%f1     ! f1 = b->imag
132         ld      [%o1],%f2       ! f2 = a->real
133         fsmuld   %f0,%f1,%f4     ! f4 = (a->imag *  b->imag)
134         ld      [%o2],%f3       ! f3 = b->real
135         fsmuld   %f2,%f1,%f6    ! f6 = a->real * b->imag
136         fsmuld   %f2,%f3,%f8    ! f8 =  a->real * b->real
137         fsmuld   %f0,%f3,%f10   ! f10 = a->imag * b->real
138         fsubd   %f8,%f4,%f0     ! f0 =  ar*br - ai*bi
139         faddd   %f6,%f10,%f2    ! f2 = ai*br + ar*bi
140         fdtos   %f0,%f4
141         fdtos   %f2,%f6
142         st      %f4,[%o0]
143         st      %f6,[%o0+4]
144         .end
145 ! }
146 !- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
147 ! void
148 ! __Fc_div(c, a, b)
149 ! complex *c, *a, *b;
150 ! {
151         .inline __Fc_div,3
152         ld      [%o2+4],%o3
153         sethi   %hi(0x7fffffff),%o4
154         or      %o4,%lo(0x7fffffff),%o4 ! [internal]
155         andcc   %o3,%o4,%g0
156         ld      [%o2],%f6               ! f6 gets reb
157         bne     1f
158         nop
159         ld      [%o1],%f0
160         ld      [%o2],%f1
161         fdivs   %f0,%f1,%f0
162         st      %f0,[%o0]
163         ld      [%o1+4],%f3
164         fdivs   %f3,%f1,%f3
165         st      %f3,[%o0+4]
166         ba      2f
167         nop
168 1:                                      ! [internal]
169         sethi   %hi(0x3ff00000),%o4
170         or      %g0,0,%o5
171         std     %o4,[%sp+0x48]
172         ldd     [%sp+0x48],%f8
173         ld      [%o2+4],%f10            ! f10 gets imb
174         fsmuld  %f6,%f6,%f16            ! f16/17 gets reb**2
175         ld      [%o1+4],%f4             ! f4 gets ima
176         fsmuld  %f10,%f10,%f12          ! f12/13 gets imb**2
177         ld      [%o1],%f19              ! f19 gets rea
178         fsmuld  %f4,%f10,%f0            ! f0/f1 gets ima*imb
179         fsmuld  %f19,%f6,%f2            ! f2/3 gets rea*reb
180         faddd   %f12,%f16,%f12          ! f12/13 gets reb**2+imb**2
181         fdivd   %f8,%f12,%f12           ! f12/13 gets 1/(reb**2+imb**2)
182         faddd   %f2,%f0,%f2             ! f2/3 gets rea*reb+ima*imb
183         fsmuld  %f4,%f6,%f24            ! f24/5 gets ima*reb
184         fmuld   %f2,%f12,%f2            ! f2/3 gets rec
185         fsmuld  %f19,%f10,%f10          ! f10/11 gets rea*imb
186         fsubd   %f24,%f10,%f10          ! f10/11 gets ima*reb-rea*imb
187         fmuld   %f10,%f12,%f12          ! f12 gets imc
188         fdtos   %f2,%f7                 ! f7 gets rec
189         fdtos   %f12,%f15               ! f15 gets imc
190         st      %f7,[%o0]
191         st      %f15,[%o0+4]
192 2:
```



```
193         .end
194 ! }

196         .inline .mul,2
197         .volatile
198         smul    %o0,%o1,%o0
199         rd      %y,%o1
200         sra     %o0,31,%o2
201         cmp     %o1,%o2
202         .nonvolatile
203         .end

205         .inline .umul,2
206         .volatile
207         umul    %o0,%o1,%o0
208         rd      %y,%o1
209         tst     %o1
210         .nonvolatile
211         .end

213         .inline .div,2
214         sra     %o0,31,%o4      ! extend sign
215         .volatile
216         wr      %o4,%g0,%y
217         cmp     %o1,0xffffffff  ! is divisor -1?
218         be,a    1f              ! if yes
219         .volatile
220         subcc   %g0,%o0,%o0     ! simply negate dividend
221         nop                     ! RT620 FABs A.0/A.1
222         sdiv    %o0,%o1,%o0     ! o0 contains quotient a/b
223         .nonvolatile
224 1:
225         .end

227         .inline .udiv,2
228         .volatile
229         wr      %g0,%g0,%y
230         nop
231         nop
232         nop
233         udiv    %o0,%o1,%o0     ! o0 contains quotient a/b
234         .nonvolatile
235         .end

237         .inline .rem,2
238         sra     %o0,31,%o4      ! extend sign
239         .volatile
240         wr      %o4,%g0,%y
241         cmp     %o1,0xffffffff  ! is divisor -1?
242         be,a    1f              ! if yes
243         .volatile
244         or      %g0,%g0,%o0     ! simply return 0
245         nop                     ! RT620 FABs A.0/A.1
246         sdiv    %o0,%o1,%o2     ! o2 contains quotient a/b
247         .nonvolatile
248         smul    %o2,%o1,%o4     ! o4 contains q*b
249         sub     %o0,%o4,%o0     ! o0 gets a-q*b
250 1:
251         .end

253         .inline .urem,2
254         .volatile
255         wr      %g0,%g0,%y
256         nop
257         nop
258         nop
```

```
259         udiv    %o0,%o1,%o2     ! o2 contains quotient a/b
260         .nonvolatile
261         umul    %o2,%o1,%o4     ! o4 contains q*b
262         sub     %o0,%o4,%o0     ! o0 gets a-q*b
263         .end

265         .inline .div_o3,2
266         sra     %o0,31,%o4      ! extend sign
267         .volatile
268         wr      %o4,%g0,%y
269         cmp     %o1,0xffffffff  ! is divisor -1?
270         be,a    1f              ! if yes
271         .volatile
272         subcc   %g0,%o0,%o0     ! simply negate dividend
273         mov     %o0,%o3         ! o3 gets __remainder
274         sdiv    %o0,%o1,%o0     ! o0 contains quotient a/b
275         .nonvolatile
276         smul    %o0,%o1,%o4     ! o4 contains q*b
277         ba      2f
278         sub     %o3,%o4,%o3     ! o3 gets a-q*b
279 1:
280         mov     %g0,%o3         ! __remainder is 0
281 2:
282         .end

284         .inline .udiv_o3,2
285         .volatile
286         wr      %g0,%g0,%y
287         mov     %o0,%o3         ! o3 gets __remainder
288         nop
289         nop
290         udiv    %o0,%o1,%o0     ! o0 contains quotient a/b
291         .nonvolatile
292         umul    %o0,%o1,%o4     ! o4 contains q*b
293         sub     %o3,%o4,%o3     ! o3 gets a-q*b
294         .end

296         .inline __ieee754_sqrt,2
297         std     %o0,[%sp+0x48]          ! store to 8-aligned address
298         ldd     [%sp+0x48],%f0
299         fsqrtd  %f0,%f0
300         .end

302         .inline __inline_sqrtf,1
303         st      %o0,[%sp+0x44]
304         ld      [%sp+0x44],%f0
305         fsqrts  %f0,%f0
306         .end

308         .inline __inline_sqrt,2
309         std     %o0,[%sp+0x48]          ! store to 8-aligned address
310         ldd     [%sp+0x48],%f0
311         fsqrtd  %f0,%f0
312         .end

314         .inline __sqrtf,1
315         st      %o0,[%sp+0x44]
316         ld      [%sp+0x44],%f0
317         fsqrts  %f0,%f0
318         .end

320         .inline __sqrt,2
321         std     %o0,[%sp+0x48]          ! store to 8-aligned address
322         ldd     [%sp+0x48],%f0
323         fsqrtd  %f0,%f0
324         .end
```



```
326         .inline __r_sqrt_,1
327         ld      [%o0],%f0
328         fsqrts  %f0,%f0
329         .end

331         .inline __d_sqrt_,1
332         ld      [%o0],%f0
333         ld      [%o0+4],%f1
334         fsqrtd  %f0,%f0
335         .end

337         .inline __ceil,2
338         std     %o0,[%sp+0x48]
339         sethi   %hi(0x80000000),%o5
340         andn    %o0,%o5,%o2
341         sethi   %hi(0x43300000),%o3
342         st      %g0,[%sp+0x54]
343         subcc   %o2,%o3,%g0
344         bl      1f
345         nop
346         sethi   %hi(0x3ff00000),%o2
347         st      %o2,[%sp+0x50]
348         ldd     [%sp+0x48],%f0
349         ldd     [%sp+0x50],%f2
350         fmuld   %f0,%f2,%f0
351         ba      4f
352         nop
353 1:
354         tst     %o0
355         st      %o3,[%sp+0x50]
356         ldd     [%sp+0x50],%f2
357         bge     2f
358         nop
359         fnegs   %f2,%f2
360 2:
361         ldd     [%sp+0x48],%f4
362         faddd   %f4,%f2,%f0
363         fsubd   %f0,%f2,%f0
364         fcmpd   %f0,%f4
365         sethi   %hi(0x3ff00000),%o2
366         st      %o2,[%sp+0x50]
367         and     %o0,%o5,%o4
368         fbge    3f
369         nop
370         ldd     [%sp+0x50],%f4
371         faddd   %f0,%f4,%f0
372 3:
373         st      %f0,[%sp+0x48]
374         ld      [%sp+0x48],%o3
375         andn    %o3,%o5,%o3
376         or      %o4,%o3,%o3
377         st      %o3,[%sp+0x48]
378         ld      [%sp+0x48],%f0
379 4:
380         .end

382         .inline __floor,2
383         std     %o0,[%sp+0x48]
384         sethi   %hi(0x80000000),%o5
385         andn    %o0,%o5,%o2
386         sethi   %hi(0x43300000),%o3
387         st      %g0,[%sp+0x54]
388         subcc   %o2,%o3,%g0
389         bl      1f
390         nop
```

```
391         sethi   %hi(0x3ff00000),%o2
392         st      %o2,[%sp+0x50]
393         ldd     [%sp+0x48],%f0
394         ldd     [%sp+0x50],%f2
395         fmuld   %f0,%f2,%f0
396         ba      4f
397         nop
398 1:
399         tst     %o0
400         st      %o3,[%sp+0x50]
401         ldd     [%sp+0x50],%f2
402         bge     2f
403         nop
404         fnegs   %f2,%f2
405 2:
406         ldd     [%sp+0x48],%f4
407         faddd   %f4,%f2,%f0
408         fsubd   %f0,%f2,%f0
409         fcmpd   %f0,%f4
410         sethi   %hi(0x3ff00000),%o2
411         st      %o2,[%sp+0x50]
412         ldd     [%sp+0x50],%f4
413         and     %o0,%o5,%o4
414         fble    3f
415         nop
416         fsubd   %f0,%f4,%f0
417 3:
418         st      %f0,[%sp+0x48]
419         ld      [%sp+0x48],%o3
420         andn    %o3,%o5,%o3
421         or      %o4,%o3,%o3
422         st      %o3,[%sp+0x48]
423         ld      [%sp+0x48],%f0
424 4:
425         .end

427         .inline __ilogb,2
428         sethi   %hi(0x7ff00000),%o4
429         andcc   %o4,%o0,%o2
430         bne     1f
431         nop
432         sethi   %hi(0x43500000),%o3
433         std     %o0,[%sp+0x48]
434         st      %o3,[%sp+0x50]
435         st      %g0,[%sp+0x54]
436         ldd     [%sp+0x48],%f0
437         ldd     [%sp+0x50],%f2
438         fmuld   %f0,%f2,%f0
439         sethi   %hi(0x80000001),%o0
440         or      %o0,%lo(0x80000001),%o0
441         st      %f0,[%sp+0x48]
442         ld      [%sp+0x48],%o2
443         andcc   %o2,%o4,%o2
444         srl     %o2,20,%o2
445         be      2f
446         nop
447         sub     %o2,0x435,%o0
448         ba      2f
449         nop
450 1:
451         subcc   %o4,%o2,%g0
452         srl     %o2,20,%o3
453         bne     0f
454         nop
455         sethi   %hi(0x7fffffff),%o0
456         or      %o0,%lo(0x7fffffff),%o0
```



```
457         ba      2f
458         nop
459 0:
460         sub     %o3,0x3ff,%o0
461 2:
462         .end

464         .inline __rint,2
465         std     %o0,[%sp+0x48]
466         sethi   %hi(0x80000000),%o2
467         andn    %o0,%o2,%o2
468         ldd     [%sp+0x48],%f0
469         sethi   %hi(0x43300000),%o3
470         st      %g0,[%sp+0x50]
471         st      %g0,[%sp+0x54]
472         subcc   %o2,%o3,%g0
473         bl      1f
474         nop
475         sethi   %hi(0x3ff00000),%o2
476         st      %o2,[%sp+0x50]
477         ldd     [%sp+0x50],%f2
478         fmuld   %f0,%f2,%f0
479         ba      3f
480         nop
481 1:
482         tst     %o0
483         st      %o3,[%sp+0x48]
484         st      %g0,[%sp+0x4c]
485         ldd     [%sp+0x48],%f2
486         bge     2f
487         nop
488         fnegs   %f2,%f2
489 2:
490         faddd   %f0,%f2,%f0
491         fcmpd   %f0,%f2
492         fbne    0f
493         nop
494         ldd     [%sp+0x50],%f0
495         bge     3f
496         nop
497         fnegs   %f0,%f0
498         ba      3f
499         nop
500 0:
501         fsubd   %f0,%f2,%f0
502 3:
503         .end

505         .inline __rintf,1
506         st      %o0,[%sp+0x48]
507         sethi   %hi(0x80000000),%o2
508         andn    %o0,%o2,%o2
509         ld      [%sp+0x48],%f0
510         sethi   %hi(0x4b000000),%o3
511         st      %g0,[%sp+0x50]
512         subcc   %o2,%o3,%g0
513         bl      1f
514         nop
515         sethi   %hi(0x3f800000),%o2
516         st      %o2,[%sp+0x50]
517         ld      [%sp+0x50],%f2
518         fmuls   %f0,%f2,%f0
519         ba      3f
520         nop
521 1:
522         tst     %o0
```

```
523         st      %o3,[%sp+0x48]
524         ld      [%sp+0x48],%f2
525         bge     2f
526         nop
527         fnegs   %f2,%f2
528 2:
529         fadds   %f0,%f2,%f0
530         fcmps   %f0,%f2
531         fbne    0f
532         nop
533         ld      [%sp+0x50],%f0
534         bge     3f
535         nop
536         fnegs   %f0,%f0
537         ba      3f
538         nop
539 0:
540         fsubs   %f0,%f2,%f0
541 3:
542         .end

544         .inline __min_subnormal,0
545         set     0x0,%o0
546         st      %o0,[%sp+0x44]
547         ld      [%sp+0x44],%f0
548         set     0x1,%o0
549         st      %o0,[%sp+0x44]
550         ld      [%sp+0x44],%f1
551         .end

553         .inline __d_min_subnormal_,0
554         set     0x0,%o0
555         st      %o0,[%sp+0x44]
556         ld      [%sp+0x44],%f0
557         set     0x1,%o0
558         st      %o0,[%sp+0x44]
559         ld      [%sp+0x44],%f1
560         .end

562         .inline __min_subnormalf,0
563         set     0x1,%o0
564         st      %o0,[%sp+0x44]
565         ld      [%sp+0x44],%f0
566         .end

568         .inline __r_min_subnormal_,0
569         set     0x1,%o0
570         st      %o0,[%sp+0x44]
571         ld      [%sp+0x44],%f0
572         .end

574         .inline __max_subnormal,0
575         set     0x000fffff,%o0
576         st      %o0,[%sp+0x44]
577         ld      [%sp+0x44],%f0
578         set     0xffffffff,%o0
579         st      %o0,[%sp+0x44]
580         ld      [%sp+0x44],%f1
581         .end

583         .inline __d_max_subnormal_,0
584         set     0x000fffff,%o0
585         st      %o0,[%sp+0x44]
586         ld      [%sp+0x44],%f0
587         set     0xffffffff,%o0
588         st      %o0,[%sp+0x44]
```



```
589         ld      [%sp+0x44],%f1
590         .end

592         .inline __max_subnormalf,0
593         set     0x007fffff,%o0
594         st      %o0,[%sp+0x44]
595         ld      [%sp+0x44],%f0
596         .end

598         .inline __r_max_subnormal_,0
599         set     0x007fffff,%o0
600         st      %o0,[%sp+0x44]
601         ld      [%sp+0x44],%f0
602         .end

604         .inline __min_normal,0
605         set     0x00100000,%o0
606         set     0x0,%o1
607         std     %o0,[%sp+0x48]
608         ldd     [%sp+0x48],%f0
609         .end

611         .inline __d_min_normal_,0
612         set     0x00100000,%o0
613         st      %o0,[%sp+0x44]
614         ld      [%sp+0x44],%f0
615         set     0x0,%o0
616         st      %o0,[%sp+0x44]
617         ld      [%sp+0x44],%f1
618         .end

620         .inline __min_normalf,0
621         set     0x00800000,%o0
622         st      %o0,[%sp+0x44]
623         ld      [%sp+0x44],%f0
624         .end

626         .inline __r_min_normal_,0
627         set     0x00800000,%o0
628         st      %o0,[%sp+0x44]
629         ld      [%sp+0x44],%f0
630         .end

632         .inline __max_normal,0
633         set     0x7fefffff,%o0
634         set     0xffffffff,%o1
635         std     %o0,[%sp+0x48]
636         ldd     [%sp+0x48],%f0
637         .end

639         .inline __d_max_normal_,0
640         set     0x7fefffff,%o0
641         st      %o0,[%sp+0x44]
642         ld      [%sp+0x44],%f0
643         set     0xffffffff,%o0
644         st      %o0,[%sp+0x44]
645         ld      [%sp+0x44],%f1
646         .end

648         .inline __max_normalf,0
649         set     0x7f7fffff,%o0
650         st      %o0,[%sp+0x44]
651         ld      [%sp+0x44],%f0
652         .end

654         .inline __r_max_normal_,0
```

```
655         set     0x7f7fffff,%o0
656         st      %o0,[%sp+0x44]
657         ld      [%sp+0x44],%f0
658         .end

660         .inline __infinity,0
661         set      0x7ff00000,%o0
662         set      0x0,%o1
663         std      %o0,[%sp+0x48]
664         ldd      [%sp+0x48],%f0
665         .end

667         .inline __infinity,0
668         set      0x7ff00000,%o0
669         set      0x0,%o1
670         std      %o0,[%sp+0x48]
671         ldd      [%sp+0x48],%f0
672         .end

674         .inline __d_infinity_,0
675         set     0x7ff00000,%o0
676         st      %o0,[%sp+0x44]
677         ld      [%sp+0x44],%f0
678         set     0x0,%o0
679         st      %o0,[%sp+0x44]
680         ld      [%sp+0x44],%f1
681         .end

683         .inline __infinityf,0
684         set     0x7f800000,%o0
685         st      %o0,[%sp+0x44]
686         ld      [%sp+0x44],%f0
687         .end

689         .inline __r_infinity_,0
690         set     0x7f800000,%o0
691         st      %o0,[%sp+0x44]
692         ld      [%sp+0x44],%f0
693         .end

695         .inline __signaling_nan,0
696         set     0x7ff00000,%o0
697         set     0x1,%o1
698         std     %o0,[%sp+0x48]
699         ldd     [%sp+0x48],%f0
700         .end

702         .inline __d_signaling_nan_,0
703         set     0x7ff00000,%o0
704         st      %o0,[%sp+0x44]
705         ld      [%sp+0x44],%f0
706         set     0x1,%o0
707         st      %o0,[%sp+0x44]
708         ld      [%sp+0x44],%f1
709         .end

711         .inline __signaling_nanf,0
712         set     0x7f800001,%o0
713         st      %o0,[%sp+0x44]
714         ld      [%sp+0x44],%f0
715         .end

717         .inline __r_signaling_nan_,0
718         set     0x7f800001,%o0
719         st      %o0,[%sp+0x44]
720         ld      [%sp+0x44],%f0
```



```
721         .end

723         .inline __quiet_nan,0
724         set     0x7fffffff,%o0
725         st      %o0,[%sp+0x44]
726         ld      [%sp+0x44],%f0
727         set     0xffffffff,%o0
728         st      %o0,[%sp+0x44]
729         ld      [%sp+0x44],%f1
730         .end

732         .inline __d_quiet_nan_,0
733         set     0x7fffffff,%o0
734         st      %o0,[%sp+0x44]
735         ld      [%sp+0x44],%f0
736         set     0xffffffff,%o0
737         st      %o0,[%sp+0x44]
738         ld      [%sp+0x44],%f1
739         .end

741         .inline __quiet_nanf,0
742         set     0x7fffffff,%o0
743         st      %o0,[%sp+0x44]
744         ld      [%sp+0x44],%f0
745         .end

747         .inline __r_quiet_nan_,0
748         set     0x7fffffff,%o0
749         st      %o0,[%sp+0x44]
750         ld      [%sp+0x44],%f0
751         .end

753         .inline __swapEX,1
754         and     %o0,0x1f,%o1
755         sll     %o1,5,%o1               ! shift input to aexc bit location
756         .volatile
757         st      %fsr,[%sp+0x44]
758         ld      [%sp+0x44],%o0          ! o0 = fsr
759         andn    %o0,0x3e0,%o2
760         or      %o1,%o2,%o1             ! o1 = new fsr
761         st      %o1,[%sp+0x44]
762         ld      [%sp+0x44],%fsr
763         srl     %o0,5,%o0
764         and     %o0,0x1f,%o0
765         .nonvolatile
766         .end

768         .inline _QgetRD,0
769         st      %fsr,[%sp+0x44]
770         ld      [%sp+0x44],%o0          ! o0 = fsr
771         srl     %o0,30,%o0              ! return __round control value
772         .end

774         .inline _QgetRP,0
775         or      %g0,%g0,%o0
776         .end

778         .inline __swapRD,1
779         and     %o0,0x3,%o0
780         sll     %o0,30,%o1              ! shift input to RD bit location
781         .volatile
782         st      %fsr,[%sp+0x44]
783         ld      [%sp+0x44],%o0          ! o0 = fsr
784         set     0xc0000000,%o4          ! mask of rounding direction bits
785         andn    %o0,%o4,%o2
786         or      %o1,%o2,%o1             ! o1 = new fsr
```

```
787         st      %o1,[%sp+0x44]
788         ld      [%sp+0x44],%fsr
789         srl     %o0,30,%o0
790         and     %o0,0x3,%o0
791         .nonvolatile
792         .end
793 !
794 ! On the SPARC, __swapRP is a no-op; always return 0 for backward compatibility
795 !

797         .inline __swapRP,1
798         or      %g0,%g0,%o0
799         .end

801         .inline __swapTE,1
802         and     %o0,0x1f,%o0
803         sll     %o0,23,%o1              ! shift input to TEM bit location
804         .volatile
805         st      %fsr,[%sp+0x44]
806         ld      [%sp+0x44],%o0            ! o0 = fsr
807         set     0x0f800000,%o4          ! mask of TEM (Trap Enable Mode bits)
808         andn    %o0,%o4,%o2
809         or      %o1,%o2,%o1             ! o1 = new fsr
810         st      %o1,[%sp+0x48]
811         ld      [%sp+0x48],%fsr
812         srl     %o0,23,%o0
813         and     %o0,0x1f,%o0
814         .nonvolatile
815         .end

817         .inline __fp_class,2
818         sethi   %hi(0x80000000),%o2     ! o2 gets 80000000
819         andn    %o0,%o2,%o0             ! o0-o1 gets abs(x)
820         orcc    %o0,%o1,%g0             ! set cc as x is zero/nonzero
821         bne     1f                      ! branch if x is nonzero
822         nop
823         mov     0,%o0
824         ba      2f                      ! x is 0
825         nop
826 1:
827         sethi   %hi(0x7ff00000),%o2     ! o2 gets 7ff00000
828         andcc   %o0,%o2,%g0             ! cc set by __exp field of x
829         bne     1f                      ! branch if normal or max __exp
830         nop
831         mov     1,%o0
832         ba      2f                      ! x is subnormal
833         nop
834 1:
835         cmp     %o0,%o2
836         bge     1f                      ! branch if x is max __exp
837         nop
838         mov     2,%o0
839         ba      2f                      ! x is normal
840         nop
841 1:
842         andn    %o0,%o2,%o0             ! o0 gets msw __significand field
843         orcc    %o0,%o1,%g0             ! set cc by OR __significand
844         bne     1f                      ! Branch if __nan
845         nop
846         mov     3,%o0
847         ba      2f                      ! x is __infinity
848         nop
849 1:
850         sethi   %hi(0x00080000),%o2
851         andcc   %o0,%o2,%g0             ! set cc by quiet/sig bit
852         be      1f                      ! Branch if signaling
```



```
853         nop
854         mov     4,%o0                   ! x is quiet NaN
855         ba      2f
856         nop
857 1:
858         mov     5,%o0                   ! x is signaling NaN
859 2:
860         .end

862         .inline __fp_classf,1
863         sethi   %hi(0x80000000),%o2
864         andncc  %o0,%o2,%o0
865         bne     1f
866         nop
867         mov     0,%o0
868         ba      2f                      ! x is 0
869         nop
870 1:
871         sethi   %hi(0x7f800000),%o2
872         andcc   %o0,%o2,%g0
873         bne     1f
874         nop
875         mov     1,%o0
876         ba      2f                      ! x is subnormal
877         nop
878 1:
879         cmp     %o0,%o2
880         bge     1f
881         nop
882         mov     2,%o0
883         ba      2f                      ! x is normal
884         nop
885 1:
886         bg      1f
887         nop
888         mov     3,%o0
889         ba      2f                      ! x is __infinity
890         nop
891 1:
892         sethi   %hi(0x00400000),%o2
893         andcc   %o0,%o2,%g0
894         mov     4,%o0                   ! x is quiet NaN
895         bne     2f
896         nop
897         mov     5,%o0                   ! x is signaling NaN
898 2:
899         .end

901         .inline __ir_fp_class_,1
902         ld      [%o0],%o0
903         sethi   %hi(0x80000000),%o2
904         andncc  %o0,%o2,%o0
905         bne     1f
906         nop
907         mov     0,%o0
908         ba      2f                      ! x is 0
909         nop
910 1:
911         sethi   %hi(0x7f800000),%o2
912         andcc   %o0,%o2,%g0
913         bne     1f
914         nop
915         mov     1,%o0
916         ba      2f                      ! x is subnormal
917         nop
918 1:
```

```
        cmp     %o0,%o2
        bge     1f
        nop
        mov     2,%o0
        ba      2f                      ! x is normal
        nop
1:
        bg      1f
        nop
        mov     3,%o0
        ba      2f                      ! x is __infinity
        nop
1:
        sethi   %hi(0x00400000),%o2
        andcc   %o0,%o2,%g0
        mov     4,%o0                   ! x is quiet NaN
        bne     2f
        nop
        mov     5,%o0                   ! x is signaling NaN
2:
        .end

        .inline __copysign,4
        set     0x80000000,%o3
        and     %o2,%o3,%o2
        andn    %o0,%o3,%o0
        or      %o0,%o2,%o0
        std      %o0,[%sp+0x48]
        ldd     [%sp+0x48],%f0
        .end

        .inline __copysignf,2
        set     0x80000000,%o2
        andn    %o0,%o2,%o0
        and     %o1,%o2,%o1
        or      %o0,%o1,%o0
        st      %o0,[%sp+0x44]
        ld      [%sp+0x44],%f0
        .end

        .inline __r_copysign_,2
        ld      [%o0],%o0
        ld      [%o1],%o1
        set     0x80000000,%o2
        andn    %o0,%o2,%o0
        and     %o1,%o2,%o1
        or      %o0,%o1,%o0
        st      %o0,[%sp+0x44]
        ld      [%sp+0x44],%f0
        .end

        .inline _finite,2
        set     0x7ff00000,%o1
        and     %o0,%o1,%o0
        cmp     %o0,%o1
        mov     1,%o0
        bne     1f
        nop
        mov     0,%o0
1:
        .end

        .inline __finitef,2
        set     0x7f800000,%o1
        and     %o0,%o1,%o0
        cmp     %o0,%o1
```



```
        mov     1,%o0
        bne     1f
        nop
        mov     0,%o0
1:
        .end

        .inline __ir_finite_,1
        ld      [%o0],%o0
        set     0x7f800000,%o1
        and     %o0,%o1,%o0
        cmp     %o0,%o1
        mov     1,%o0
        bne     1f
        nop
        mov     0,%o0
1:
        .end

        .inline __signbit,1
        srl     %o0,31,%o0
        .end

        .inline __signbitf,1
        srl     %o0,31,%o0
        .end

        .inline __ir_signbit_,1
        ld      [%o0],%o0
        srl     %o0,31,%o0
        .end

        .inline __isinf,2
        tst     %o1
        sethi   %hi(0x80000000),%o2
        bne     1f
        nop
        andn    %o0,%o2,%o0
        sethi   %hi(0x7ff00000),%o2
        cmp     %o0,%o2
        mov     1,%o0
        be      2f
        nop
1:
        mov     0,%o0
2:
        .end

        .inline __isinff,1
        sethi   %hi(0x80000000),%o2
        andn    %o0,%o2,%o0             ! o0 gets abs(x)
        sethi   %hi(0x7f800000),%o2
        cmp     %o0,%o2
        mov     0,%o0
        bne     1f                      ! Branch if not inf.
        nop
        mov     1,%o0
1:
        .end

        .inline __ir_isinf_,1
        ld      [%o0],%o0
        sethi   %hi(0x80000000),%o2
        andn    %o0,%o2,%o0             ! o0 gets abs(x)
        sethi   %hi(0x7f800000),%o2
        cmp     %o0,%o2
```

```
1051         mov     0,%o0
1052         bne     1f                      ! Branch if not inf.
1053         nop
1054         mov     1,%o0
1055 1:
1056         .end

1058         .inline __isnan,2
1059         sethi   %hi(0x80000000),%o2
1060         andn    %o0,%o2,%o0
1061         sub     %g0,%o1,%o3
1062         or      %o1,%o3,%o1
1063         srl     %o1,31,%o1
1064         or      %o0,%o1,%o0
1065         sethi   %hi(0x7ff00000),%o4
1066         sub     %o4,%o0,%o0
1067         srl     %o0,31,%o0
1068         .end

1070         .inline __isnanf,1
1071         sethi   %hi(0x80000000),%o2
1072         andn    %o0,%o2,%o0
1073         sethi   %hi(0x7f800000),%o1
1074         sub     %o1,%o0,%o0
1075         srl     %o0,31,%o0
1076         .end

1078         .inline __ir_isnan_,1
1079         ld      [%o0],%o0
1080         sethi   %hi(0x80000000),%o2
1081         andn    %o0,%o2,%o0
1082         sethi   %hi(0x7f800000),%o1
1083         sub     %o1,%o0,%o0
1084         srl     %o0,31,%o0
1085         .end

1087         .inline __isnormal,2
1088         sethi   %hi(0x80000000),%o2
1089         andn    %o0,%o2,%o0
1090         sethi   %hi(0x7ff00000),%o2
1091         cmp     %o0,%o2
1092         sethi   %hi(0x00100000),%o2
1093         bge     1f
1094         nop
1095         cmp     %o0,%o2
1096         mov     1,%o0
1097         bge     2f
1098         nop
1099 1:
1100         mov     0,%o0
1101 2:
1102         .end

1104         .inline __isnormalf,1
1105         sethi   %hi(0x80000000),%o2
1106         andn    %o0,%o2,%o0
1107         sethi   %hi(0x7f800000),%o2
1108         cmp     %o0,%o2
1109         sethi   %hi(0x00800000),%o2
1110         bge     1f
1111         nop
1112         cmp     %o0,%o2
1113         mov     1,%o0
1114         bge     2f
1115         nop
1116 1:
```



```
1117         mov     0,%o0
1118 2:
1119         .end

1121         .inline __ir_isnormal_,1
1122         ld      [%o0],%o0
1123         sethi   %hi(0x80000000),%o2
1124         andn    %o0,%o2,%o0
1125         sethi   %hi(0x7f800000),%o2
1126         cmp     %o0,%o2
1127         sethi   %hi(0x00800000),%o2
1128         bge     1f
1129         nop
1130         cmp     %o0,%o2
1131         mov     1,%o0
1132         bge     2f
1133         nop
1134 1:
1135         mov     0,%o0
1136 2:
1137         .end

1139         .inline __issubnormal,2
1140         sethi   %hi(0x80000000),%o2     ! o2 gets 80000000
1141         andn    %o0,%o2,%o0             ! o0/o1 gets abs(x)
1142         sethi   %hi(0x00100000),%o2     ! o2 gets 00100000
1143         cmp     %o0,%o2
1144         bge     1f                      ! branch if x norm or max __exp
1145         nop
1146         orcc    %o0,%o1,%g0
1147         be      1f                      ! Branch if x zero
1148         nop
1149         mov     1,%o0                   ! x is subnormal
1150         ba      2f
1151         nop
1152 1:
1153         mov     0,%o0
1154 2:
1155         .end

1157         .inline __issubnormalf,1
1158         sethi   %hi(0x80000000),%o2     ! o2 gets 80000000
1159         andn    %o0,%o2,%o0             ! o0 gets abs(x)
1160         sethi   %hi(0x00800000),%o2     ! o2 gets 00800000
1161         cmp     %o0,%o2
1162         bge     1f                      ! branch if x norm or max __exp
1163         nop
1164         orcc    %o0,%g0,%g0
1165         be      1f                      ! Branch if x zero
1166         nop
1167         mov     1,%o0                   ! x is subnormal
1168         ba      2f
1169         nop
1170 1:
1171         mov     0,%o0
1172 2:
1173         .end

1175         .inline __ir_issubnormal_,1
1176         ld      [%o0],%o0
1177         sethi   %hi(0x80000000),%o2     ! o2 gets 80000000
1178         andn    %o0,%o2,%o0             ! o0 gets abs(x)
1179         sethi   %hi(0x00800000),%o2     ! o2 gets 00800000
1180         cmp     %o0,%o2
1181         bge     1f                      ! branch if x norm or max __exp
1182         nop
```

```
1183         orcc    %o0,%g0,%g0
1184         be      1f                      ! Branch if x zero
1185         nop
1186         mov     1,%o0                   ! x is subnormal
1187         ba      2f
1188         nop
1189 1:
1190         mov     0,%o0
1191 2:
1192         .end

1194         .inline __iszero,2
1195         sethi   %hi(0x80000000),%o2
1196         andn    %o0,%o2,%o0
1197         orcc    %o0,%o1,%g0
1198         mov     1,%o0
1199         be      1f
1200         nop
1201         mov     0,%o0
1202 1:
1203         .end

1205         .inline __iszerof,1
1206         sethi   %hi(0x80000000),%o2
1207         andncc  %o0,%o2,%o0
1208         mov     1,%o0
1209         be      1f
1210         nop
1211         mov     0,%o0
1212 1:
1213         .end

1215         .inline __ir_iszero_,1
1216         ld      [%o0],%o0
1217         sethi   %hi(0x80000000),%o2
1218         andncc  %o0,%o2,%o0
1219         mov     1,%o0
1220         be      1f
1221         nop
1222         mov     0,%o0
1223 1:
1224         .end

1226         .inline abs,1
1227         sra     %o0,31,%o1
1228         xor     %o0,%o1,%o0
1229         sub     %o0,%o1,%o0
1230         .end

1232         .inline __fabs,2
1233         st      %o0,[%sp+0x48]
1234         st      %o1,[%sp+0x4c]
1235         ldd     [%sp+0x48],%f0
1236         fabsd   %f0,%f0
1237         .end

1239         .inline __fabsf,1
1240         st      %o0,[%sp+0x44]
1241         ld      [%sp+0x44],%f0
1242         fabss   %f0,%f0
1243         .end

1245         .inline __r_fabs_,1
1246         ld      [%o0],%f0
1247         fabss   %f0,%f0
1248         .end
```



```
1249 !
1250 !       __nintf - f77 NINT(REAL*4)
1251 !

1253         .inline __nintf,1
1254         srl     %o0,30-7,%g1
1255         sethi   %hi(0x7fffff),%o2
1256         st      %o0,[%sp+0x44]
1257         and     %g1,0xff,%g1
1258         or      %o2,%lo(0x7fffff),%o2
1259         sethi   %hi(1<<22),%o4
1260         subcc   %g1,127+31,%g0
1261         and     %o0,%o2,%o3
1262         bl      0f
1263         nop
1264         sethi   %hi(0xcf000000),%o2
1265         sethi   %hi(0x80000000),%g1
1266         subcc   %o0,%o2,%g0
1267         or      %g1,%g0,%o0
1268         be      9f
1269         nop
1270         ld      [%sp+0x44],%f0
1271         fstoi   %f0,%f0
1272         st      %f0,[%sp+0x44]
1273         ld      [%sp+0x44],%o0
1274         ba      9f
1275         nop
1276 0:
1277         add     %o4,%o4,%o5
1278         or      %o3,%o5,%o3
1279         sra     %o0,31-0,%o2
1280         subcc   %g1,127,%g1
1281         srl     %o4,%g1,%o4
1282         bge     1f
1283         nop
1284         subcc   %g1,-1,%g0
1285         or      %g0,0,%o0
1286         bne     2f
1287         nop
1288         or      %g0,1,%o0
1289         ba      2f
1290         nop
1291 1:
1292         add     %o3,%o4,%o3
1293         or      %g0,23,%o0
1294         subcc   %o0,%g1,%o0
1295         bl      1f
1296         nop
1297         srl     %o3,%o0,%o0
1298         ba      2f
1299         nop
1300 1:
1301         sub     %g0,%o0,%o0
1302         sll     %o3,%o0,%o0
1303 2:
1304         xor     %o0,%o2,%o0
1305         and     %o2,1,%o2
1306         add     %o0,%o2,%o0
1307 9:
1308         .end

1310         .inline __il_nint,1
1311         ld      [%o0],%o0
1312         sra     %o0,0,%o0
1313         srlx    %o0,31-8,%g1
1314         or      %g0,1,%o2
```

```
1315         sllx    %o2,23-1,%o4
1316         and     %g1,0xff,%g1
1317         sllx    %o2,63-0,%o2
1318         subcc   %g1,127+63,%g0
1319         bl      0f
1320         nop
1321         st      %o0,[%sp+0x48]
1322         ld      [%sp+0x48],%f0
1323         fstox   %f0,%f0
1324         std     %f0,[%sp+0x48]
1325         ldx     [%sp+0x48],%o1
1326         ba      9f
1327         nop
1328 0:
1329         add     %o4,%o4,%o5
1330         srax    %o2,63-23,%o2
1331         sub     %g1,127+23,%o1
1332         xnor    %o2,%g0,%o2
1333         and     %o0,%o2,%o3
1334         or      %o3,%o5,%o3
1335         srax    %o0,63-0,%o2
1336         subcc   %g1,127,%g1
1337         bge     1f
1338         nop
1339         subcc   %g1,-1,%g0
1340         or      %g0,0,%o0
1341         bne     2f
1342         nop
1343         or      %g0,1,%o0
1344         ba      2f
1345         nop
1346 1:
1347         brlz,pt %o1,3f
1348         nop
1349         sub     %g1,23,%o0
1350         sllx    %o3,%o0,%o0
1351         ba      2f
1352         nop
1353 3:
1354         srlx    %o4,%g1,%o4
1355         add     %o3,%o4,%o3
1356         or      %g0,23,%o0
1357         sub     %o0,%g1,%o0
1358         srlx    %o3,%o0,%o0
1359 2:
1360         xor     %o0,%o2,%o0
1361         sub     %o0,%o2,%o1
1362 9:
1363         srlx    %o1,32,%o0
1364         .end
1365 !
1366 !       __i_dnnt - f77 NINT(REAL*8)
1367 !

1369         .inline __i_dnnt,1
1370         ld      [%o0],%o1
1371         sllx    %o1,32,%o1
1372         ld      [%o0+4],%o0
1373         or      %o0,%o1,%o0
1374         srlx    %o0,63-11,%g1
1375         or      %g0,1,%o2
1376         stx     %o0,[%sp+0x48]
1377         sllx    %o2,52-1,%o4
1378         and     %g1,0x7ff,%g1
1379         sllx    %o2,63-0,%o2
1380         subcc   %g1,1023+32,%g0
```



```
1381         bl      0f
1382         nop
1383         ldd     [%sp+0x48],%f0
1384         ba      8f
1385         nop
1386 0:
1387         add     %o4,%o4,%o5
1388         srax    %o2,63-52,%o2
1389         sub     %g1,1023+30,%o1
1390         xnor    %o2,%g0,%o2
1391         and     %o0,%o2,%o3
1392         or      %o3,%o5,%o3
1393         srax    %o0,63-0,%o2
1394         subcc   %g1,1023,%g1
1395         bge     1f
1396         nop
1397         subcc   %g1,-1,%g0
1398         or      %g0,0,%o0
1399         bne     2f
1400         nop
1401         or      %g0,1,%o0
1402         ba      2f
1403         nop
1404 1:
1405         srlx    %o4,%g1,%o4
1406         add     %o3,%o4,%o3
1407         or      %g0,52,%o0
1408         sub     %o0,%g1,%o0
1409         srlx    %o3,%o0,%o0
1410 2:
1411         xor     %o0,%o2,%o0
1412         sub     %o0,%o2,%o0
1413         brlz,pt %o1,9f
1414         nop
1415         stx     %o0,[%sp+0x48]
1416         ldd     [%sp+0x48],%f0
1417         fxtod   %f0,%f0
1418 8:
1419         fdtoi   %f0,%f0
1420         st      %f0,[%sp+0x44]
1421         ld      [%sp+0x44],%o0
1422 9:
1423         .end

1425         .inline __il_dnnt,1
1426         ld      [%o0],%o1
1427         sllx    %o1,32,%o1
1428         ld      [%o0+4],%o0
1429         or      %o0,%o1,%o0
1430         srlx    %o0,63-11,%g1
1431         or      %g0,1,%o2
1432         sllx    %o2,52-1,%o4
1433         and     %g1,0x7ff,%g1
1434         sllx    %o2,63-0,%o2
1435         subcc   %g1,1023+63,%g0
1436         bl      0f
1437         nop
1438         stx     %o0,[%sp+0x48]
1439         ldd     [%sp+0x48],%f0
1440         fdtox   %f0,%f0
1441         std     %f0,[%sp+0x48]
1442         ldx     [%sp+0x48],%o1
1443         ba      9f
1444         nop
1445 0:
1446         add     %o4,%o4,%o5
```

```
1447         srax    %o2,63-52,%o2
1448         sub     %g1,1023+52,%o1
1449         xnor    %o2,%g0,%o2
1450         and     %o0,%o2,%o3
1451         or      %o3,%o5,%o3
1452         srax    %o0,63-0,%o2
1453         subcc   %g1,1023,%g1
1454         bge     1f
1455         nop
1456         subcc   %g1,-1,%g0
1457         or      %g0,0,%o0
1458         bne     2f
1459         nop
1460         or      %g0,1,%o0
1461         ba      2f
1462         nop
1463 1:
1464         brlz,pt %o1,3f
1465         nop
1466         sub     %g1,52,%o0
1467         sllx    %o3,%o0,%o0
1468         ba      2f
1469         nop
1470 3:
1471         srlx    %o4,%g1,%o4
1472         add     %o3,%o4,%o3
1473         or      %g0,52,%o0
1474         sub     %o0,%g1,%o0
1475         srlx    %o3,%o0,%o0
1476 2:
1477         xor     %o0,%o2,%o0
1478         sub     %o0,%o2,%o1
1479 9:
1480         srlx    %o1,32,%o0
1481         .end

1483         .inline __anintf,1
1484         or      %g0,1,%o1
1485         srl     %o0,23,%g1
1486         and     %g1,0xff,%g1
1487         sub     %g0,%g1,%g1
1488         add     %g1,0x95,%g1
1489         subcc   %g1,23,%g0
1490         sll     %o1,%g1,%o1
1491         sub     %o1,1,%o2
1492         bcs     1f
1493         nop
1494         be      2f
1495         nop
1496         bl      3f
1497         nop
1498         sethi   %hi(0x80000000),%o1
1499         and     %o0,%o1,%o0
1500         ba      3f
1501         nop
1502 1:
1503         and     %o0,%o1,%o1
1504 2:
1505         add     %o0,%o1,%o0
1506         andn    %o0,%o2,%o0
1507 3:
1508         st      %o0,[%sp+0x48]
1509         ld      [%sp+0x48],%f0
1510         .end

1512         .inline __anint,2
```



```
1513         sllx    %o0,32,%o0
1514         or      %o0,%o1,%o0
1515         or      %g0,1,%o1
1516         srlx    %o0,52,%g1
1517         and     %g1,0x7ff,%g1
1518         sub     %g0,%g1,%g1
1519         add     %g1,0x432,%g1
1520         subcc   %g1,52,%g0
1521         sllx    %o1,%g1,%o1
1522         sub     %o1,1,%o2
1523         bcs,pt  %icc,1f
1524         nop
1525         be,pt   %icc,2f
1526         nop
1527         bl,pt   %icc,3f
1528         nop
1529         srlx    %o0,63,%o0
1530         sllx    %o0,63,%o0
1531         ba      3f
1532         nop
1533 1:
1534         and     %o0,%o1,%o1
1535 2:
1536         add     %o0,%o1,%o0
1537         andn    %o0,%o2,%o0
1538 3:
1539         stx     %o0,[%sp+0x48]
1540         ldd     [%sp+0x48],%f0
1541         .end

1543         .inline __Fz_minus,3
1544         ld      [%o1],%f0
1545         ld      [%o1+0x4],%f1
1546         ld      [%o2],%f4
1547         ld      [%o2+0x4],%f5
1548         fsubd   %f0,%f4,%f0
1549         ld      [%o1+8],%f2
1550         ld      [%o1+0xc],%f3
1551         ld      [%o2+8],%f6
1552         ld      [%o2+0xc],%f7
1553         fsubd   %f2,%f6,%f2
1554         st      %f0,[%o0+0x0]
1555         st      %f1,[%o0+0x4]
1556         st      %f2,[%o0+0x8]
1557         st      %f3,[%o0+0xc]
1558         .end

1560         .inline __Fz_add,3
1561         ld      [%o1],%f0
1562         ld      [%o1+0x4],%f1
1563         ld      [%o2],%f4
1564         ld      [%o2+0x4],%f5
1565         faddd   %f0,%f4,%f0
1566         ld      [%o1+8],%f2
1567         ld      [%o1+0xc],%f3
1568         ld      [%o2+8],%f6
1569         ld      [%o2+0xc],%f7
1570         faddd   %f2,%f6,%f2
1571         st      %f0,[%o0+0x0]
1572         st      %f1,[%o0+0x4]
1573         st      %f2,[%o0+0x8]
1574         st      %f3,[%o0+0xc]
1575         .end

1577         .inline __Fz_neg,2
1578         ld      [%o1],%f0
```

```
1579         fnegs   %f0,%f0
1580         ld      [%o1+0x4],%f1
1581         st      %f1,[%o0+0x4]
1582         ld      [%o1+8],%f2
1583         fnegs   %f2,%f2
1584         ld      [%o1+0xc],%f3
1585         st      %f3,[%o0+0xc]
1586         st      %f0,[%o0]
1587         st      %f2,[%o0+0x8]
1588         .end

1590         .inline __Ff_conv_z,2
1591         st      %o1,[%sp+0x44]
1592         ld      [%sp+0x44],%f0
1593         fstod   %f0,%f0
1594         st      %g0,[%o0+0x8]
1595         st      %g0,[%o0+0xc]
1596         st      %f1,[%o0+0x4]
1597         st      %f0,[%o0]
1598         .end

1600         .inline __Fz_conv_f,1
1601         ld      [%o0],%f0
1602         ld      [%o0+4],%f1
1603         fdtos   %f0,%f0
1604         .end

1606         .inline __Fz_conv_i,1
1607         ld      [%o0],%f0
1608         ld      [%o0+4],%f1
1609         fdtoi   %f0,%f0
1610         st      %f0,[%sp+0x44]
1611         ld      [%sp+0x44],%o0
1612         .end

1614         .inline __Fi_conv_z,2
1615         st      %o1,[%sp+0x44]
1616         ld      [%sp+0x44],%f0
1617         fitod   %f0,%f0
1618         st      %g0,[%o0+0x8]
1619         st      %g0,[%o0+0xc]
1620         st      %f1,[%o0+0x4]
1621         st      %f0,[%o0]
1622         .end

1624         .inline __Fz_conv_d,1
1625         ld      [%o0],%f0
1626         ld      [%o0+4],%f1
1627         .end

1629         .inline __Fd_conv_z,3
1630         st      %o1,[%o0]
1631         st      %o2,[%o0+0x4]
1632         st      %g0,[%o0+0x8]
1633         st      %g0,[%o0+0xc]
1634         .end

1636         .inline __Fz_conv_c,2
1637         ldd     [%o1],%f0
1638         fdtos   %f0,%f0
1639         st      %f0,[%o0]
1640         ldd     [%o1+0x8],%f2
1641         fdtos   %f2,%f1
1642         st      %f1,[%o0+0x4]
1643         .end
```



```
1645         .inline __Fz_eq,2
1646         ld      [%o0],%f0
1647         ld      [%o0+4],%f1
1648         ld      [%o1],%f2
1649         ld      [%o1+4],%f3
1650         fcmpd   %f0,%f2
1651         mov     %o0,%o2
1652         mov     0,%o0
1653         fbne    1f
1654         nop
1655         ld      [%o2+8],%f0
1656         ld      [%o2+12],%f1
1657         ld      [%o1+8],%f2
1658         ld      [%o1+12],%f3
1659         fcmpd   %f0,%f2
1660         nop
1661         fbne    1f
1662         nop
1663         mov     1,%o0
1664 1:
1665         .end

1667         .inline __Fz_ne,2
1668         ld      [%o0],%f0
1669         ld      [%o0+4],%f1
1670         ld      [%o1],%f2
1671         ld      [%o1+4],%f3
1672         fcmpd   %f0,%f2
1673         mov     %o0,%o2
1674         mov     1,%o0
1675         fbne    1f
1676         nop
1677         ld      [%o2+8],%f0
1678         ld      [%o2+12],%f1
1679         ld      [%o1+8],%f2
1680         ld      [%o1+12],%f3
1681         fcmpd   %f0,%f2
1682         nop
1683         fbne    1f
1684         nop
1685         mov     0,%o0
1686 1:
1687         .end

1689         .inline __c_cmplx,3
1690         ld      [%o1],%o1
1691         st      %o1,[%o0]
1692         ld      [%o2],%o2
1693         st      %o2,[%o0+4]
1694         .end

1696         .inline __d_cmplx,3
1697         ld      [%o1],%f0
1698         st      %f0,[%o0]
1699         ld      [%o1+4],%f1
1700         st      %f1,[%o0+4]
1701         ld      [%o2],%f0
1702         st      %f0,[%o0+0x8]
1703         ld      [%o2+4],%f1
1704         st      %f1,[%o0+0xc]
1705         .end

1707         .inline __r_cnjg,2
1708         ld      [%o1+0x4],%f1
1709         fnegs   %f1,%f1
1710         ld      [%o1],%f0
```

```
1711         st      %f0,[%o0]
1712         st      %f1,[%o0+4]
1713         .end

1715         .inline __d_cnjg,2
1716         ld      [%o1+0x8],%f0
1717         fnegs   %f0,%f0
1718         ld      [%o1+0xc],%f1
1719         st      %f1,[%o0+0xc]
1720         ld      [%o1+0x0],%f1
1721         st      %f1,[%o0+0x0]
1722         ld      [%o1+0x4],%f1
1723         st      %f1,[%o0+0x4]
1724         st      %f0,[%o0+0x8]
1725         .end

1727         .inline __r_dim,2
1728         st      %g0,[%sp+0x48]
1729         ld      [%sp+0x48],%f4
1730         ld      [%o0],%f0
1731         ld      [%o1],%f2
1732         fcmps   %fcc0,%f0,%f2
1733         fmovsule %fcc0,%f4,%f2
1734         fsubs   %f0,%f2,%f0
1735         fmovsule %fcc0,%f4,%f0
1736         .end

1738         .inline __d_dim,2
1739         stx     %g0,[%sp+0x48]
1740         ldd     [%sp+0x48],%f4
1741         ld      [%o0],%f0
1742         ld      [%o0+4],%f1
1743         ld      [%o1],%f2
1744         ld      [%o1+4],%f3
1745         fcmpd   %fcc0,%f0,%f2
1746         fmovdule %fcc0,%f4,%f2
1747         fsubd   %f0,%f2,%f0
1748         fmovdule %fcc0,%f4,%f0
1749         .end

1751         .inline __r_imag,1
1752         ld      [%o0+4],%f0
1753         .end

1755         .inline __d_imag,1
1756         ld      [%o0+8],%f0
1757         ld      [%o0+0xc],%f1
1758         .end

1760         .inline __f95_signf,2
1761         ld      [%o0],%f0
1762         ld      [%o1],%o1
1763         fabss   %f0,%f0
1764         fnegs   %f0,%f1
1765         sra     %o1,0,%o1
1766         fmovrslz %o1,%f1,%f0
1767         .end

1769         .inline __f95_sign,2
1770         ld      [%o0],%f0
1771         ld      [%o0+4],%f1
1772         ld      [%o1],%o1
1773         fabsd   %f0,%f0
1774         fnegd   %f0,%f2
1775         sra     %o1,0,%o1
1776         fmovrdlz %o1,%f2,%f0
```



```
1777         .end

1779         .inline __r_sign,2
1780         ld      [%o0],%f0
1781         ld      [%o1],%o1
1782         fabss   %f0,%f0
1783         fnegs   %f0,%f1
1784         sub     %o1,1,%o0
1785         and     %o1,%o0,%o1
1786         sra     %o1,0,%o1
1787         fmovrslz %o1,%f1,%f0
1788         .end

1790         .inline __d_sign,2
1791         ld      [%o0],%f0
1792         ld      [%o0+4],%f1
1793         ld      [%o1],%o0
1794         sllx    %o0,32,%o0
1795         ld      [%o1+4],%o1
1796         or      %o1,%o0,%o1
1797         fabsd   %f0,%f0
1798         fnegd   %f0,%f2
1799         sub     %o1,1,%o0
1800         and     %o1,%o0,%o1
1801         fmovrdlz %o1,%f2,%f0
1802         .end

1804         .inline __Fz_mult,3
1805         ld      [%o1],%f0
1806         ld      [%o1+0x4],%f1
1807         ld      [%o2],%f4
1808         ld      [%o2+0x4],%f5
1809         fmuld   %f0,%f4,%f8     ! f8 = r1*r2
1810         ld      [%o1+0x8],%f2
1811         ld      [%o1+0xc],%f3
1812         ld      [%o2+0x8],%f6
1813         ld      [%o2+0xc],%f7
1814         fmuld   %f2,%f6,%f10    ! f10= i1*i2
1815         fsubd   %f8,%f10,%f12   ! f12= r1*r2-i1*i2
1816         st      %f12,[%o0]
1817         st      %f13,[%o0+4]
1818         fmuld   %f0,%f6,%f14    ! f14= r1*i2
1819         fmuld   %f2,%f4,%f16    ! f16= r2*i1
1820         faddd   %f14,%f16,%f2   ! f2 = r1*i2+r2*i1
1821         st      %f2,[%o0+8]
1822         st      %f3,[%o0+12]
1823         .end
1824 !- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
1825 ! void
1826 ! __Fc_minus(c, a, b)
1827 ! complex *c, *a, *b;
1828 ! {

1830         .inline __Fc_minus,3
1831 !    30         c->real = a->real - b->real
1832         ld      [%o1],%f0
1833         ld      [%o2],%f1
1834         fsubs   %f0,%f1,%f2
1835 !    31         c->imag = a->imag - b->imag
1836         ld      [%o1+4],%f3
1837         ld      [%o2+4],%f4
1838         fsubs   %f3,%f4,%f5
1839         st      %f2,[%o0]
1840         st      %f5,[%o0+4]
1841         .end
1842  }
```

```
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! void
! __Fc_add(c, a, b)
! complex *c, *a, *b;
! {

        .inline __Fc_add,3
!    39         c->real = a->real + b->real
        ld      [%o1],%f0
        ld      [%o2],%f1
        fadds   %f0,%f1,%f2
!    40         c->imag = a->imag + b->imag
        ld      [%o1+4],%f3
        ld      [%o2+4],%f4
        fadds   %f3,%f4,%f5
        st      %f2,[%o0]
        st      %f5,[%o0+4]
        .end
! }
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! void
! __Fc_neg(c, a)
! complex *c, *a;
! {

        .inline __Fc_neg,2
!    48         c->real = - a->real
        ld      [%o1],%f0
        fnegs   %f0,%f1
!    49         c->imag = - a->imag
        ld      [%o1+4],%f2
        fnegs   %f2,%f3
        st      %f1,[%o0]
        st      %f3,[%o0+4]
        .end
! }
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! void
! __Ff_conv_c(c, x)
! complex *c;
! FLOATPARAMETER x;
! {

        .inline __Ff_conv_c,2
!    59         c->real = x
        st      %o1,[%o0]
!    60         c->imag = 0.0
        st      %g0,[%o0+4]
        .end
! }
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! FLOATFUNCTIONTYPE
! __Fc_conv_f(c)
! complex *c;
! {

        .inline __Fc_conv_f,1
!    69         RETURNFLOAT(c->real)
        ld      [%o0],%f0
        .end
! }
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! int
! __Fc_conv_i(c)
! complex *c;
! {
```



```
        .inline __Fc_conv_i,1
!    78         return (int)c->real
        ld      [%o0],%f0
        fstoi   %f0,%f1
        st      %f1,[%sp+68]
        ld      [%sp+68],%o0
        .end
! }
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! void
! __Fi_conv_c(c, i)
! complex *c;
! int i;
! {

        .inline __Fi_conv_c,2
!    88         c->real = (float)i
        st      %o1,[%sp+68]
        ld      [%sp+68],%f0
        fitos   %f0,%f1
        st      %f1,[%o0]
!    89         c->imag = 0.0
        st      %g0,[%o0+4]
        .end
! }
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! double
! __Fc_conv_d(c)
! complex *c;
! {

        .inline __Fc_conv_d,1
!    98         return (double)c->real
        ld      [%o0],%f2
        fstod   %f2,%f0
        .end
! }
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! void
! __Fd_conv_c(c, x)
! complex *c;
! double x;
! {

        .inline __Fd_conv_c,2
        st      %o1,[%sp+72]
        st      %o2,[%sp+76]
!   109         c->real = (float)(x)
        ldd     [%sp+72],%f0
        fdtos   %f0,%f1
        st      %f1,[%o0]
!   110         c->imag = 0.0
        st      %g0,[%o0+4]
        .end
! }
!- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
! void
! __Fc_conv_z(result, c)
! dcomplex *result;
! complex *c;
! {

        .inline __Fc_conv_z,2
!   120         result->dreal = (double)c->real
        ld      [%o1],%f0
```

```
1975         fstod   %f0,%f2
1976         st      %f2,[%o0]
1977         st      %f3,[%o0+4]
1978 !   121           result->dimag = (double)c->imag
1979         ld      [%o1+4],%f3
1980         fstod   %f3,%f4
1981         st      %f4,[%o0+8]
1982         st      %f5,[%o0+12]
1983         .end
1984 ! }
1985 !- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
1986 ! int
1987 ! __Fc_eq(x, y)
1988 ! complex *x, *y;
1989 ! {

1991         .inline __Fc_eq,2
1992 !       return  (x->real == y->real) && (x->imag == y->imag);
1993         ld      [%o0],%f0
1994         ld      [%o1],%f2
1995         mov     %o0,%o2
1996         fcmps   %f0,%f2
1997         mov     0,%o0
1998         fbne    1f
1999         nop
2000         ld      [%o2+4],%f0
2001         ld      [%o1+4],%f2
2002         fcmps   %f0,%f2
2003         nop
2004         fbne    1f
2005         nop
2006         mov     1,%o0
2007 1:
2008         .end
2009 ! }
2010 !- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
2011 ! int
2012 ! __Fc_ne(x, y)
2013 ! complex *x, *y;
2014 ! {

2016         .inline __Fc_ne,2
2017 !       return  (x->real != y->real) || (x->imag != y->imag);
2018         ld      [%o0],%f0
2019         ld      [%o1],%f2
2020         mov     %o0,%o2
2021         fcmps   %f0,%f2
2022         mov     1,%o0
2023         fbne    1f
2024         nop
2025         ld      [%o2+4],%f0
2026         ld      [%o1+4],%f2
2027         fcmps   %f0,%f2
2028         nop
2029         fbne    1f
2030         nop
2031         mov     0,%o0
2032 1:
2033         .end
2034 ! }
```

```
**********************************************************
    2755 Sat May 10 12:09:47 2014
new/usr/src/lib/libm/sparc/src/nextafter.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */
/*
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 */

        .file   "nextafter.S"

#include "libm.h"
LIBM_ANSI_PRAGMA_WEAK(nextafter,function)
        .weak _nextafter
        .type _nextafter,#function
_nextafter      = __nextafter
#include "libm_synonyms.h"
#include "libm_protos.h"

#if defined(LIBM_BUILD) && !defined(ELFOBJ)
#define mENTRY(x)       ENTRY(__libm/**/x)
#define mNAME(x)        NAME(__libm/**/x)
#else
#define mENTRY(x)       ENTRY(x)
#define mNAME(x)        NAME(x)
#endif

        RO_DATA
        .align  8
.Lconstant:
two54   = 0x00
        .word   0x43500000,0x0          !  2**54
twom54  = 0x08
        .word   0x3c900000,0x0          !  2**-54
tiny    = 0x10
        .word   0x00100000,0x0          !  tiny

! variable using fp
x       = -0x8
y       = -0x10

        ENTRY(nextafter)
```



```
        save    %sp,-128,%sp
        PIC_SETUP(l7)
        std     %i0,[%fp+x]
        or      %g0,%i0,%o0             ! save original arguments
        or      %g0,%i1,%o1
        std     %i2,[%fp+y]
        or      %g0,%i2,%o2
        or      %g0,%i3,%o3
        ldd     [%fp+x],%f2             ! x
        ldd     [%fp+y],%f0             ! y
        fcmpd   %f2,%f0                 ! x:y
        PIC_SET(l7,.Lconstant,l0)
        sethi   %hi(0x80000000),%l1
        andn    %i0,%l1,%l4
        fbe     9f                      ! next_return
        nop
        fbu,a   9f                      ! next_return
        fmuld   %f2,%f0,%f0             ! + -> * for Cheetah
        orcc    %i1,%l4,%g0             ! see if x is zero
        bne     1f
        tst     %i0
    ! x is zero, return sign(y)*min
        and     %i2,%l1,%i0
        ba      4f                      ! next_final
        mov     1,%i1
1:      bge     2f
        nop
    ! x is negative
        fbl     1f                      ! next_subulp
        nop
        fbg     3f                      ! next_addulp
        nop
2:
        fbl     3f                      ! next_addulp
        nop
1:                                      ! next_subulp
        subcc   %i1,1,%i1
        ba      4f                      ! next_final
        subx    %i0,0,%i0
3:                                      ! next_addulp
        addcc   %i1,1,%i1
        addx    %i0,0,%i0
4:                                      ! next_final
        sethi   %hi(0x7ff00000),%l3
        std     %i0,[%fp+x]
        andcc   %i0,%l3,%i2
        be,a    1f                      ! xflow
        ldd     [%l0+tiny],%f2
        cmp     %i2,%l3
        bne,a   9f                      ! next_return
        ldd     [%fp+x],%f0
        call    mNAME(_SVID_libm_err)   ! overflow
        or      %g0,46,%o4
        ba      9f
        nop
1:                                      ! xflow
        fmuld   %f2,%f2,%f2
        ldd     [%fp+x],%f0
9:                                      ! next_return
        ret
        restore

        SET_SIZE(nextafter)
```

****
635 Sat May 10 12:09:47 2014
new/usr/src/lib/libm/sparcv9/Makefile
patch01 - 693 import Sun Devpro Math Library
****

```
#
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#

TARGET_ARCH= sparcv9

include ../Makefile.com
include $(SRC)/lib/Makefile.lib.64

CHIP            = ultra

install:        all $(ROOTLIBS64) $(ROOTLINKS64)

include ../Makefile.targ
```

```
**********************************************************
    6471 Sat May 10 12:09:47 2014
new/usr/src/lib/libm/sparcv9/src/libm_inlines.h
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 *
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 */

/*
 * Copyright 2011, Richard Lowe.
 */

/* Functions in this file are duplicated in locallibm.il.  Keep them in sync */

#ifndef _LIBM_INLINES_H
#define _LIBM_INLINES_H

#ifdef __GNUC__

#include <sys/types.h>
#include <sys/ieeefp.h>

#ifdef __cplusplus
extern "C" {
#endif

extern __inline__ enum fp_class_type
fp_classf(float f)
{
        enum fp_class_type ret;
        int fint;               /* scratch for f as int */
        uint64_t tmp;

        __asm__ __volatile__(
            "fabss  %3,%3\n\t"
            "st     %3,%1\n\t"
            "ld     %1,%0\n\t"
            "orcc   %%g0,%0,%%g0\n\t"
            "be,pn  %%icc,2f\n\t"
            "nop\n\t"
            "1:\n\t"
            "sethi  %%hi(0x7f800000),%2\n\t"
            "andcc  %0,%2,%%g0\n\t"
            "bne,pt %%icc,1f\n\t"
            "nop\n\t"
            "or     %%g0,1,%0\n\t"
            "ba     2f\n\t"     /* subnormal */
            "nop\n\t"
            "1:\n\t"
            "subcc  %0,%2,%%g0\n\t"
            "bge,pn %%icc,1f\n\t"
            "nop\n\t"
            "or     %%g0,2,%0\n\t"
            "ba     2f\n\t"     /* normal */
            "nop\n\t"
            "1:\n\t"
            "bg,pn  %%icc,1f\n\t"
            "nop\n\t"
            "or     %%g0,3,%0\n\t"
            "ba     2f\n\t"     /* infinity */
            "nop\n\t"
            "1:\n\t"
            "sethi  %%hi(0x00400000),%2\n\t"
            "andcc  %0,%2,%%g0\n\t"
            "or     %%g0,4,%0\n\t"
            "bne,pt %%icc,2f\n\t" /* quiet NaN */
            "nop\n\t"
            "or     %%g0,5,%0\n\t" /* signalling NaN */
            "2:\n\t"
            : "=r" (ret), "=m" (fint), "=r" (tmp)
            : "f" (f)
            : "cc");

        return (ret);
}

extern __inline__ enum fp_class_type
fp_class(double d)
{
        enum fp_class_type ret;
        uint64_t dint;          /* Scratch for d-as-long */
        uint64_t tmp;

        __asm__ __volatile__(
            "fabsd  %3,%3\n\t"
            "std    %3,%1\n\t"
            "ldx    %1,%0\n\t"
            "orcc   %%g0,%0,%%g0\n\t"
            "be,pn  %%xcc,2f\n\t"
            "nop\n\t"
            "sethi  %%hi(0x7ff00000),%2\n\t"
            "sllx   %2,32,%2\n\t"
            "andcc  %0,%2,%%g0\n\t"
            "bne,pt %%xcc,1f\n\t"
            "nop\n\t"
            "or     %%g0,1,%0\n\t"
            "ba     2f\n\t"
            "nop\n\t"
            "1:\n\t"
            "subcc  %0,%2,%%g0\n\t"
            "bge,pn %%xcc,1f\n\t"
            "nop\n\t"
            "or     %%g0,2,%0\n\t"
            "ba     2f\n\t"
            "nop\n\t"
            "1:\n\t"
            "andncc %0,%2,%0\n\t"
            "bne,pn %%xcc,1f\n\t"
```



```
            "andcc  %0,%2,%%g0\n\t"
            "bne,pt %%icc,1f\n\t"
            "nop\n\t"
            "or     %%g0,1,%0\n\t"
            "ba     2f\n\t"     /* subnormal */
            "nop\n\t"
            "1:\n\t"
            "subcc  %0,%2,%%g0\n\t"
            "bge,pn %%icc,1f\n\t"
            "nop\n\t"
            "or     %%g0,2,%0\n\t"
            "ba     2f\n\t"     /* normal */
            "nop\n\t"
            "1:\n\t"
            "bg,pn  %%icc,1f\n\t"
            "nop\n\t"
            "or     %%g0,3,%0\n\t"
            "ba     2f\n\t"     /* infinity */
            "nop\n\t"
            "1:\n\t"
            "sethi  %%hi(0x00400000),%2\n\t"
            "andcc  %0,%2,%%g0\n\t"
            "or     %%g0,4,%0\n\t"
            "bne,pt %%icc,2f\n\t" /* quiet NaN */
            "nop\n\t"
            "or     %%g0,5,%0\n\t" /* signalling NaN */
            "2:\n\t"
            : "=r" (ret), "=m" (fint), "=r" (tmp)
            : "f" (f)
            : "cc");

        return (ret);
}

extern __inline__ enum fp_class_type
fp_class(double d)
{
        enum fp_class_type ret;
        uint64_t dint;          /* Scratch for d-as-long */
        uint64_t tmp;

        __asm__ __volatile__(
            "fabsd  %3,%3\n\t"
            "std    %3,%1\n\t"
            "ldx    %1,%0\n\t"
            "orcc   %%g0,%0,%%g0\n\t"
            "be,pn  %%xcc,2f\n\t"
            "nop\n\t"
            "sethi  %%hi(0x7ff00000),%2\n\t"
            "sllx   %2,32,%2\n\t"
            "andcc  %0,%2,%%g0\n\t"
            "bne,pt %%xcc,1f\n\t"
            "nop\n\t"
            "or     %%g0,1,%0\n\t"
            "ba     2f\n\t"
            "nop\n\t"
            "1:\n\t"
            "subcc  %0,%2,%%g0\n\t"
            "bge,pn %%xcc,1f\n\t"
            "nop\n\t"
            "or     %%g0,2,%0\n\t"
            "ba     2f\n\t"
            "nop\n\t"
            "1:\n\t"
            "andncc %0,%2,%0\n\t"
            "bne,pn %%xcc,1f\n\t"
```

```
127             "nop\n\t"
128             "or     %%g0,3,%0\n\t"
129             "ba     2f\n\t"
130             "nop\n\t"
131             "1:\n\t"
132             "sethi  %%hi(0x00080000),%2\n\t"
133             "sllx   %2,32,%2\n\t"
134             "andcc  %0,%2,%%g0\n\t"
135             "or     %%g0,4,%0\n\t"
136             "bne,pt %%xcc,2f\n\t"
137             "nop\n\t"
138             "or     %%g0,5,%0\n\t"
139             "2:\n\t"
140             : "=r" (ret), "=m" (dint), "=r" (tmp)
141             : "e" (d)
142             : "cc");
143
144         return (ret);
145 }
146
147 extern __inline__ float
148 __inline_sqrtf(float f)
149 {
150         float ret;
151
152         __asm__ __volatile__("fsqrts %1,%0\n\t" : "=f" (ret) : "f" (f));
153         return (ret);
154 }
155
156 extern __inline__ double
157 __inline_sqrt(double d)
158 {
159         double ret;
160
161         __asm__ __volatile__("fsqrtd %1,%0\n\t" : "=f" (ret) : "f" (d));
162         return (ret);
163 }
164
165 extern __inline__ int
166 __swapEX(int i)
167 {
168         int ret;
169         uint32_t fsr;
170         uint64_t tmp1, tmp2;
171
172         __asm__ __volatile__(
173             "and  %4,0x1f,%2\n\t"
174             "sll  %2,5,%2\n\t"  /* shift input to aexc bit location */
175             ".volatile\n\t"
176             "st   %%fsr,%1\n\t"
177             "ld   %1,%0\n\t"    /* %0 = fsr */
178             "andn %0,0x3e0,%3\n\t"
179             "or   %2,%3,%2\n\t" /* %2 = new fsr */
180             "st   %2,%1\n\t"
181             "ld   %1,%%fsr\n\t"
182             "srl  %0,5,%0\n\t"
183             "and  %0,0x1f,%0\n\t"
184             ".nonvolatile\n\t"
185             : "=r" (ret), "=m" (fsr), "=r" (tmp1), "=r" (tmp2)
186             : "r" (i)
187             : "cc");
188
189         return (ret);
190 }
191
192 /*
```



```
193  * On the SPARC, __swapRP is a no-op; always return 0 for backward
194  * compatibility
195  */
196 /* ARGSUSED */
197 extern __inline__ enum fp_precision_type
198 __swapRP(enum fp_precision_type i)
199 {
200         return (0);
201 }
202
203 extern __inline__ enum fp_direction_type
204 __swapRD(enum fp_direction_type d)
205 {
206         enum fp_direction_type ret;
207         uint32_t fsr;
208         uint64_t tmp1, tmp2, tmp3;
209
210         __asm__ __volatile__(
211             "and   %5,0x3,%0\n\t"
212             "sll   %0,30,%2\n\t"        /* shift input to RD bit location */
213             ".volatile\n\t"
214             "st    %%fsr,%1\n\t"
215             "ld    %1,%0\n\t"           /* %0 = fsr */
216             /* mask of rounding direction bits */
217             "sethi %%hi(0xc0000000),%4\n\t"
218             "andn  %0,%4,%3\n\t"
219             "or    %2,%3,%2\n\t"        /* %2 = new fsr */
220             "st    %2,%1\n\t"
221             "ld    %1,%%fsr\n\t"
222             "srl   %0,30,%0\n\t"
223             "and   %0,0x3,%0\n\t"
224             ".nonvolatile\n\t"
225             : "=r" (ret), "=m" (fsr), "=r" (tmp1), "=r" (tmp2), "=r" (tmp3)
226             : "r" (d)
227             : "cc");
228
229         return (ret);
230 }
231
232 extern __inline__ int
233 __swapTE(int i)
234 {
235         int ret;
236         uint32_t fsr;
237         uint64_t tmp1, tmp2, tmp3;
238
239         __asm__ __volatile__(
240             "and   %5,0x1f,%0\n\t"
241             "sll   %0,23,%2\n\t"        /* shift input to TEM bit location */
242             ".volatile\n\t"
243             "st    %%fsr,%1\n\t"
244             "ld    %1,%0\n\t"           /* %0 = fsr */
245             /* mask of TEM (Trap Enable Mode bits) */
246             "sethi %%hi(0x0f800000),%4\n\t"
247             "andn  %0,%4,%3\n\t"
248             "or    %2,%3,%2\n\t"        /* %2 = new fsr */
249             "st    %2,%1\n\t"
250             "ld    %1,%%fsr\n\t"
251             "srl   %0,23,%0\n\t"
252             "and   %0,0x1f,%0\n\t"
253             ".nonvolatile\n\t"
254             : "=r" (ret), "=m" (fsr), "=r" (tmp1), "=r" (tmp2), "=r" (tmp3)
255             : "r" (i)
256             : "cc");
257
258         return (ret);
```

```
259 }


262 extern __inline__ double
263 sqrt(double d)
264 {
265         return (__inline_sqrt(d));
266 }

268 extern __inline__ float
269 sqrtf(float f)
270 {
271         return (__inline_sqrtf(f));
272 }

274 extern __inline__ double
275 fabs(double d)
276 {
277         double ret;

279         __asm__ __volatile__("fabsd %1,%0\n\t" : "=e" (ret) : "e" (d));
280         return (ret);
281 }

283 extern __inline__ float
284 fabsf(float f)
285 {
286         float ret;

288         __asm__ __volatile__("fabss %1,%0\n\t" : "=f" (ret) : "f" (f));
289         return (ret);
290 }

292 #ifdef __cplusplus
293 }
294 #endif

296 #endif  /* __GNUC__ */

298 #endif /* _LIBM_INLINES_H */
```

```
**********************************************************
   16133 Sat May 10 12:09:47 2014
new/usr/src/lib/libm/sparcv9/src/locallibm.il
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  27 ! Portions of this file are duplicated as GCC inline assembly in
  28 ! libm_inlines.h.  Keep them in sync.

  30         .inline __ieee754_sqrt,1
  31         fsqrtd  %f0,%f0
  32         .end

  34         .inline __inline_sqrtf,1
  35         fsqrts  %f1,%f0
  36         .end

  38         .inline __inline_sqrt,1
  39         fsqrtd  %f0,%f0
  40         .end

  42         .inline __sqrtf,1
  43         fsqrts  %f1,%f0
  44         .end

  46         .inline __sqrt,1
  47         fsqrtd  %f0,%f0
  48         .end

  50         .inline __ceil,1
  51         sethi   %hi(0x43300000),%o0
  52         sllx    %o0,32,%o0
  53         stx     %o0,[%sp+0x87f]
  54         ldd     [%sp+0x87f],%f2
  55         fabsd   %f0,%f4
  56         fsubd   %f2,%f2,%f6
  57         fcmpd   %fcc0,%f4,%f2
  58         fbl,pt  %fcc0,1f
  59         nop
  60         sethi   %hi(0x3ff00000),%o0
  61         sllx    %o0,32,%o0
```



```
  62         stx     %o0,[%sp+0x87f]
  63         ldd     [%sp+0x87f],%f6
  64         fmuld   %f0,%f6,%f0
  65         ba      4f
  66         nop
  67 1:
  68         fcmpd   %fcc1,%f0,%f6
  69         fbg,pt  %fcc1,2f
  70         nop
  71         fbe,pn  %fcc1,4f
  72         nop
  73         fnegd   %f2,%f2
  74 2:
  75         faddd   %f0,%f2,%f4
  76         fsubd   %f4,%f2,%f4
  77         fcmpd   %fcc0,%f4,%f0
  78         fbge,pt %fcc0,3f
  79         nop
  80         sethi   %hi(0x3ff00000),%o0
  81         st      %o0,[%sp+0x87f]
  82         ldd     [%sp+0x87f],%f2
  83         faddd   %f4,%f2,%f4
  84 3:
  85         fabsd   %f4,%f0
  86         fbge,pt %fcc1,4f
  87         nop
  88         fnegd   %f0,%f0
  89 4:
  90         .end

  92         .inline __floor,1
  93         sethi   %hi(0x43300000),%o0
  94         sllx    %o0,32,%o0
  95         stx     %o0,[%sp+0x87f]
  96         ldd     [%sp+0x87f],%f2
  97         fabsd   %f0,%f4
  98         fsubd   %f2,%f2,%f6
  99         fcmpd   %fcc0,%f4,%f2
 100         fbl,pt  %fcc0,1f
 101         nop
 102         sethi   %hi(0x3ff00000),%o0
 103         sllx    %o0,32,%o0
 104         stx     %o0,[%sp+0x87f]
 105         ldd     [%sp+0x87f],%f6
 106         fmuld   %f0,%f6,%f0
 107         ba      4f
 108         nop
 109 1:
 110         fcmpd   %fcc1,%f0,%f6
 111         fbg,pt  %fcc1,2f
 112         nop
 113         fbe,pn  %fcc1,4f
 114         nop
 115         fnegd   %f2,%f2
 116 2:
 117         faddd   %f0,%f2,%f4
 118         fsubd   %f4,%f2,%f4
 119         fcmpd   %fcc0,%f4,%f0
 120         fble,pt %fcc0,3f
 121         nop
 122         sethi   %hi(0x3ff00000),%o0
 123         st      %o0,[%sp+0x87f]
 124         ldd     [%sp+0x87f],%f2
 125         fsubd   %f4,%f2,%f4
 126 3:
 127         fabsd   %f4,%f0
```

```
128         fbge,pt %fcc1,4f
129         nop
130         fnegd   %f0,%f0
131 4:
132         .end

134         .inline __ilogb,1
135         st      %f0,[%sp+0x87f]
136         ld      [%sp+0x87f],%o0
137         sethi   %hi(0x7ff00000),%o1
138         andcc   %o0,%o1,%o0
139         bne,pt  %icc,2f
140         nop
141         sethi   %hi(0x43500000),%o0
142         sllx    %o0,32,%o0
143         stx     %o0,[%sp+0x87f]
144         ldd     [%sp+0x87f],%f2
145         fmuld   %f0,%f2,%f0
146         st      %f0,[%sp+0x87f]
147         ld      [%sp+0x87f],%o0
148         andcc   %o0,%o1,%o0
149         bne,pt  %icc,1f
150         nop
151         sethi   %hi(0x80000001),%o0
152         or      %o0,%lo(0x80000001),%o0
153         ba      4f
154         nop
155 1:
156         srl     %o0,20,%o0
157         sub     %o0,0x435,%o0
158         ba      4f
159         nop
160 2:
161         subcc   %o1,%o0,%g0
162         bne,pt  %icc,3f
163         nop
164         sethi   %hi(0x7fffffff),%o0
165         or      %o0,%lo(0x7fffffff),%o0
166         ba      4f
167         nop
168 3:
169         srl     %o0,20,%o0
170         sub     %o0,0x3ff,%o0
171 4:
172         .end

174         .inline __rint,1
175         std     %f0,[%sp+0x87f]
176         ldx     [%sp+0x87f],%o0
177         sethi   %hi(0x80000000),%o2
178         sllx    %o2,32,%o2
179         andn    %o0,%o2,%o2
180         sethi   %hi(0x43300000),%o3
181         sllx    %o3,32,%o3
182         stx     %g0,[%sp+0x887]
183         subcc   %o2,%o3,%g0
184         bl,pt   %xcc,1f
185         nop
186         sethi   %hi(0x3ff00000),%o2
187         sllx    %o2,32,%o2
188         stx     %o2,[%sp+0x887]
189         ldd     [%sp+0x887],%f2
190         fmuld   %f0,%f2,%f0
191         ba      3f
192         nop
193 1:
```



```
194         orcc    %o0,0,%g0
195         stx     %o3,[%sp+0x87f]
196         ldd     [%sp+0x87f],%f2
197         bge,pt  %xcc,2f
198         nop
199         fnegd   %f2,%f2
200 2:
201         faddd   %f0,%f2,%f0
202         fcmpd   %f0,%f2
203         fbne,pt %fcc0,0f
204         nop
205         ldd     [%sp+0x887],%f0
206         bge,pt  %xcc,3f
207         nop
208         fnegd   %f0,%f0
209         ba      3f
210         nop
211 0:
212         fsubd   %f0,%f2,%f0
213 3:
214         .end

216         .inline __rintf,1
217         st      %f1,[%sp+0x87f]
218         ld      [%sp+0x87f],%o0
219         sethi   %hi(0x80000000),%o2
220         andn    %o0,%o2,%o2
221         sethi   %hi(0x4b000000),%o3
222         st      %g0,[%sp+0x887]
223         subcc   %o2,%o3,%g0
224         bl      1f
225         nop
226         sethi   %hi(0x3f800000),%o2
227         st      %o2,[%sp+0x887]
228         ld      [%sp+0x887],%f2
229         fmuls   %f1,%f2,%f0
230         ba      3f
231         nop
232 1:
233         tst     %o0
234         st      %o3,[%sp+0x87f]
235         ld      [%sp+0x87f],%f2
236         bge     2f
237         nop
238         fnegs   %f2,%f2
239 2:
240         fadds   %f1,%f2,%f0
241         fcmps   %f0,%f2
242         fbne    0f
243         nop
244         ld      [%sp+0x887],%f0
245         bge     3f
246         nop
247         fnegs   %f0,%f0
248         ba      3f
249         nop
250 0:
251         fsubs   %f0,%f2,%f0
252 3:
253         .end

255         .inline __min_subnormal,1
256         or      %g0,1,%o0
257         stx     %o0,[%sp+0x87f]
258         ldd     [%sp+0x87f],%f0
259         .end
```

```
261         .inline __min_subnormalf,1
262         or      %g0,1,%o0
263         st      %o0,[%sp+0x87f]
264         ld      [%sp+0x87f],%f0
265         .end

267         .inline __max_subnormal,1
268         xnor    %g0,%g0,%o0
269         srlx    %o0,12,%o0
270         stx     %o0,[%sp+0x87f]
271         ldd     [%sp+0x87f],%f0
272         .end

274         .inline __max_subnormalf,1
275         xnor    %g0,%g0,%o0
276         srl     %o0,9,%o0
277         st      %o0,[%sp+0x87f]
278         ld      [%sp+0x87f],%f0
279         .end

281         .inline __min_normal,1
282         sethi   %hi(0x00100000),%o0
283         sllx    %o0,32,%o0
284         stx     %o0,[%sp+0x87f]
285         ldd     [%sp+0x87f],%f0
286         .end

288         .inline __min_normalf,1
289         sethi   %hi(0x00800000),%o0
290         st      %o0,[%sp+0x87f]
291         ld      [%sp+0x87f],%f0
292         .end

294         .inline __max_normal,1
295         sethi   %hi(0x80100000),%o1
296         sllx    %o1,32,%o1
297         xnor    %g0,%g0,%o0
298         andn    %o0,%o1,%o0
299         stx     %o0,[%sp+0x87f]
300         ldd     [%sp+0x87f],%f0
301         .end

303         .inline __max_normalf,1
304         sethi   %hi(0x7f7ffc00),%o0
305         or      %o0,0x3ff,%o0
306         st      %o0,[%sp+0x87f]
307         ld      [%sp+0x87f],%f0
308         .end

310         .inline __infinity,1
311         sethi   %hi(0x7ff00000),%o0
312         sllx    %o0,32,%o0
313         stx     %o0,[%sp+0x87f]
314         ldd     [%sp+0x87f],%f0
315         .end

317         .inline __infinity,1
318         sethi   %hi(0x7ff00000),%o0
319         sllx    %o0,32,%o0
320         stx     %o0,[%sp+0x87f]
321         ldd     [%sp+0x87f],%f0
322         .end

324         .inline __infinityf,1
325         sethi   %hi(0x7f800000),%o0
```



```
326         st      %o0,[%sp+0x87f]
327         ld      [%sp+0x87f],%f0
328         .end

330         .inline __signaling_nan,1
331         sethi   %hi(0x7ff00000),%o0
332         sllx    %o0,32,%o0
333         or      %o0,0x1,%o0
334         stx     %o0,[%sp+0x87f]
335         ldd     [%sp+0x87f],%f0
336         .end

338         .inline __signaling_nanf,1
339         sethi   %hi(0x7f800000),%o0
340         or      %o0,1,%o0
341         st      %o0,[%sp+0x87f]
342         ld      [%sp+0x87f],%f0
343         .end

345         .inline __quiet_nan,1
346         xnor    %g0,%g0,%o0
347         srlx    %o0,1,%o0
348         stx     %o0,[%sp+0x87f]
349         ldd     [%sp+0x87f],%f0
350         .end

352         .inline __quiet_nanf,1
353         xnor    %g0,%g0,%o0
354         srl     %o0,1,%o0
355         st      %o0,[%sp+0x87f]
356         ld      [%sp+0x87f],%f0
357         .end

359         .inline __swapEX,1
360         and     %o0,0x1f,%o1
361         sll     %o1,5,%o1
362         .volatile
363         st      %fsr,[%sp+0x87f]
364         ld      [%sp+0x87f],%o0
365         andn    %o0,0x3e0,%o2
366         or      %o1,%o2,%o1
367         st      %o1,[%sp+0x87f]
368         ld      [%sp+0x87f],%fsr
369         srl     %o0,5,%o0
370         and     %o0,0x1f,%o0
371         .nonvolatile
372         .end

374         .inline _QgetRD,0
375         st      %fsr,[%sp+0x87f]
376         ld      [%sp+0x87f],%o0
377         srl     %o0,30,%o0
378         .end

380         .inline _QgetRP,0
381         or      %g0,%g0,%o0
382         .end

384         .inline __swapRD,1
385         and     %o0,0x3,%o0
386         sll     %o0,30,%o1
387         .volatile
388         st      %fsr,[%sp+0x87f]
389         ld      [%sp+0x87f],%o0
390         sethi   %hi(0xc0000000),%o4
391         andn    %o0,%o4,%o2
```

```
392         or      %o1,%o2,%o1
393         st      %o1,[%sp+0x87f]
394         ld      [%sp+0x87f],%fsr
395         srl     %o0,30,%o0
396         and     %o0,0x3,%o0
397         .nonvolatile
398         .end
399 !
400 ! On the SPARC, __swapRP is a no-op; always return 0 for backward compatibility
401 !

403         .inline __swapRP,1
404         or      %g0,%g0,%o0
405         .end

407         .inline __swapTE,1
408         and     %o0,0x1f,%o0
409         sll     %o0,23,%o1
410         .volatile
411         st      %fsr,[%sp+0x87f]
412         ld      [%sp+0x87f],%o0
413         sethi   %hi(0x0f800000),%o4
414         andn    %o0,%o4,%o2
415         or      %o1,%o2,%o1
416         st      %o1,[%sp+0x87f]
417         ld      [%sp+0x87f],%fsr
418         srl     %o0,23,%o0
419         and     %o0,0x1f,%o0
420         .nonvolatile
421         .end

423         .inline __fp_class,1
424         fabsd   %f0,%f0
425         std     %f0,[%sp+0x87f]
426         ldx     [%sp+0x87f],%o0
427         orcc    %g0,%o0,%g0
428         be,pn   %xcc,2f
429         nop
430         sethi   %hi(0x7ff00000),%o1
431         sllx    %o1,32,%o1
432         andcc   %o0,%o1,%g0
433         bne,pt  %xcc,1f
434         nop
435         or      %g0,1,%o0
436         ba      2f
437         nop
438 1:
439         subcc   %o0,%o1,%g0
440         bge,pn  %xcc,1f
441         nop
442         or      %g0,2,%o0
443         ba      2f
444         nop
445 1:
446         andncc  %o0,%o1,%o0
447         bne,pn  %xcc,1f
448         nop
449         or      %g0,3,%o0
450         ba      2f
451         nop
452 1:
453         sethi   %hi(0x00080000),%o1
454         sllx    %o1,32,%o1
455         andcc   %o0,%o1,%g0
456         or      %g0,4,%o0
457         bne,pt  %xcc,2f
```



```
458         nop
459         or      %g0,5,%o0
460 2:
461         .end

463         .inline __fp_classf,1
464         fabss   %f1,%f1
465         st      %f1,[%sp+0x87f]
466         ld      [%sp+0x87f],%o0
467         orcc    %g0,%o0,%g0
468         be,pn   %icc,2f
469         nop
470 1:
471         sethi   %hi(0x7f800000),%o1
472         andcc   %o0,%o1,%g0
473         bne,pt  %icc,1f
474         nop
475         or      %g0,1,%o0
476         ba      2f
477         nop
478 1:
479         subcc   %o0,%o1,%g0
480         bge,pn  %icc,1f
481         nop
482         or      %g0,2,%o0
483         ba      2f
484         nop
485 1:
486         bg,pn   %icc,1f
487         nop
488         or      %g0,3,%o0
489         ba      2f
490         nop
491 1:
492         sethi   %hi(0x00400000),%o1
493         andcc   %o0,%o1,%g0
494         or      %g0,4,%o0
495         bne,pt  %icc,2f
496         nop
497         or      %g0,5,%o0
498 2:
499         .end

501         .inline __copysign,2
502         fabsd   %f0,%f0
503         st      %f0,[%sp+0x87f]
504         ld      [%sp+0x87f],%o0
505         st      %f2,[%sp+0x887]
506         ld      [%sp+0x887],%o1
507         srl     %o1,31,%o1
508         sll     %o1,31,%o1
509         or      %o0,%o1,%o0
510         st      %o0,[%sp+0x87f]
511         ld      [%sp+0x87f],%f0
512         .end

514         .inline __copysignf,2
515         fabss   %f1,%f1
516         st      %f1,[%sp+0x87f]
517         ld      [%sp+0x87f],%o0
518         st      %f3,[%sp+0x887]
519         ld      [%sp+0x887],%o1
520         srl     %o1,31,%o1
521         sll     %o1,31,%o1
522         or      %o0,%o1,%o0
523         st      %o0,[%sp+0x87f]
```

```
524         ld      [%sp+0x87f],%f0
525         .end

527         .inline _finite,1
528         fabsd   %f0,%f0
529         st      %f0,[%sp+0x87f]
530         ld      [%sp+0x87f],%o0
531         sethi   %hi(0x7ff00000),%o1
532         sub     %o0,%o1,%o0
533         srl     %o0,31,%o0
534         .end

536         .inline __finitef,1
537         fabss   %f1,%f1
538         st      %f1,[%sp+0x87f]
539         ld      [%sp+0x87f],%o0
540         sethi   %hi(0x7f800000),%o1
541         sub     %o0,%o1,%o0
542         srl     %o0,31,%o0
543         .end

545         .inline __signbit,1
546         st      %f0,[%sp+0x87f]
547         ld      [%sp+0x87f],%o0
548         srl     %o0,31,%o0
549         .end

551         .inline __signbitf,1
552         st      %f1,[%sp+0x87f]
553         ld      [%sp+0x87f],%o0
554         srl     %o0,31,%o0
555         .end

557         .inline __isinf,1
558         fabsd   %f0,%f0
559         std     %f0,[%sp+0x87f]
560         ldx     [%sp+0x87f],%o0
561         sethi   %hi(0x7ff00000),%o1
562         sllx    %o1,32,%o1
563         sub     %o0,%o1,%o0
564         sub     %g0,%o0,%o1
565         or      %o0,%o1,%o0
566         xnor    %o0,%g0,%o0
567         srlx    %o0,63,%o0
568         .end

570         .inline __isinff,1
571         fabss   %f1,%f1
572         st      %f1,[%sp+0x87f]
573         ld      [%sp+0x87f],%o0
574         sethi   %hi(0x7f800000),%o1
575         sub     %o0,%o1,%o0
576         sub     %g0,%o0,%o1
577         or      %o0,%o1,%o0
578         xnor    %o0,%g0,%o0
579         srl     %o0,31,%o0
580         .end

582         .inline __isnan,1
583         std     %f0,[%sp+0x87f]
584         ldx     [%sp+0x87f],%o0
585         sllx    %o0,1,%o0
586         srlx    %o0,1,%o0
587         sethi   %hi(0x7ff00000),%o1
588         sllx    %o1,32,%o1
589         sub     %o1,%o0,%o0
```



```
590         srlx    %o0,63,%o0
591         .end

593         .inline __isnanf,1
594         st      %f1,[%sp+0x87f]
595         ld      [%sp+0x87f],%o0
596         sethi   %hi(0x80000000),%o2
597         andn    %o0,%o2,%o0
598         sethi   %hi(0x7f800000),%o1
599         sub     %o1,%o0,%o0
600         srl     %o0,31,%o0
601         .end

603         .inline __isnormal,1
604         fabsd   %f0,%f0
605         st      %f0,[%sp+0x87f]
606         ld      [%sp+0x87f],%o0
607         sethi   %hi(0x7ff00000),%o1
608         sub     %o0,%o1,%o2
609         sethi   %hi(0x00100000),%o1
610         sub     %o0,%o1,%o1
611         andn    %o2,%o1,%o0
612         srl     %o0,31,%o0
613         .end

615         .inline __isnormalf,1
616         fabss   %f1,%f1
617         st      %f1,[%sp+0x87f]
618         ld      [%sp+0x87f],%o0
619         sethi   %hi(0x7f800000),%o1
620         sub     %o0,%o1,%o2
621         sethi   %hi(0x00800000),%o1
622         sub     %o0,%o1,%o1
623         andn    %o2,%o1,%o0
624         srl     %o0,31,%o0
625         .end

627         .inline __issubnormal,1
628         fabsd   %f0,%f0
629         std     %f0,[%sp+0x87f]
630         ldx     [%sp+0x87f],%o0
631         sethi   %hi(0x00100000),%o1
632         sllx    %o1,32,%o1
633         sub     %o0,%o1,%o1
634         sub     %g0,%o0,%o2
635         or      %o0,%o2,%o0
636         and     %o0,%o1,%o0
637         srlx    %o0,63,%o0
638         .end

640         .inline __issubnormalf,1
641         fabss   %f1,%f1
642         st      %f1,[%sp+0x87f]
643         ld      [%sp+0x87f],%o0
644         sethi   %hi(0x00800000),%o1
645         sub     %o0,%o1,%o1
646         sub     %g0,%o0,%o2
647         or      %o0,%o2,%o0
648         and     %o0,%o1,%o0
649         srl     %o0,31,%o0
650         .end

652         .inline __iszero,1
653         fabsd   %f0,%f0
654         std     %f0,[%sp+0x87f]
655         ldx     [%sp+0x87f],%o0
```

```
656         sub     %g0,%o0,%o1
657         or      %o0,%o1,%o0
658         xnor    %o0,%g0,%o0
659         srlx    %o0,63,%o0
660         .end

662         .inline __iszerof,1
663         fabss   %f1,%f1
664         st      %f1,[%sp+0x87f]
665         ld      [%sp+0x87f],%o0
666         sub     %g0,%o0,%o1
667         or      %o0,%o1,%o0
668         xnor    %o0,%g0,%o0
669         srl     %o0,31,%o0
670         .end

672         .inline abs,1
673         sra     %o0,31,%o1
674         xor     %o0,%o1,%o0
675         sub     %o0,%o1,%o0
676         sra     %o0,0,%o0
677         .end

679         .inline __fabs,1
680         fabsd   %f0,%f0
681         .end

683         .inline __fabsf,1
684         fabss   %f1,%f0
685         .end
686 !
687 !       __nintf - f77 NINT(REAL*4)
688 !

690         .inline __nintf,1
691         st      %f1,[%sp+0x87f]
692         ld      [%sp+0x87f],%o0
693         srl     %o0,30-7,%g1
694         sethi   %hi(0x7fffff),%o2
695         and     %g1,0xff,%g1
696         or      %o2,%lo(0x7fffff),%o2
697         sethi   %hi(1<<22),%o4
698         subcc   %g1,127+31,%g0
699         and     %o0,%o2,%o3
700         bl      1f
701         nop
702         sethi   %hi(0xcf000000),%o2
703         sethi   %hi(0x80000000),%g1
704         subcc   %o0,%o2,%g0
705         or      %g1,%g0,%o0
706         be      0f
707         nop
708         fstoi   %f1,%f0
709         st      %f0,[%sp+0x87f]
710         ld      [%sp+0x87f],%o0
711 0:
712         sra     %o0,0,%o0
713         ba      9f
714         nop
715 1:
716         add     %o4,%o4,%o5
717         or      %o3,%o5,%o3
718         sra     %o0,31-0,%o2
719         subcc   %g1,127,%g1
720         srl     %o4,%g1,%o4
721         bge     1f
```



```
722         nop
723         subcc   %g1,-1,%g0
724         or      %g0,0,%o0
725         bne     2f
726         nop
727         or      %g0,1,%o0
728         ba      2f
729         nop
730 1:
731         add     %o3,%o4,%o3
732         or      %g0,23,%o0
733         subcc   %o0,%g1,%o0
734         bl      1f
735         nop
736         srl     %o3,%o0,%o0
737         ba      2f
738         nop
739 1:
740         sub     %g0,%o0,%o0
741         sll     %o3,%o0,%o0
742 2:
743         xor     %o0,%o2,%o0
744         sra     %o0,0,%o0
745         and     %o2,1,%o2
746         add     %o0,%o2,%o0
747 9:
748         .end

750         .inline __il_nint,1
751         ld      [%o0],%o0
752         sra     %o0,0,%o0
753         srlx    %o0,31-8,%g1
754         or      %g0,1,%o2
755         sllx    %o2,23-1,%o4
756         and     %g1,0xff,%g1
757         sllx    %o2,63-0,%o2
758         subcc   %g1,127+63,%g0
759         bl      0f
760         nop
761         st      %o0,[%sp+0x87f]
762         ld      [%sp+0x87f],%f0
763         fstox   %f0,%f0
764         std     %f0,[%sp+0x87f]
765         ldx     [%sp+0x87f],%o0
766         ba      9f
767         nop
768 0:
769         add     %o4,%o4,%o5
770         srax    %o2,63-23,%o2
771         sub     %g1,127+23,%o1
772         xnor    %o2,%g0,%o2
773         and     %o0,%o2,%o3
774         or      %o3,%o5,%o3
775         srax    %o0,63-0,%o2
776         subcc   %g1,127,%g1
777         bge     1f
778         nop
779         subcc   %g1,-1,%g0
780         or      %g0,0,%o0
781         bne     2f
782         nop
783         or      %g0,1,%o0
784         ba      2f
785         nop
786 1:
787         brlz,pt %o1,3f
```

```
788         nop
789         sub     %g1,23,%o0
790         sllx    %o3,%o0,%o0
791         ba      2f
792         nop
793 3:
794         srlx    %o4,%g1,%o4
795         add     %o3,%o4,%o3
796         or      %g0,23,%o0
797         sub     %o0,%g1,%o0
798         srlx    %o3,%o0,%o0
799 2:
800         xor     %o0,%o2,%o0
801         sub     %o0,%o2,%o0
802 9:
803         .end
804 !
805 !       __i_dnnt - f77 NINT(REAL*8)
806 !

808         .inline __i_dnnt,1
809         ldx     [%o0],%o0
810         srlx    %o0,63-11,%g1
811         or      %g0,1,%o2
812         stx     %o0,[%sp+0x87f]
813         sllx    %o2,52-1,%o4
814         and     %g1,0x7ff,%g1
815         sllx    %o2,63-0,%o2
816         subcc   %g1,1023+32,%g0
817         bl      0f
818         nop
819         ldd     [%sp+0x87f],%f0
820         ba      8f
821         nop
822 0:
823         add     %o4,%o4,%o5
824         srax    %o2,63-52,%o2
825         sub     %g1,1023+30,%o1
826         xnor    %o2,%g0,%o2
827         and     %o0,%o2,%o3
828         or      %o3,%o5,%o3
829         srax    %o0,63-0,%o2
830         subcc   %g1,1023,%g1
831         bge     1f
832         nop
833         subcc   %g1,-1,%g0
834         or      %g0,0,%o0
835         bne     2f
836         nop
837         or      %g0,1,%o0
838         ba      2f
839         nop
840 1:
841         srlx    %o4,%g1,%o4
842         add     %o3,%o4,%o3
843         or      %g0,52,%o0
844         sub     %o0,%g1,%o0
845         srlx    %o3,%o0,%o0
846 2:
847         xor     %o0,%o2,%o0
848         sub     %o0,%o2,%o0
849         brlz,pt %o1,9f
850         nop
851         stx     %o0,[%sp+0x87f]
852         ldd     [%sp+0x87f],%f0
853         fxtod   %f0,%f0
```



```
854 8:
855         fdtoi   %f0,%f0
856         st      %f0,[%sp+0x87f]
857         ld      [%sp+0x87f],%o0
858         sra     %o0,0,%o0
859 9:
860         .end

862         .inline __il_dnnt,1
863         ldx     [%o0],%o0
864         srlx    %o0,63-11,%g1
865         or      %g0,1,%o2
866         sllx    %o2,52-1,%o4
867         and     %g1,0x7ff,%g1
868         sllx    %o2,63-0,%o2
869         subcc   %g1,1023+63,%g0
870         bl      0f
871         nop
872         stx     %o0,[%sp+0x87f]
873         ldd     [%sp+0x87f],%f0
874         fdtox   %f0,%f0
875         std     %f0,[%sp+0x87f]
876         ldx     [%sp+0x87f],%o0
877         ba      9f
878         nop
879 0:
880         add     %o4,%o4,%o5
881         srax    %o2,63-52,%o2
882         sub     %g1,1023+52,%o1
883         xnor    %o2,%g0,%o2
884         and     %o0,%o2,%o3
885         or      %o3,%o5,%o3
886         srax    %o0,63-0,%o2
887         subcc   %g1,1023,%g1
888         bge     1f
889         nop
890         subcc   %g1,-1,%g0
891         or      %g0,0,%o0
892         bne     2f
893         nop
894         or      %g0,1,%o0
895         ba      2f
896         nop
897 1:
898         brlz,pt %o1,3f
899         nop
900         sub     %g1,52,%o0
901         sllx    %o3,%o0,%o0
902         ba      2f
903         nop
904 3:
905         srlx    %o4,%g1,%o4
906         add     %o3,%o4,%o3
907         or      %g0,52,%o0
908         sub     %o0,%g1,%o0
909         srlx    %o3,%o0,%o0
910 2:
911         xor     %o0,%o2,%o0
912         sub     %o0,%o2,%o0
913 9:
914         .end

916         .inline __anintf,1
917         st      %f1,[%sp+0x87f]
918         ld      [%sp+0x87f],%o0
919         or      %g0,1,%o1
```

```
920         srl     %o0,23,%g1
921         and     %g1,0xff,%g1
922         sub     %g0,%g1,%g1
923         add     %g1,0x95,%g1
924         subcc   %g1,23,%g0
925         sll     %o1,%g1,%o1
926         sub     %o1,1,%o2
927         bcs     1f
928         nop
929         be      2f
930         nop
931         bl      3f
932         nop
933         sethi   %hi(0x80000000),%o1
934         and     %o0,%o1,%o0
935         ba      3f
936         nop
937 1:
938         and     %o0,%o1,%o1
939 2:
940         add     %o0,%o1,%o0
941         andn    %o0,%o2,%o0
942 3:
943         st      %o0,[%sp+0x87f]
944         ld      [%sp+0x87f],%f0
945         .end

947         .inline __anint,1
948         std     %f0,[%sp+0x87f]
949         ldx     [%sp+0x87f],%o0
950         or      %g0,1,%o1
951         srlx    %o0,52,%g1
952         and     %g1,0x7ff,%g1
953         sub     %g0,%g1,%g1
954         add     %g1,0x432,%g1
955         subcc   %g1,52,%g0
956         sllx    %o1,%g1,%o1
957         sub     %o1,1,%o2
958         bcs,pt  %icc,1f
959         nop
960         be,pt   %icc,2f
961         nop
962         bl,pt   %icc,3f
963         nop
964         srlx    %o0,63,%o0
965         sllx    %o0,63,%o0
966         ba      3f
967         nop
968 1:
969         and     %o0,%o1,%o1
970 2:
971         add     %o0,%o1,%o0
972         andn    %o0,%o2,%o0
973 3:
974         stx     %o0,[%sp+0x87f]
975         ldd     [%sp+0x87f],%f0
976         .end

978         .inline __r_dim,2
979         st      %g0,[%sp+0x87f]
980         ld      [%sp+0x87f],%f4
981         ld      [%o0],%f0
982         ld      [%o1],%f2
983         fcmps   %fcc0,%f0,%f2
984         fmovsule %fcc0,%f4,%f2
985         fsubs   %f0,%f2,%f0
```



```
986         fmovsule %fcc0,%f4,%f0
987         .end

989         .inline __d_dim,2
990         stx     %g0,[%sp+0x87f]
991         ldd     [%sp+0x87f],%f4
992         ld      [%o0],%f0
993         ld      [%o0+4],%f1
994         ld      [%o1],%f2
995         ld      [%o1+4],%f3
996         fcmpd   %fcc0,%f0,%f2
997         fmovdule %fcc0,%f4,%f2
998         fsubd   %f0,%f2,%f0
999         fmovdule %fcc0,%f4,%f0
1000        .end

1002        .inline __f95_signf,2
1003        ld      [%o0],%f0
1004        ld      [%o1],%o1
1005        fabss   %f0,%f0
1006        fnegs   %f0,%f1
1007        sra     %o1,0,%o1
1008        fmovrslz %o1,%f1,%f0
1009        .end

1011        .inline __f95_sign,2
1012        ld      [%o0],%f0
1013        ld      [%o0+4],%f1
1014        ld      [%o1],%o1
1015        fabsd   %f0,%f0
1016        fnegd   %f0,%f2
1017        sra     %o1,0,%o1
1018        fmovrdlz %o1,%f2,%f0
1019        .end

1021        .inline __r_sign,2
1022        ld      [%o0],%f0
1023        ld      [%o1],%o1
1024        fabss   %f0,%f0
1025        fnegs   %f0,%f1
1026        sub     %o1,1,%o0
1027        and     %o1,%o0,%o1
1028        sra     %o1,0,%o1
1029        fmovrslz %o1,%f1,%f0
1030        .end

1032        .inline __d_sign,2
1033        ldd     [%o0],%f0
1034        ldx     [%o1],%o1
1035        fabsd   %f0,%f0
1036        fnegd   %f0,%f2
1037        sub     %o1,1,%o0
1038        and     %o1,%o0,%o1
1039        fmovrdlz %o1,%f2,%f0
1040        .end
1041 !
1042 ! complex __Fc_div_f(complex a, complex b);
1043 !

1045        .inline __Fc_div_f,0
1046        st      %g0,[%sp+0x87f]
1047        ld      [%sp+0x87f],%f4
1048        fcmps   %fcc0,%f3,%f4
1049        fbne,pn %fcc0,1f
1050        nop
1051        fdivs   %f0,%f2,%f0
```

```
1052         fdivs   %f1,%f2,%f1
1053         ba      2f
1054         nop
1055 1:
1056         sethi   %hi(0x3ff00000),%o0
1057         sllx    %o0,32,%o0
1058         stx     %o0,[%sp+0x87f]
1059         ldd     [%sp+0x87f],%f16
1060         fsmuld  %f2,%f2,%f4
1061         fsmuld  %f3,%f3,%f6
1062         fsmuld  %f1,%f3,%f8
1063         fsmuld  %f0,%f2,%f10
1064         faddd   %f6,%f4,%f6
1065         fdivd   %f16,%f6,%f6
1066         faddd   %f10,%f8,%f10
1067         fsmuld  %f1,%f2,%f12
1068         fmuld   %f10,%f6,%f10
1069         fsmuld  %f0,%f3,%f14
1070         fsubd   %f12,%f14,%f14
1071         fmuld   %f14,%f6,%f6
1072         fdtos   %f10,%f0
1073         fdtos   %f6,%f1
1074 2:
1075         .end
```

```
**********************************************************
     925 Sat May 10 12:09:48 2014
new/usr/src/lib/libm1/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
#
# This file and its contents are supplied under the terms of the
# Common Development and Distribution License ("CDDL"), version 1.0.
# You may only use this file in accordance with the terms of version
# 1.0 of the CDDL.
#
# A full copy of the text of the CDDL should have accompanied this
# source.  A copy of the CDDL is also available via the Internet at
# http://www.illumos.org/license/CDDL.
#

#
# Copyright 2011 Nexenta Systems, Inc.  All rights reserved.
#

LIBRARY=        libm.a
VERS=           .1

# include common library definitions
include $(SRC)/lib/Makefile.lib

SUBDIRS         = $(MACH)
$(BUILD64)SUBDIRS += $(MACH64)

all     :=      TARGET= all
install :=      TARGET= install
clean   :=      TARGET= clean
clobber :=      TARGET= clobber
lint    :=      TARGET= lint

.KEEP_STATE:

.PARALLEL: $(SUBDIRS)

all clean clobber install lint: $(SUBDIRS)

$(SUBDIRS): FRC
        @cd $@; pwd; VERSION='$(VERSION)' $(MAKE) $(TARGET)

FRC:

include $(SRC)/lib/Makefile.targ
```

```
**********************************************************
     878 Sat May 10 12:09:48 2014
new/usr/src/lib/libm1/Makefile.com
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
   1 #
   2 # This file and its contents are supplied under the terms of the
   3 # Common Development and Distribution License ("CDDL"), version 1.0.
   4 # You may only use this file in accordance with the terms of version
   5 # 1.0 of the CDDL.
   6 #
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   8 # source.  A copy of the CDDL is also available via the Internet at
   9 # http://www.illumos.org/license/CDDL.
  10 #

  12 #
  13 # Copyright 2011, Richard Lowe.
  14 #


  17 LIBRARY         = libm.a
  18 VERS            = .1

  20 LIBMDIR         = $(SRC)/lib/libm

  22 OBJECTS         = libmv1.o

  24 include         $(SRC)/lib/Makefile.lib
  25 include         $(SRC)/lib/Makefile.rootfs
  26 include         $(LIBMDIR)/Makefile.libm.com

  28 LIBS            = $(DYNLIB)
  29 SRCS            = $(OBJECTS:%.o=../common/%.c)
  30 SRCDIR          = ../common/

  32 CPPFLAGS        += -DLIBM_BUILD
  33 MAPFILEDIR      = ../common/
  34 DYNFLAGS        += -zignore -Wl,-F'libm.so.2'
  35 LINTFLAGS64     += -errchk=longptr64

  37 .KEEP_STATE:

  39 all: $(LIBS)

  41 lint: lintcheck
```

```
**********************************************************
     610 Sat May 10 12:09:48 2014
new/usr/src/lib/libm1/amd64/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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   5 # 1.0 of the CDDL.
   6 #
   7 # A full copy of the text of the CDDL should have accompanied this
   8 # source.  A copy of the CDDL is also available via the Internet at
   9 # http://www.illumos.org/license/CDDL.
  10 #

  12 #
  13 # Copyright 2011 Nexenta Systems, Inc.  All rights reserved.
  14 #

  16 TARGET_ARCH=    amd64

  18 include ../Makefile.com
  19 include $(SRC)/lib/Makefile.lib.64

  21 install: all $(ROOTLIBS64)

  23 include $(SRC)/lib/Makefile.targ
```

```
**********************************************************
    8856 Sat May 10 12:09:48 2014
new/usr/src/lib/libm1/common/libmv1.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
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 *
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 * If applicable, add the following below this CDDL HEADER, with the
 * fields enclosed by brackets "[]" replaced with your own identifying
 * information: Portions Copyright [yyyy] [name of copyright owner]
 *
 * CDDL HEADER END
 */

/*
 * Copyright 2011 Nexenta Systems, Inc.  All rights reserved.
 */
/*
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 * Use is subject to license terms.
 */

#pragma weak _lib_version = __libm_lib_version
#pragma weak acos = __acos
#pragma weak acosh = __acosh
#pragma weak asin = __asin
#pragma weak asinh = __asinh
#pragma weak atan = __atan
#pragma weak atan2 = __atan2
#pragma weak atanh = __atanh
#pragma weak cbrt = __cbrt
#pragma weak ceil = __ceil
#pragma weak copysign = __copysign
#pragma weak cos = __cos
#pragma weak cosh = __cosh
#pragma weak erf = __erf
#pragma weak erfc = __erfc
#pragma weak exp = __exp
#pragma weak expm1 = __expm1
#pragma weak fabs = __fabs
#pragma weak floor = __floor
#pragma weak fmod = __fmod
#pragma weak gamma = __gamma
#pragma weak gamma_r = __gamma_r
#pragma weak hypot = __hypot
#pragma weak ilogb = __ilogb
#pragma weak isnan = __isnan
#pragma weak j0 = __j0
#pragma weak j1 = __j1
#pragma weak jn = __jn
#pragma weak lgamma = __lgamma
#pragma weak lgamma_r = __lgamma_r
#pragma weak log = __log
#pragma weak log10 = __log10
```



```
#pragma weak log1p = __log1p
#pragma weak logb = __logb
#pragma weak nextafter = __nextafter
#pragma weak pow = __pow
#pragma weak remainder = __remainder
#pragma weak rint = __rint
#pragma weak scalb = __scalb
#pragma weak scalbn = __scalbn
#pragma weak signgam = __signgam
#pragma weak significand = __significand
#pragma weak sin = __sin
#pragma weak sinh = __sinh
#pragma weak sqrt = __sqrt
#pragma weak tan = __tan
#pragma weak tanh = __tanh
#pragma weak y0 = __y0
#pragma weak y1 = __y1
#pragma weak yn = __yn

#include <math.h>

const enum version __libm_lib_version = libm_ieee;
int __signgam = 0;

#if !defined(__sparcv9) && !defined(__amd64)
/* ARGSUSED */
int *
__libm_errno(void) {
        return (0);
}
#endif

/* ARGSUSED */
int
__libm__rem_pio2(double x, double *y) {
        return (0);
}

/* ARGSUSED */
int
__libm__rem_pio2m(double *x, double *y, int e0, int nx, int p, const int *ip) {
        return (0);
}

/* ARGSUSED */
double
__acos(double x) {
        return (0.0);
}

/* ARGSUSED */
double
__acosh(double x) {
        return (0.0);
}

/* ARGSUSED */
double
__asin(double x) {
        return (0.0);
}

/* ARGSUSED */
double
__asinh(double x) {
        return (0.0);
```

```
128 }

130 /* ARGSUSED */
131 double
132 __atan(double x) {
133         return (0.0);
134 }

136 /* ARGSUSED */
137 double
138 __atan2(double y, double x) {
139         return (0.0);
140 }

142 /* ARGSUSED */
143 double
144 __atanh(double x) {
145         return (0.0);
146 }

148 /* ARGSUSED */
149 double
150 __cbrt(double x) {
151         return (0.0);
152 }

154 /* ARGSUSED */
155 double
156 __ceil(double x) {
157         return (0.0);
158 }

160 /* ARGSUSED */
161 double
162 __copysign(double x, double y) {
163         return (0.0);
164 }

166 /* ARGSUSED */
167 double
168 __cos(double x) {
169         return (0.0);
170 }

172 /* ARGSUSED */
173 double
174 __cosh(double x) {
175         return (0.0);
176 }

178 /* ARGSUSED */
179 double
180 __erf(double x) {
181         return (0.0);
182 }

184 /* ARGSUSED */
185 double
186 __erfc(double x) {
187         return (0.0);
188 }

190 /* ARGSUSED */
191 double
192 __exp(double x) {
193         return (0.0);
```



```
194 }

196 /* ARGSUSED */
197 double
198 __expm1(double x) {
199         return (0.0);
200 }

202 /* ARGSUSED */
203 double
204 __fabs(double x) {
205         return (0.0);
206 }

208 /* ARGSUSED */
209 double
210 __floor(double x) {
211         return (0.0);
212 }

214 /* ARGSUSED */
215 double
216 __fmod(double x, double y) {
217         return (0.0);
218 }

220 /* ARGSUSED */
221 double
222 __gamma(double x) {
223         return (0.0);
224 }

226 /* ARGSUSED */
227 double
228 __gamma_r(double x, int *signgamp) {
229         return (0.0);
230 }

232 /* ARGSUSED */
233 double
234 __hypot(double x, double y) {
235         return (0.0);
236 }

238 /* ARGSUSED */
239 int
240 __ilogb(double x) {
241         return (0);
242 }

244 /* ARGSUSED */
245 int
246 __isnan(double x) {
247         return (0);
248 }

250 /* ARGSUSED */
251 double
252 __j0(double x) {
253         return (0.0);
254 }

256 /* ARGSUSED */
257 double
258 __j1(double x) {
259         return (0.0);
```

```
260 }

262 /* ARGSUSED */
263 double
264 __jn(int n, double y) {
265         return (0.0);
266 }

268 /* ARGSUSED */
269 double
270 __lgamma(double x) {
271         return (0.0);
272 }

274 /* ARGSUSED */
275 double
276 __lgamma_r(double x, int *signgamp) {
277         return (0.0);
278 }

280 /* ARGSUSED */
281 double
282 __log(double x) {
283         return (0.0);
284 }

286 /* ARGSUSED */
287 double
288 __log10(double x) {
289         return (0.0);
290 }

292 /* ARGSUSED */
293 double
294 __log1p(double x) {
295         return (0.0);
296 }

298 /* ARGSUSED */
299 double
300 __logb(double x) {
301         return (0.0);
302 }

304 /* ARGSUSED */
305 double
306 __nextafter(double x, double y) {
307         return (0.0);
308 }

310 /* ARGSUSED */
311 double
312 __pow(double x, double y) {
313         return (0.0);
314 }

316 /* ARGSUSED */
317 double
318 __remainder(double x, double y) {
319         return (0.0);
320 }

322 /* ARGSUSED */
323 double
324 __rint(double x) {
325         return (0.0);
```



```
326 }

328 /* ARGSUSED */
329 double
330 __scalb(double x, double y) {
331         return (0.0);
332 }

334 /* ARGSUSED */
335 double
336 __scalbn(double x, int n) {
337         return (0.0);
338 }

340 /* ARGSUSED */
341 double
342 __significand(double x) {
343         return (0.0);
344 }

346 /* ARGSUSED */
347 double
348 __sin(double x) {
349         return (0.0);
350 }

352 /* ARGSUSED */
353 double
354 __sinh(double x) {
355         return (0.0);
356 }

358 /* ARGSUSED */
359 double
360 __sqrt(double x) {
361         return (0.0);
362 }

364 /* ARGSUSED */
365 double
366 __tan(double x) {
367         return (0.0);
368 }

370 /* ARGSUSED */
371 double
372 __tanh(double x) {
373         return (0.0);
374 }

376 /* ARGSUSED */
377 double
378 __y0(double x) {
379         return (0.0);
380 }

382 /* ARGSUSED */
383 double
384 __y1(double x) {
385         return (0.0);
386 }

388 /* ARGSUSED */
389 double
390 __yn(int n, double x) {
391         return (0.0);
```

```
392 }

394 /* ARGSUSED */
395 int
396 matherr(struct exception *excep) {
397         return (0);
398 }

400 /* ARGSUSED */
401 float
402 __acosf(float x) {
403         return (0.0F);
404 }

406 /* ARGSUSED */
407 float
408 __asinf(float x) {
409         return (0.0F);
410 }

412 /* ARGSUSED */
413 float
414 __atanf(float x) {
415         return (0.0F);
416 }

418 /* ARGSUSED */
419 float
420 __atan2f(float y, float x) {
421         return (0.0F);
422 }

424 /* ARGSUSED */
425 float
426 __ceilf(float x) {
427         return (0.0F);
428 }

430 /* ARGSUSED */
431 float
432 __cosf(float x) {
433         return (0.0F);
434 }

436 /* ARGSUSED */
437 float
438 __coshf(float x) {
439         return (0.0F);
440 }

442 /* ARGSUSED */
443 float
444 __expf(float x) {
445         return (0.0F);
446 }

448 /* ARGSUSED */
449 float
450 __fabsf(float x) {
451         return (0.0F);
452 }

454 /* ARGSUSED */
455 float
456 __floorf(float x) {
457         return (0.0F);
```



```
458 }

460 /* ARGSUSED */
461 float
462 __fmodf(float x, float y) {
463         return (0.0F);
464 }

466 /* ARGSUSED */
467 float
468 __frexpf(float x, int *e) {
469         return (0.0F);
470 }

472 /* ARGSUSED */
473 float
474 __ldexpf(float x, int n) {
475         return (0.0F);
476 }

478 /* ARGSUSED */
479 float
480 __logf(float x) {
481         return (0.0F);
482 }

484 /* ARGSUSED */
485 float
486 __log10f(float x) {
487         return (0.0F);
488 }

490 /* ARGSUSED */
491 float
492 __modff(float x, float *iptr) {
493         return (0.0F);
494 }

496 /* ARGSUSED */
497 float
498 __powf(float x, float y) {
499         return (0.0F);
500 }

502 /* ARGSUSED */
503 float
504 __sinf(float x) {
505         return (0.0F);
506 }

508 /* ARGSUSED */
509 float
510 __sinhf(float x) {
511         return (0.0F);
512 }

514 /* ARGSUSED */
515 float
516 __sqrtf(float x) {
517         return (0.0F);
518 }

520 /* ARGSUSED */
521 float
522 __tanf(float x) {
523         return (0.0F);
```

```
524 }

526 /* ARGSUSED */
527 float
528 __tanhf(float x) {
529         return (0.0F);
530 }

532 /* ARGSUSED */
533 long double
534 __acosl(long double x) {
535         return (0.0L);
536 }

538 /* ARGSUSED */
539 long double
540 __asinl(long double x) {
541         return (0.0L);
542 }

544 /* ARGSUSED */
545 long double
546 __atanl(long double x) {
547         return (0.0L);
548 }

550 /* ARGSUSED */
551 long double
552 __atan2l(long double y, long double x) {
553         return (0.0L);
554 }

556 /* ARGSUSED */
557 long double
558 __ceill(long double x) {
559         return (0.0L);
560 }

562 /* ARGSUSED */
563 long double
564 __cosl(long double x) {
565         return (0.0L);
566 }

568 /* ARGSUSED */
569 long double
570 __coshl(long double x) {
571         return (0.0L);
572 }

574 /* ARGSUSED */
575 long double
576 __expl(long double x) {
577         return (0.0L);
578 }

580 /* ARGSUSED */
581 long double
582 __fabsl(long double x) {
583         return (0.0L);
584 }

586 /* ARGSUSED */
587 long double
588 __floorl(long double x) {
589         return (0.0L);
```



```
590 }

592 /* ARGSUSED */
593 long double
594 __fmodl(long double x, long double y) {
595         return (0.0L);
596 }

598 /* ARGSUSED */
599 long double
600 __frexpl(long double x, int *e) {
601         return (0.0L);
602 }

604 /* ARGSUSED */
605 long double
606 __ldexpl(long double x, int n) {
607         return (0.0L);
608 }

610 /* ARGSUSED */
611 long double
612 __logl(long double x) {
613         return (0.0L);
614 }

616 /* ARGSUSED */
617 long double
618 __log10l(long double x) {
619         return (0.0L);
620 }

622 /* ARGSUSED */
623 long double
624 __modfl(long double x, long double *iptr) {
625         return (0.0L);
626 }

628 /* ARGSUSED */
629 long double
630 __powl(long double x, long double y) {
631         return (0.0L);
632 }

634 /* ARGSUSED */
635 long double
636 __sinl(long double x) {
637         return (0.0L);
638 }

640 /* ARGSUSED */
641 long double
642 __sinhl(long double x) {
643         return (0.0L);
644 }

646 /* ARGSUSED */
647 long double
648 __sqrtl(long double x) {
649         return (0.0L);
650 }

652 /* ARGSUSED */
653 long double
654 __tanl(long double x) {
655         return (0.0L);
```

```
656 }

658 /* ARGSUSED */
659 long double
660 __tanhl(long double x) {
661         return (0.0L);
662 }
```

```
**********************************************************
    3661 Sat May 10 12:09:48 2014
new/usr/src/lib/libm1/common/mapfile-vers
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
#
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#
# CDDL HEADER END
#
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#
# Copyright 2006 Sun Microsystems, Inc.  All rights reserved.
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#
# Interface definition for libm.so.1
#
# For information regarding the establishment of versioned definitions see:
#       The Linker and Libraries Manual (version 2.5 or greater)
# This is part of the Developers Guide in the Answerbook.  Specifically refer
# to Chapter 2 under section "Defining Additional Symbols" through section
# "Reducing Symbol Scope", and Chapter 5 "Versioning".
#
# For specific rules for the modification (evolution) of these version
# definitions see:
#       psarc_1995_14: Integration of Scoped Libraries
#               (/shared/sac/PSARC/1995/014)
#       Policy for Shared Library Version Names and Interface Definitions
#               (/shared/ON/general_docs/scoping-rules.ps)

$mapfile_version 2

$if _ELF32
$add lf64
$endif
$if _sparc && _ELF32
$add sparc32
$endif
$if _sparc && _ELF64
$add sparcv9
$endif
$if _x86 && _ELF32
$add i386
$endif
$if _x86 && _ELF64
$add amd64
$endif

SYMBOL_VERSION SUNW_1.1.1 {
        global:
                __acosf;
```



```
                __acosl;
                __asinf;
                __asinl;
                __atan2f;
                __atan2l;
                __atanf;
                __atanl;
                __ceilf;
                __ceill;
                __cosf;
                __coshf;
                __coshl;
                __cosl;
                __expf;
                __expl;
                __fabsf;
                __fabsl;
                __floorf;
                __floorl;
                __fmodf;
                __fmodl;
                __frexpf;
                __frexpl;
                __ldexpf;
                __ldexpl;
                __log10f;
                __log10l;
                __logf;
                __logl;
                __modff;
                __modfl;
                __powf;
                __powl;
                __sinf;
                __sinhf;
                __sinhl;
                __sinl;
                __sqrtf;
                __sqrtl;
                __tanf;
                __tanhf;
                __tanhl;
                __tanl;
} SUNW_1.1;

SYMBOL_VERSION SUNW_1.1 {
        global:
                __acos;
                __acosh;
                __asin;
                __asinh;
                __atan;
                __atan2;
                __atanh;
                __cbrt;
                __ceil;
                __copysign;
                __cos;
                __cosh;
                __erf;
                __erfc;
                __exp;
                __expm1;
                __fabs;
                __floor;
                __fmod;
```

```
128                 __gamma;
129                 __gamma_r;
130                 __hypot;
131                 __ilogb;
132                 __isnan;
133                 __j0;
134                 __j1;
135                 __jn;
136                 __lgamma;
137                 __lgamma_r;
138                 __log;
139                 __log10;
140                 __log1p;
141                 __logb;
142                 __nextafter;
143                 __pow;
144                 __remainder;
145                 __rint;
146                 __scalb;
147                 __scalbn;
148                 __signgam;
149                 __significand;
150                 __sin;
151                 __sinh;
152                 __sqrt;
153                 __tan;
154                 __tanh;
155                 __y0;
156                 __y1;
157                 __yn;
158                 acos;
159                 acosh;
160                 asin;
161                 asinh;
162                 atan;
163                 atan2;
164                 atanh;
165                 cbrt;
166                 ceil;
167                 copysign;
168                 cos;
169                 cosh;
170                 erf;
171                 erfc;
172                 exp;
173                 expm1;
174                 fabs;
175                 floor;
176                 fmod;
177                 gamma;
178                 gamma_r;
179                 hypot;
180                 ilogb;
181                 isnan;
182                 j0;
183                 j1;
184                 jn;
185                 lgamma;
186                 lgamma_r;
187                 log;
188                 log10;
189                 log1p;
190                 logb;
191                 matherr;
192                 nextafter;
193                 pow;
```



```
194                 remainder;
195                 rint;
196                 scalb;
197                 scalbn;
198                 signgam;
199                 significand;
200                 sin;
201                 sinh;
202                 sqrt;
203                 tan;
204                 tanh;
205                 y0;
206                 y1;
207                 yn;
208 };

210 $if i386
211 SYMBOL_VERSION SUNWprivate_1.2 {
212         global:
213                 __libm_errno;   # SC3.0.1 -lmopt
214 } SUNWprivate_1.1;
215 $endif

217 SYMBOL_VERSION SUNWprivate_1.1 {
218         global:
219                 _lib_version;
220                 __libm__rem_pio2;
221                 __libm__rem_pio2m;
222         # anything else is local
223         local:
224                 *;      # symbols not mentioned in this file are scoped out
225 };
```

```
**********************************************************
     571 Sat May 10 12:09:48 2014
new/usr/src/lib/libm1/i386/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  10 #

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  14 #

  16 TARGET_ARCH=    i386
  17 include ../Makefile.com

  19 install: all $(ROOTLIBS)

  21 include $(SRC)/lib/Makefile.targ
```

```
**********************************************************
     573 Sat May 10 12:09:48 2014
new/usr/src/lib/libm1/sparc/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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  16 TARGET_ARCH=    sparc

  18 include ../Makefile.com

  20 install: all $(ROOTLIBS)

  22 include $(SRC)/lib/Makefile.targ
```

****
612 Sat May 10 12:09:48 2014
new/usr/src/lib/libm1/sparcv9/Makefile
patch01 - 693 import Sun Devpro Math Library
****

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#

TARGET_ARCH=    sparcv9

include ../Makefile.com
include $(SRC)/lib/Makefile.lib.64

install: all $(ROOTLIBS64)

include $(SRC)/lib/Makefile.targ
```

```
**********************************************************
    1175 Sat May 10 12:09:49 2014
new/usr/src/lib/libmvec/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#

LIBRARY=        libmvec.a
VERS=           .1

# include common library definitions
include $(SRC)/lib/Makefile.lib

COMPS_i386      = i386_hwcap1
COMPS_sparc     = sparc_sparcv8plus+vis sparc_sparcv9+vis2
COMPONENTS      = $(COMPS_$(MACH))

COMPS_amd64     =
COMPS_sparcv9   = sparcv9_sparcv9+vis sparcv9_sparcv9+vis2
COMPONENTS64    = $(COMPS_$(MACH64))

SUBDIRS         = $(MACH) $(COMPONENTS)
$(BUILD64)SUBDIRS += $(MACH64) $(COMPONENTS64)

all     :=      TARGET= all
install :=      TARGET= install
clean   :=      TARGET= clean
clobber :=      TARGET= clobber
lint    :=      TARGET= lint

.KEEP_STATE:

.PARALLEL: $(SUBDIRS)

all clean clobber install lint: $(SUBDIRS)

$(SUBDIRS): FRC
        @cd $@; pwd; VERSION='$(VERSION)' $(MAKE) $(TARGET)

FRC:

include $(SRC)/lib/Makefile.targ
```

```
**********************************************************
    5808 Sat May 10 12:09:49 2014
new/usr/src/lib/libmvec/Makefile.com
remove -Wno-uninitialized in libmvec
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#
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#

LIBMDIR         = $(SRC)/lib/libm

mvecOBJS        = \
                  __vTBL_atan1.o \
                  __vTBL_atan2.o \
                  __vTBL_rsqrt.o \
                  __vTBL_sincos.o \
                  __vTBL_sincos2.o \
                  __vTBL_sqrtf.o \
                  __vatan.o \
                  __vatan2.o \
                  __vatan2f.o \
                  __vatanf.o \
                  __vc_abs.o \
                  __vc_exp.o \
                  __vc_log.o \
                  __vc_pow.o \
                  __vcos.o \
                  __vcosbig.o \
                  __vcosbigf.o \
                  __vcosf.o \
                  __vexp.o \
                  __vexpf.o \
                  __vhypot.o \
                  __vhypotf.o \
                  __vlog.o \
                  __vlogf.o \
                  __vpow.o \
                  __vpowf.o \
                  __vrem_pio2m.o \
                  __vrhypot.o \
                  __vrhypotf.o \
                  __vrsqrt.o \
                  __vrsqrtf.o \
                  __vsin.o \
                  __vsinbig.o \
                  __vsinbigf.o \
                  __vsincos.o \
                  __vsincosbig.o \
                  __vsincosbigf.o \
                  __vsincosf.o \
                  __vsinf.o \
                  __vsqrt.o \
                  __vsqrtf.o \
```



```
                  __vz_abs.o \
                  __vz_exp.o \
                  __vz_log.o \
                  __vz_pow.o \
                  vatan2_.o \
                  vatan2f_.o \
                  vatan_.o \
                  vatanf_.o \
                  vc_abs_.o \
                  vc_exp_.o \
                  vc_log_.o \
                  vc_pow_.o \
                  vcos_.o \
                  vcosf_.o \
                  vexp_.o \
                  vexpf_.o \
                  vhypot_.o \
                  vhypotf_.o \
                  vlog_.o \
                  vlogf_.o \
                  vpow_.o \
                  vpowf_.o \
                  vrhypot_.o \
                  vrhypotf_.o \
                  vrsqrt_.o \
                  vrsqrtf_.o \
                  vsin_.o \
                  vsincos_.o \
                  vsincosf_.o \
                  vsinf_.o \
                  vsqrt_.o \
                  vsqrtf_.o \
                  vz_abs_.o \
                  vz_exp_.o \
                  vz_log_.o \
                  vz_pow_.o \
                  #end

mvecvisCOBJS    = \
                  __vTBL_atan1.o \
                  __vTBL_atan2.o \
                  __vTBL_rsqrt.o \
                  __vTBL_sincos.o \
                  __vTBL_sincos2.o \
                  __vTBL_sqrtf.o \
                  __vcosbig.o \
                  __vcosbigf.o \
                  __vrem_pio2m.o \
                  __vsinbig.o \
                  __vsinbigf.o \
                  __vsincosbig.o \
                  __vsincosbigf.o \
                  #end

mvecvisSOBJS    = \
                  __vatan.o \
                  __vatan2.o \
                  __vatan2f.o \
                  __vatanf.o \
                  __vcos.o \
                  __vcosf.o \
                  __vexp.o \
                  __vexpf.o \
                  __vhypot.o \
                  __vhypotf.o \
                  __vlog.o \
```

```
126                 __vlogf.o \
127                 __vpow.o \
128                 __vpowf.o \
129                 __vrhypot.o \
130                 __vrhypotf.o \
131                 __vrsqrt.o \
132                 __vrsqrtf.o \
133                 __vsin.o \
134                 __vsincos.o \
135                 __vsincosf.o \
136                 __vsinf.o \
137                 __vsqrt.o \
138                 __vsqrtf.o \
139                 #end

141 mvecvis2COBJS   = \
142                 __vTBL_sincos.o \
143                 __vTBL_sincos2.o \
144                 __vTBL_sqrtf.o \
145                 __vcosbig.o \
146                 __vcosbig_ultra3.o \
147                 __vrem_pio2m.o \
148                 __vsinbig.o \
149                 __vsinbig_ultra3.o \
150                 #end

152 mvecvis2SOBJS   = \
153                 __vcos_ultra3.o \
154                 __vlog_ultra3.o \
155                 __vsin_ultra3.o \
156                 __vsqrtf_ultra3.o \
157                 #end

159 include         $(SRC)/lib/Makefile.lib
160 include         $(SRC)/lib/Makefile.rootfs
161 include         $(LIBMDIR)/Makefile.libm.com

163 LIBS            = $(DYNLIB)
164 SRCDIR          = ../common/
165 DYNFLAGS        += -zignore

167 LINTERROFF      = -erroff=E_FP_DIVISION_BY_ZERO
168 LINTERROFF      += -erroff=E_FP_INVALID
169 LINTERROFF      += -erroff=E_BAD_PTR_CAST_ALIGN
170 LINTERROFF      += -erroff=E_ASSIGMENT_CAUSE_LOSS_PREC
171 LINTERROFF      += -erroff=E_FUNC_SET_NOT_USED

173 CERRWARN        += -_gcc=-Wno-parentheses
174 CERRWARN        += -_gcc=-Wno-unused-variable

176 LINTFLAGS       += $(LINTERROFF)
177 LINTFLAGS64     += $(LINTERROFF)
178 LINTFLAGS64     += -errchk=longptr64

180 CLAGS           += $(LINTERROFF)
181 CFLAGS64        += $(LINTERROFF)

183 ASDEF           += -DLIBMVEC_SO_BUILD

185 FLTRPATH_sparc          = $$ORIGIN/cpu/$$ISALIST/libmvec_isa.so.1
186 FLTRPATH_sparcv9        = $$ORIGIN/../cpu/$$ISALIST/sparcv9/libmvec_isa.so.1
187 FLTRPATH_i386           = $$ORIGIN/libmvec/$$HWCAP
188 FLTRPATH                = $(FLTRPATH_$(TARGET_ARCH))

190 sparc_CFLAGS += -_cc=-W0,-xintrinsic
191 sparcv9_CFLAGS += -_cc=-W0,-xintrinsic
```



```
192 CPPFLAGS_i386   += -Dfabs=__fabs

194 CPPFLAGS        += -DLIBMVEC_SO_BUILD

196 SRCS_mvec_i386 = \
197         ../common/__vsqrtf.c \
198         #end

200 SRCS_mvec_sparc = \
201         $(SRCS_mvec_i386) \
202         #end
203 SRCS_mvec_sparcv9 = \
204         $(SRCS_mvec_i386) \
205         #end

207 SRCS_mvec = \
208         $(SRCS_mvec_$(TARGETMACH)) \
209         ../common/__vTBL_atan1.c \
210         ../common/__vTBL_atan2.c \
211         ../common/__vTBL_rsqrt.c \
212         ../common/__vTBL_sincos.c \
213         ../common/__vTBL_sincos2.c \
214         ../common/__vTBL_sqrtf.c \
215         ../common/__vatan.c \
216         ../common/__vatan2.c \
217         ../common/__vatan2f.c \
218         ../common/__vatanf.c \
219         ../common/__vc_abs.c \
220         ../common/__vc_exp.c \
221         ../common/__vc_log.c \
222         ../common/__vc_pow.c \
223         ../common/__vcos.c \
224         ../common/__vcosbig.c \
225         ../common/__vcosbigf.c \
226         ../common/__vcosf.c \
227         ../common/__vexp.c \
228         ../common/__vexpf.c \
229         ../common/__vhypot.c \
230         ../common/__vhypotf.c \
231         ../common/__vlog.c \
232         ../common/__vlogf.c \
233         ../common/__vpow.c \
234         ../common/__vpowf.c \
235         ../common/__vrem_pio2m.c \
236         ../common/__vrhypot.c \
237         ../common/__vrhypotf.c \
238         ../common/__vrsqrt.c \
239         ../common/__vrsqrtf.c \
240         ../common/__vsin.c \
241         ../common/__vsinbig.c \
242         ../common/__vsinbigf.c \
243         ../common/__vsincos.c \
244         ../common/__vsincosbig.c \
245         ../common/__vsincosbigf.c \
246         ../common/__vsincosf.c \
247         ../common/__vsinf.c \
248         ../common/__vsqrt.c \
249         ../common/__vz_abs.c \
250         ../common/__vz_exp.c \
251         ../common/__vz_log.c \
252         ../common/__vz_pow.c \
253         ../common/vatan2_.c \
254         ../common/vatan2f_.c \
255         ../common/vatan_.c \
256         ../common/vatanf_.c \
257         ../common/vc_abs_.c \
```

```
258         ../common/vc_exp_.c \
259         ../common/vc_log_.c \
260         ../common/vc_pow_.c \
261         ../common/vcos_.c \
262         ../common/vcosf_.c \
263         ../common/vexp_.c \
264         ../common/vexpf_.c \
265         ../common/vhypot_.c \
266         ../common/vhypotf_.c \
267         ../common/vlog_.c \
268         ../common/vlogf_.c \
269         ../common/vpow_.c \
270         ../common/vpowf_.c \
271         ../common/vrhypot_.c \
272         ../common/vrhypotf_.c \
273         ../common/vrsqrt_.c \
274         ../common/vrsqrtf_.c \
275         ../common/vsin_.c \
276         ../common/vsincos_.c \
277         ../common/vsincosf_.c \
278         ../common/vsinf_.c \
279         ../common/vsqrt_.c \
280         ../common/vsqrtf_.c \
281         ../common/vz_abs_.c \
282         ../common/vz_exp_.c \
283         ../common/vz_log_.c \
284         ../common/vz_pow_.c \
285         #end

287 .KEEP_STATE:

289 all:    $(LIBS)

291 lint:   lintcheck

293 pics/%.o: ../$(TARGET_ARCH)/src/%.S
294         $(COMPILE.s) -o $@ $<
295         $(POST_PROCESS_O)

297 pics/%.o: ../common/$$(CHIP)/%.S
298         $(COMPILE.s) -o $@ $<
299         $(POST_PROCESS_O)
```

```
**********************************************************
     711 Sat May 10 12:09:49 2014
new/usr/src/lib/libmvec/amd64/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  14 #

  16 TARGET_ARCH     = amd64

  18 LIBRARY         = libmvec.a
  19 VERS            = .1

  21 OBJECTS         = $(mvecOBJS)

  23 include ../Makefile.com
  24 include $(SRC)/lib/Makefile.lib.64

  26 SRCS            = $(SRCS_mvec)

  28 install: all $(ROOTLIBS64) $(ROOTLINKS64)

  30 include $(SRC)/lib/libm/Makefile.targ
```

```
**********************************************************
    2531 Sat May 10 12:09:49 2014
new/usr/src/lib/libmvec/amd64/src/__vsqrtf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
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 */

        .file   "__vsqrtf.S"

#include "libm.h"

        ENTRY(__vsqrtf)
        push    %rbp
        movq    %rsp,%rbp

/ on entry:
/   %edi = n
/   %rsi = x
/   %edx = stridex
/   %rcx = y
/   %r8d = stridey

        movslq  %edx,%rdx               / sign extend and scale strides
        shlq    $2,%rdx
        movslq  %r8d,%r8
        shlq    $2,%r8

        cmpl    $4,%edi
        jl      .finish

        cmpq    $4,%rdx
        jne     .nonunit
        cmpq    $4,%r8
        jne     .nonunit

/ unit-stride case
        movq    %rdx,%r9
        shlq    $2,%r9
        movq    %r8,%r10
        shlq    $2,%r10
```



```
        .align  16
.loop:
        movups  (%rsi),%xmm0
        addq    %r9,%rsi
        sqrtps  %xmm0,%xmm0
        movups  %xmm0,(%rcx)
        addq    %r10,%rcx
        subl    $4,%edi
        cmpl    $4,%edi
        jge     .loop

.finish:
        testl   %edi,%edi
        jle     .done

.finish_loop:
        movss   (%rsi),%xmm0
        addq    %rdx,%rsi
        sqrtss  %xmm0,%xmm0
        movss   %xmm0,(%rcx)
        addq    %r8,%rcx
        decl    %edi
        jg      .finish_loop

.done:
        leave
        ret

        .align  16
.nonunit:
        movss   (%rsi),%xmm0
        addq    %rdx,%rsi
        movss   (%rsi),%xmm1
        addq    %rdx,%rsi
        movss   (%rsi),%xmm2
        addq    %rdx,%rsi
        movss   (%rsi),%xmm3
        addq    %rdx,%rsi

        movlhps %xmm1,%xmm0             / xmm0:   0  x1   0  x0
        movlhps %xmm3,%xmm2             / xmm2:   0  x3   0  x2
        shufps  $0x88,%xmm2,%xmm0       / xmm0:  x3  x2  x1  x0

        sqrtps  %xmm0,%xmm0             / xmm0:  y3  y2  y1  y0

        movaps  %xmm0,%xmm1             / xmm1:  y3  y2  y1  y0
        shufps  $0xf5,%xmm0,%xmm1       / xmm1:  y3  y3  y1  y1
        movhlps %xmm0,%xmm2             / xmm2:   0  x3  y3  y2
        movhlps %xmm1,%xmm3             / xmm3:   0   0  y3  y3

        movss   %xmm0,(%rcx)
        addq    %r8,%rcx
        movss   %xmm1,(%rcx)
        addq    %r8,%rcx
        movss   %xmm2,(%rcx)
        addq    %r8,%rcx
        movss   %xmm3,(%rcx)
        addq    %r8,%rcx

        subl    $4,%edi
        cmpl    $4,%edi
        jge     .nonunit

        jmp     .finish
```

```
128         SET_SIZE(__vsqrtf)
```

```
**********************************************************
   35696 Sat May 10 12:09:49 2014
new/usr/src/lib/libmvec/common/__vTBL_atan1.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
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 */
/*
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 */

#pragma align 32 (__vlibm_TBL_atan1)
const double __vlibm_TBL_atan1[] = {

/* i=  -2 conup conlo = 0.0      */                    0.0 ,
/* i=  -1 PI/2 upper, lower      */ 1.57079632679489658E+00, 6.1232339957367658
                                  /*        3ff921fb54442d18,         3c91a626331


/* i=       0 atan(3F900000...) */  1.56237286204768313E-02, -4.9136001365663039
/* i=       0 atan(3F900000...)           3F8FFF555BBB729B,          BC2220C39D4

/* i=       1 atan(3F910000...) */  1.66000375562312640E-02,  1.1218911895686726
/* i=       1 atan(3F910000...)           3F90FF99A9AA60D7,          3C34B1FB39D

/* i=       2 atan(3F920000...) */  1.75763148444955872E-02,  6.5951925030100953
/* i=       2 atan(3F920000...)           3F91FF8685C3E636,          3C2854FBB35

/* i=       3 atan(3F930000...) */  1.85525586258889763E-02,  1.3920347754501219
/* i=       3 atan(3F930000...)           3F92FF712238A4B8,          3C048AF56CE

/* i=       4 atan(3F940000...) */  1.95287670414137082E-02, -9.7999955345426691
/* i=       4 atan(3F940000...)           3F93FF595F18A700,          BC3213EAC36

/* i=       5 atan(3F950000...) */  2.05049382324763683E-02, -8.4009476155209115
/* i=       5 atan(3F950000...)           3F94FF3F1C75BEE7,          BC2EFE787F0

/* i=       6 atan(3F960000...) */  2.14810703409090559E-02, -4.1945064679965748
/* i=       6 atan(3F960000...)           3F95FF223A639D5C,          BBE8C28F182

/* i=       7 atan(3F970000...) */  2.24571615089905717E-02, -1.3095931213565438
/* i=       7 atan(3F970000...)           3F96FF0298F7EA3F,          BC382860F00
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/* i=       8 atan(3F980000...) */  2.34332098794675855E-02, -1.0946924642180501
/* i=       8 atan(3F980000...)           3F97FEE0184A5C36,          BC343189FC0

/* i=       9 atan(3F990000...) */  2.44092135955758099E-02, -1.4789750959929971
/* i=       9 atan(3F990000...)           3F98FEBA9874D084,          BC3B48432E1

/* i=      10 atan(3F9A0000...) */  2.53851708010611396E-02, -1.3430320004039153
/* i=      10 atan(3F9A0000...)           3F99FE91F99362D6,          BC38C64A0FD

/* i=      11 atan(3F9B0000...) */  2.63610796402007873E-02,  1.3726744327160815
/* i=      11 atan(3F9B0000...)           3F9AFE661BC4850F,          3C395245904

/* i=      12 atan(3F9C0000...) */  2.73369382578244127E-02, -8.1610816567139386
/* i=      12 atan(3F9C0000...)           3F9BFE36DF291712,          BC2E1BEC775

/* i=      13 atan(3F9D0000...) */  2.83127447993351995E-02,  8.5924930627086542
/* i=      13 atan(3F9D0000...)           3F9CFE0423E47E7D,          3C2FB36157F

/* i=      14 atan(3F9E0000...) */  2.92884974107309737E-02, -7.7602436449302630
/* i=      14 atan(3F9E0000...)           3F9DFDCDCA1CBE70,          BC2CA157C82

/* i=      15 atan(3F9F0000...) */  3.02641942386252458E-02, -1.6657446744421094
/* i=      15 atan(3F9F0000...)           3F9EFD93B1FA8F3E,          BC3EBA41BEE

/* i=      16 atan(3FA00000...) */  3.12398334302682774E-02, -1.1884427115877479
/* i=      16 atan(3FA00000...)           3F9FFD55BBA97625,          BC35EC43144

/* i=      17 atan(3FA10000...) */  3.31909314971115949E-02, -9.4293915390556721
/* i=      17 atan(3FA10000...)           3FA0FE66DA9B94EE,          BC3164E77D4

/* i=      18 atan(3FA20000...) */  3.51417768027967800E-02,  2.6588515081819635
/* i=      18 atan(3FA20000...)           3FA1FE1A5C2EC497,          3C4886091E8

/* i=      19 atan(3FA30000...) */  3.70923545503918164E-02, -1.9405065272058178
/* i=      19 atan(3FA30000...)           3FA2FDC4E3737DDD,          BC41E5E438D

/* i=      20 atan(3FA40000...) */  3.90426499551669928E-02,  6.2712633742130889
/* i=      20 atan(3FA40000...)           3FA3FD65F169C9D9,          3C27230A716

/* i=      21 atan(3FA50000...) */  4.09926482452637811E-02,  2.4768764111915085
/* i=      21 atan(3FA50000...)           3FA4FCFD072DFF79,          3C46D85BEC3

/* i=      22 atan(3FA60000...) */  4.29423346623621707E-02,  2.0309529788732214
/* i=      22 atan(3FA60000...)           3FA5FC89A5FA3B2D,          3C42BB73BF4

/* i=      23 atan(3FA70000...) */  4.48916944623464972E-02,  2.3175181899658152
/* i=      23 atan(3FA70000...)           3FA6FC0B4F27D5BB,          3C1119AB07E

/* i=      24 atan(3FA80000...) */  4.68407129159696539E-02, -1.6556774422549521
/* i=      24 atan(3FA80000...)           3FA7FB818430DA2A,          BC086EF8F79

/* i=      25 atan(3FA90000...) */  4.87893753095156174E-02,  2.9134876745390292
/* i=      25 atan(3FA90000...)           3FA8FAEBC6B17ABA,          3C4ADF473CC

/* i=      26 atan(3FAA0000...) */  5.07376669454602178E-02,  2.0746227103241065
/* i=      26 atan(3FAA0000...)           3FA9FA49986984DF,          3C4322907AF

/* i=      27 atan(3FAB0000...) */  5.26855731431300420E-02,  2.8686623298883309
/* i=      27 atan(3FAB0000...)           3FAAF99A7B3DD42F,          3C4A756FFAA

/* i=      28 atan(3FAC0000...) */  5.46330792393594777E-02, -2.6698003590189837
/* i=      28 atan(3FAC0000...)           3FABF8DDF139C444,          BC489FE34B2

/* i=      29 atan(3FAD0000...) */  5.65801705891457105E-02,  3.2548950769825044
/* i=      29 atan(3FAD0000...)           3FACF8137C90A177,          3C4E0567596
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/* i=     30 atan(3FAE0000...) */  5.85268325663017702E-02, -2.4827118140778358
/* i=     30 atan(3FAE0000...)           3FADF73A9F9F1882,          BC1251B5C41

/* i=     31 atan(3FAF0000...) */  6.04730505641073168E-02, -5.6698989033396742
/* i=     31 atan(3FAF0000...)           3FAEF652DCECA4DC,          BC24EB116F8

/* i=     32 atan(3FB00000...) */  6.24188099959573500E-02, -1.5490756308295045
/* i=     32 atan(3FB00000...)           3FAFF55BB72CFDEA,          BC3C934D86D

/* i=     33 atan(3FB10000...) */  6.63088949198234884E-02, -4.8859239893040005
/* i=     33 atan(3FB10000...)           3FB0F99EA71D52A7,          BC22069FEEC

/* i=     34 atan(3FB20000...) */  7.01969710718705203E-02, -1.7981921603220458
/* i=     34 atan(3FB20000...)           3FB1F86DBF082D59,          BC4095DC773

/* i=     35 atan(3FB30000...) */  7.40829225490337306E-02,  1.3544828953032299
/* i=     35 atan(3FB30000...)           3FB2F719318A4A9A,          3C03FD1779B

/* i=     36 atan(3FB40000...) */  7.79666338315423008E-02,  5.8045518731433566
/* i=     36 atan(3FB40000...)           3FB3F59F0E7C559D,          3C5AC4CE285

/* i=     37 atan(3FB50000...) */  8.18479898030765457E-02,  1.7384613138337836
/* i=     37 atan(3FB50000...)           3FB4F3FD677292FB,          3C4008D3626

/* i=     38 atan(3FB60000...) */  8.57268757707448092E-02,  5.3471941435029508
/* i=     38 atan(3FB60000...)           3FB5F2324FD2D7B2,          3C58A8DA440

/* i=     39 atan(3FB70000...) */  8.96031774848717461E-02, -1.0808258835513640
/* i=     39 atan(3FB70000...)           3FB6F03BDCEA4B0D,          BC33F00E512

/* i=     40 atan(3FB80000...) */  9.34767811585894698E-02, -6.2844725995420954
/* i=     40 atan(3FB80000...)           3FB7EE182602F10F,          BC5CFB654C0

/* i=     41 atan(3FB90000...) */  9.73475734872236709E-02,  2.5150658954435769
/* i=     41 atan(3FB90000...)           3FB8EBC54478FB28,          3C4732880CA

/* i=     42 atan(3FBA0000...) */  1.01215441667466668E-01,  5.6812025586234137
/* i=     42 atan(3FBA0000...)           3FB9E94153CFDCF1,          3C5A332E1D6

/* i=     43 atan(3FBB0000...) */  1.05080273416329528E-01,  3.0363193185774176
/* i=     43 atan(3FBB0000...)           3FBAE68A71C722B8,          3C4C014E691

/* i=     44 atan(3FBC0000...) */  1.08941956989865793E-01,  6.8267122072409585
/* i=     44 atan(3FBC0000...)           3FBBE39EBE6F07C3,          3C5F7B8F29A

/* i=     45 atan(3FBD0000...) */  1.12800381201659389E-01,  1.8672415475943624
/* i=     45 atan(3FBD0000...)           3FBCE07C5C3CCA32,          3C4138E6425

/* i=     46 atan(3FBE0000...) */  1.16655435441069349E-01,  5.4879258121086992
/* i=     46 atan(3FBE0000...)           3FBDDD21701EBA6E,          3C594EFFCD7

/* i=     47 atan(3FBF0000...) */  1.20507009691224562E-01, -5.3252909626225655
/* i=     47 atan(3FBF0000...)           3FBED98C2190043B,          BC23A598592

/* i=     48 atan(3FC00000...) */  1.24354994546761438E-01, -3.1253241424539383
/* i=     48 atan(3FC00000...)           3FBFD5BA9AAC2F6E,          BC4CD376867

/* i=     49 atan(3FC10000...) */  1.32039761614638762E-01, -1.2769254007099595
/* i=     49 atan(3FC10000...)           3FC0E6ADCCF40882,          BC6D71A31BB

/* i=     50 atan(3FC20000...) */  1.39708874289163648E-01, -2.9579864247315813
/* i=     50 atan(3FC20000...)           3FC1E1FAFB043727,          BC4B485914D

/* i=     51 atan(3FC30000...) */  1.47361481088651630E-01,  5.4095991476662979
/* i=     51 atan(3FC30000...)           3FC2DCBDB2FBA1FF,          3C58F287055
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/* i=     52 atan(3FC40000...) */  1.54996741923940973E-01,  9.5854155941143238
/* i=     52 atan(3FC40000...)           3FC3D6EEE8C6626C,          3C661A3B0CE

/* i=     53 atan(3FC50000...) */  1.62613828597948568E-01,  7.7844706431062524
/* i=     53 atan(3FC50000...)           3FC4D087A9DA4F17,          3C61F323F1A

/* i=     54 atan(3FC60000...) */  1.70211925285474408E-01, -3.5411640798021251
/* i=     54 atan(3FC60000...)           3FC5C9811E3EC26A,          BC5054AB2C0

/* i=     55 atan(3FC70000...) */  1.77790228992676075E-01, -4.0295821008544223
/* i=     55 atan(3FC70000...)           3FC6C1D4898933D9,          BC52954A760

/* i=     56 atan(3FC80000...) */  1.85347949995694761E-01,  4.1806922688430789
/* i=     56 atan(3FC80000...)           3FC7B97B4BCE5B02,          3C5347B0B4F

/* i=     57 atan(3FC90000...) */  1.92884312257974672E-01, -7.4145901762472457
/* i=     57 atan(3FC90000...)           3FC8B06EE2879C29,          BC6118CD303

/* i=     58 atan(3FCA0000...) */  2.00398553825878512E-01,  3.1399542871844492
/* i=     58 atan(3FCA0000...)           3FC9A6A8E96C8626,          3C4CF601E7B

/* i=     59 atan(3FCB0000...) */  2.07889927202262986E-01,  7.3331606665208985
/* i=     59 atan(3FCB0000...)           3FCA9C231B403279,          3C60E8BBE89

/* i=     60 atan(3FCC0000...) */  2.15357699697738048E-01,  4.7381601300787319
/* i=     60 atan(3FCC0000...)           3FCB90D7529260A2,          3C217B10D2E

/* i=     61 atan(3FCD0000...) */  2.22801153759394521E-01, -5.4988221724468431
/* i=     61 atan(3FCD0000...)           3FCC84BF8A742E6E,          BC595BDD068

/* i=     62 atan(3FCE0000...) */  2.30219587276843718E-01,  1.2313404529142703
/* i=     62 atan(3FCE0000...)           3FCD77D5DF205736,          3C6C648D153

/* i=     63 atan(3FCF0000...) */  2.37612313865471242E-01,  1.0582314313711129
/* i=     63 atan(3FCF0000...)           3FCE6A148E96EC4D,          3C6866B2202

/* i=     64 atan(3FD00000...) */  2.44978663126864143E-01,  1.0698755618734451
/* i=     64 atan(3FD00000...)           3FCF5B75F92C80DD,          3C68AB6E3CF

/* i=     65 atan(3FD10000...) */  2.59629629408257512E-01,  1.9238754924615304
/* i=     65 atan(3FD10000...)           3FD09DC597D86362,          3C762E47390

/* i=     66 atan(3FD20000...) */  2.74167451119658789E-01,  8.2613535751637719
/* i=     66 atan(3FD20000...)           3FD18BF5A30BF178,          3C630CA4748

/* i=     67 atan(3FD30000...) */  2.88587361894077410E-01, -1.4283699573772570
/* i=     67 atan(3FD30000...)           3FD278372057EF46,          BC7077CDD36

/* i=     68 atan(3FD40000...) */  3.02884868374971417E-01, -1.1010827903001369
/* i=     68 atan(3FD40000...)           3FD362773707EBCC,          BC6963A544B

/* i=     69 atan(3FD50000...) */  3.17055753209147029E-01, -1.8939289242926421
/* i=     69 atan(3FD50000...)           3FD44AA436C2AF0A,          BC75D5E43C5

/* i=     70 atan(3FD60000...) */  3.31096076704132103E-01, -7.9526103757937987
/* i=     70 atan(3FD60000...)           3FD530AD9951CD4A,          BC625664808

/* i=     71 atan(3FD70000...) */  3.45002177207105132E-01, -2.2938804755578303
/* i=     71 atan(3FD70000...)           3FD614840309CFE2,          BC7A7257157

/* i=     72 atan(3FD80000...) */  3.58770670270572245E-01, -2.4623815582638634
/* i=     72 atan(3FD80000...)           3FD6F61941E4DEF1,          BC7C63AAE6F

/* i=     73 atan(3FD90000...) */  3.72398446676754202E-01,  1.9612311504845653
/* i=     73 atan(3FD90000...)           3FD7D5604B63B3F7,          3C769C885C2
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260 /* i=     74 atan(3FDA0000...) */  3.85882669398073752E-01,  2.3788227324919408
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263 /* i=     75 atan(3FDB0000...) */  3.99220769575252543E-01,  2.2465981056170420
264 /* i=     75 atan(3FDB0000...)            3FD98CD5454D6B18,          3C79E6C988F

266 /* i=     76 atan(3FDC0000...) */  4.12410441597387323E-01, -1.5876522277706890
267 /* i=     76 atan(3FDC0000...)            3FDA64EEC3CC23FD,          BC724DEC1B5

269 /* i=     77 atan(3FDD0000...) */  4.25449637370042266E-01,  2.3315530741892884
270 /* i=     77 atan(3FDD0000...)            3FDB3A911DA65C6C,          3C7AE187B1C

272 /* i=     78 atan(3FDE0000...) */  4.38336559857957830E-01, -2.4942770306265409
273 /* i=     78 atan(3FDE0000...)            3FDC0DB4C94EC9F0,          BC7CC1CE709

275 /* i=     79 atan(3FDF0000...) */  4.51069655988523499E-01, -2.2703795229420474
276 /* i=     79 atan(3FDF0000...)            3FDCDE53432C1351,          BC7A2CFA441

278 /* i=     80 atan(3FE00000...) */  4.63647609000806094E-01,  2.2698777452961687
279 /* i=     80 atan(3FE00000...)            3FDDAC670561BB4F,          3C7A2B7F222

281 /* i=     81 atan(3FE10000...) */  4.88333951056405535E-01, -1.1373236189329584
282 /* i=     81 atan(3FE10000...)            3FDF40DD0B541418,          BC6A3992DC3

284 /* i=     82 atan(3FE20000...) */  5.12389460310737732E-01, -2.5462781472855803
285 /* i=     82 atan(3FE20000...)            3FE0657E94DB30D0,          BC7D5B495F6

287 /* i=     83 atan(3FE30000...) */  5.35811237960463704E-01, -4.0637956834825575
288 /* i=     83 atan(3FE30000...)            3FE1255D9BFBD2A9,          BC52BDAEE1C

290 /* i=     84 atan(3FE40000...) */  5.58599315343562441E-01, -5.4556305485916263
291 /* i=     84 atan(3FE40000...)            3FE1E00BABDEFEB4,          BC5928DF287

293 /* i=     85 atan(3FE50000...) */  5.80756353567670414E-01, -1.4414643781930669
294 /* i=     85 atan(3FE50000...)            3FE2958E59308E31,          BC709E73B0C

296 /* i=     86 atan(3FE60000...) */  6.02287346134964152E-01,  2.9504307372284023
297 /* i=     86 atan(3FE60000...)            3FE345F01CCE37BB,          3C81021137C

299 /* i=     87 atan(3FE70000...) */  6.23199329934065904E-01,  2.6724038851400950
300 /* i=     87 atan(3FE70000...)            3FE3F13FB89E96F4,          3C7ECF8B492

302 /* i=     88 atan(3FE80000...) */  6.43501108793284371E-01,  1.5834785051444286
303 /* i=     88 atan(3FE80000...)            3FE4978FA3269EE1,          3C72419A87F

305 /* i=     89 atan(3FE90000...) */  6.63202992706093286E-01, -3.0760548644296490
306 /* i=     89 atan(3FE90000...)            3FE538F57B89061F,          BC81BB74ABD

308 /* i=     90 atan(3FEA0000...) */  6.82316554874748071E-01,  6.9432236715600077
309 /* i=     90 atan(3FEA0000...)            3FE5D58987169B18,          3C60028E4BC

311 /* i=     91 atan(3FEB0000...) */  7.00854407884450192E-01, -1.9876262343358161
312 /* i=     91 atan(3FEB0000...)            3FE66D663923E087,          BC76EA6FEBE

314 /* i=     92 atan(3FEC0000...) */  7.18829999621624527E-01, -2.1478388444456983
315 /* i=     92 atan(3FEC0000...)            3FE700A7C5784634,          BC78C34D25A

317 /* i=     93 atan(3FED0000...) */  7.36257428981428097E-01,  3.4739376482994567
318 /* i=     93 atan(3FED0000...)            3FE78F6BBD5D315E,          3C8406A0898

320 /* i=     94 atan(3FEE0000...) */  7.53151280962194414E-01, -2.4256934659182068
321 /* i=     94 atan(3FEE0000...)            3FE819D0B7158A4D,          BC7BF76229D

323 /* i=     95 atan(3FEF0000...) */  7.69526480405658297E-01, -3.7049919056027212
324 /* i=     95 atan(3FEF0000...)            3FE89FF5FF57F1F8,          BC855B9A5E1
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326 /* i=     96 atan(3FF00000...) */  7.85398163397448279E-01,  3.0616169978683830
327 /* i=     96 atan(3FF00000...)            3FE921FB54442D18,          3C81A626331

329 /* i=     97 atan(3FF10000...) */  8.15691923316223422E-01, -1.0714565627787430
330 /* i=     97 atan(3FF10000...)            3FEA1A25F2C82506,          BC68B4C3611

332 /* i=     98 atan(3FF20000...) */  8.44153986113171051E-01, -4.8413370119349167
333 /* i=     98 atan(3FF20000...)            3FEB034F38649C88,          BC8BE88D693

335 /* i=     99 atan(3FF30000...) */  8.70903457075652976E-01, -2.2698235907472870
336 /* i=     99 atan(3FF30000...)            3FEBDE70ED439FE7,          BC7A2B56372

338 /* i=    100 atan(3FF40000...) */  8.96055384571343927E-01,  2.9238762857743048
339 /* i=    100 atan(3FF40000...)            3FECAC7C57846F9E,          3C80DAE13AD

341 /* i=    101 atan(3FF50000...) */  9.19719605350416858E-01, -4.0574394128527679
342 /* i=    101 atan(3FF50000...)            3FED6E57CF4F0ACA,          BC8763B9456

344 /* i=    102 atan(3FF60000...) */  9.42000040379463610E-01,  5.4608374858466876
345 /* i=    102 atan(3FF60000...)            3FEE24DD44C855D1,          3C8F7AC612A

347 /* i=    103 atan(3FF70000...) */  9.62994330680936206E-01, -3.9866605952107524
348 /* i=    103 atan(3FF70000...)            3FEED0D97C9041C9,          BC52629E3B5

350 /* i=    104 atan(3FF80000...) */  9.82793723247329054E-01,  1.3903311031230998
351 /* i=    104 atan(3FF80000...)            3FEF730BD281F69B,          3C7007887AF

353 /* i=    105 atan(3FF90000...) */  1.00148313569423464E+00,  9.4383080235453920
354 /* i=    105 atan(3FF90000...)            3FF006132E34D617,          3C9B343DFA8

356 /* i=    106 atan(3FFA0000...) */  1.01914134426634972E+00,  1.0004018869366798
357 /* i=    106 atan(3FFA0000...)            3FF04E67277A01D7,          3C67115496C

359 /* i=    107 atan(3FFB0000...) */  1.03584125300880014E+00,  3.1943139817845037
360 /* i=    107 atan(3FFB0000...)            3FF092CE471853CC,          3C8269F9B3E

362 /* i=    108 atan(3FFC0000...) */  1.05165021254837376E+00, -9.6505647314675135
363 /* i=    108 atan(3FFC0000...)            3FF0D38F2C5BA09F,          BC9BD0DC231

365 /* i=    109 atan(3FFD0000...) */  1.06663036531574362E+00, -5.9565896371603745
366 /* i=    109 atan(3FFD0000...)            3FF110EB007F39F7,          BC912B2FF85

368 /* i=    110 atan(3FFE0000...) */  1.08083900054116833E+00, -1.5676322511359072
369 /* i=    110 atan(3FFE0000...)            3FF14B1DD5F90CE1,          BC7212D570A

371 /* i=    111 atan(3FFF0000...) */  1.09432890732118993E+00, -5.4906761550223642
372 /* i=    111 atan(3FFF0000...)            3FF1825F074030D9,          BC59523F0AF

374 /* i=    112 atan(40000000...) */  1.10714871779409041E+00,  9.4044713735663794
375 /* i=    112 atan(40000000...)            3FF1B6E192EBBE44,          3C9B1B466A8

377 /* i=    113 atan(40010000...) */  1.13095374397916038E+00,  7.1238338045384463
378 /* i=    113 atan(40010000...)            3FF21862F3FADE36,          3C94887628D

380 /* i=    114 atan(40020000...) */  1.15257199721566761E+00, -9.1597385089003788
381 /* i=    114 atan(40020000...)            3FF270EF55A53A25,          BC9A66B1AF5

383 /* i=    115 atan(40030000...) */  1.17227388112847630E+00,  8.3851886140286743
384 /* i=    115 atan(40030000...)            3FF2C1A241D66DC3,          3C982B2D58B

386 /* i=    116 atan(40040000...) */  1.19028994968253166E+00,  7.6833336298420688
387 /* i=    116 atan(40040000...)            3FF30B6D796A4DA8,          3C96254CB03

389 /* i=    117 atan(40050000...) */  1.20681737028525249E+00,  4.1724676388614391
390 /* i=    117 atan(40050000...)            3FF34F1FBB19EB09,          3C880D79B4C
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392 /* i=     118 atan(40060000...) */  1.2220253231098967E+00, -2.9791628648928492
393 /* i=     118 atan(40060000...)           3FF38D6A6CE13353,          BC812C77E8A

395 /* i=     119 atan(40070000...) */  1.2360594894780818 6E+00,  7.8797527394594212
396 /* i=     119 atan(40070000...)           3FF3C6E650B38047,          3C96B63B358

398 /* i=     120 atan(40080000...) */  1.2490457723982544 3E+00, -2.1962037996123112
399 /* i=     120 atan(40080000...)           3FF3FC176B7A8560,          BC4441A3BD3

401 /* i=     121 atan(40090000...) */  1.2610933822524403 9E+00,  3.2421396215349605
402 /* i=     121 atan(40090000...)           3FF42D70411F9EC1,          3C82B08DB7F

404 /* i=     122 atan(400A0000...) */  1.2722973952087173 2E+00,  2.2458750150345070
405 /* i=     122 atan(400A0000...)           3FF45B54837351A0,          3C79E4A72EE

407 /* i=     123 atan(400B0000...) */  1.2827408797442707 6E+00, -9.2831887542661294
408 /* i=     123 atan(400B0000...)           3FF4861B4CFBE710,          BC6567D3D25

410 /* i=     124 atan(400C0000...) */  1.2924966677897853 4E+00, -6.8308047689266603
411 /* i=     124 atan(400C0000...)           3FF4AE10FC6589A5,          BC93B03E8A2

413 /* i=     125 atan(400D0000...) */  1.3016288340091961 6E+00, -1.2369184998246266
414 /* i=     125 atan(400D0000...)           3FF4D378C1999A0D,          BC6C857A639

416 /* i=     126 atan(400E0000...) */  1.3101939350475555 6E+00,  8.7454137347802788
417 /* i=     126 atan(400E0000...)           3FF4F68DEA672617,          3C9934F9F2B

419 /* i=     127 atan(400F0000...) */  1.3182420510168371 1E+00, -6.3193940311446762
420 /* i=     127 atan(400F0000...)           3FF51784FA1544BA,          BC9236E3C85

422 /* i=     128 atan(40100000...) */  1.3258176636680325 5E+00, -8.8244293739511363
423 /* i=     128 atan(40100000...)           3FF5368C951E9CFD,          BC996F47948

425 /* i=     129 atan(40110000...) */  1.3397056595899957 E+00, -2.5990118603041343
426 /* i=     129 atan(40110000...)           3FF56F6F33A3E6A7,          BC7DF6EDD6F

428 /* i=     130 atan(40120000...) */  1.3521273809209546 4E+00,  2.1476742507511509
429 /* i=     130 atan(40120000...)           3FF5A25052114E60,          3C78C2D0C89

431 /* i=     131 atan(40130000...) */  1.3633001003596938 4E+00,  1.0932461715269362
432 /* i=     131 atan(40130000...)           3FF5D013C41ADABD,          3C9F82BBA19

434 /* i=     132 atan(40140000...) */  1.3734007669450158 9E+00, -3.3077103557695165
435 /* i=     132 atan(40140000...)           3FF5F97315254857,          BC831151A43

437 /* i=     133 atan(40150000...) */  1.3825748214901258 9E+00, -3.5614904386482301
438 /* i=     133 atan(40150000...)           3FF61F06C6A92B89,          BC8487D50BC

440 /* i=     134 atan(40160000...) */  1.3909428270024184 5E+00, -9.8437121334888425
441 /* i=     134 atan(40160000...)           3FF6414D44094C7C,          BC9C5F60A65

443 /* i=     135 atan(40170000...) */  1.3986055122719576 2E+00, -2.3240611825916279
444 /* i=     135 atan(40170000...)           3FF660B02C736A06,          BC7ACB6AFB3

446 /* i=     136 atan(40180000...) */  1.4056476493802698 7E+00, -8.9226301382344923
447 /* i=     136 atan(40180000...)           3FF67D8863BC99BD,          BC99B7BD2E1

449 /* i=     137 atan(40190000...) */  1.4121410646084953 1E+00, -9.5738071105572232
450 /* i=     137 atan(40190000...)           3FF698213A9D5053,          BC9B9839085

452 /* i=     138 atan(401A0000...) */  1.4181469983996315 4E+00, -8.2638837825110136
453 /* i=     138 atan(401A0000...)           3FF6B0BAE830C070,          BC97D1AB82F

455 /* i=     139 atan(401B0000...) */  1.4237179714064940 3E+00,  8.7218709222239675
456 /* i=     139 atan(401B0000...)           3FF6C78C7EDEB195,          3C99239AD62
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458 /* i=     140 atan(401C0000...) */  1.4288992721907327 6E+00, -6.4571347432387543
459 /* i=     140 atan(401C0000...)           3FF6DCC57BB565FD,          BC929C86447

461 /* i=     141 atan(401D0000...) */  1.4337301524847090 3E+00, -4.3962044667676361
462 /* i=     141 atan(401D0000...)           3FF6F08F07435FEC,          BC8957A7170

464 /* i=     142 atan(401E0000...) */  1.4382447944982226 2E+00, -2.4930199102645655
465 /* i=     142 atan(401E0000...)           3FF7030CF9403197,          BC7CBE18962

467 /* i=     143 atan(401F0000...) */  1.4424730991091019 3E+00, -1.1051194354303157
468 /* i=     143 atan(401F0000...)           3FF7145EAC2088A4,          BC9FDA5797B

470 /* i=     144 atan(40200000...) */  1.4464413322481350 9E+00,  9.2113239715450515
471 /* i=     144 atan(40200000...)           3FF7249FAA996A21,          3C9A8CC1E74

473 /* i=     145 atan(40210000...) */  1.4536875822280324 0E+00, -6.8187692501513467
474 /* i=     145 atan(40210000...)           3FF7424DE90454D4,          BC93A75D182

476 /* i=     146 atan(40220000...) */  1.4601391056210009 1E+00,  6.2609747078308441
477 /* i=     146 atan(40220000...)           3FF75CBAD2A40BD5,          3C920BC8AF3

479 /* i=     147 atan(40230000...) */  1.4659193880646628 2E+00, -9.7112555540748321
480 /* i=     147 atan(40230000...)           3FF77467E364F601,          BC9BFDA44F3

482 /* i=     148 atan(40240000...) */  1.4711276743037347 0E+00, -1.0849222762061423
483 /* i=     148 atan(40240000...)           3FF789BD2C160054,          BC9F45503CC

485 /* i=     149 atan(40250000...) */  1.4758446204521402 7E+00,  3.3875596727663147
486 /* i=     149 atan(40250000...)           3FF79D0F3FAD1C92,          3C838727DC4

488 /* i=     150 atan(40260000...) */  1.4801364395941514 2E+00,  8.5026254760796697
489 /* i=     150 atan(40260000...)           3FF7AEA38C1ACBD1,          3C9881D48AE

491 /* i=     151 atan(40270000...) */  1.4840579881189115 4E+00, -3.4454510678635940
492 /* i=     151 atan(40270000...)           3FF7BEB396C5699A,          BC83DC969C7

494 /* i=     152 atan(40280000...) */  1.4876550949064553 1E+00,  7.8443717394610766
495 /* i=     152 atan(40280000...)           3FF7CD6F6DC59DB4,          3C969C1FED6

497 /* i=     153 atan(40290000...) */  1.4909663410826592 4E+00,  6.2214347600201221
498 /* i=     153 atan(40290000...)           3FF7DAFF85A63058,          3C91EE9BCCA

500 /* i=     154 atan(402A0000...) */  1.4940244355251186 5E+00, -7.4764175027764594
501 /* i=     154 atan(402A0000...)           3FF7E7862AA0157C,          BC958C9F564

503 /* i=     155 atan(402B0000...) */  1.4968572891369562 6E+00,  1.6960076212551171
504 /* i=     155 atan(402B0000...)           3FF7F320A0F9F587,          3C738DBB209

506 /* i=     156 atan(402C0000...) */  1.4994888620096062 9E+00, -8.6923396045110498
507 /* i=     156 atan(402C0000...)           3FF7FDE80870C2A0,          BC3008D760C

509 /* i=     157 atan(402D0000...) */  1.5019398374938519 6E+00,  6.0618995840758136
510 /* i=     157 atan(402D0000...)           3FF807F2112987C7,          3C9178E474E

512 /* i=     158 atan(402E0000...) */  1.5042281630190728 1E+00,  9.1377815342268471
513 /* i=     158 atan(402E0000...)           3FF811518CDE39A6,          3C6511FE80F

515 /* i=     159 atan(402F0000...) */  1.5063694873693431 7E+00, -1.0553391013319709
516 /* i=     159 atan(402F0000...)           3FF81A16E43F190B,          BC9E6B07333

518 /* i=     160 atan(40300000...) */  1.5083775167989392 8E+00, -6.6075234508751205
519 /* i=     160 atan(40300000...)           3FF82250768AC529,          BC5E78C96D0

521 /* i=     161 atan(40310000...) */  1.5120405040791740 1E+00, -8.1782724869630649
522 /* i=     161 atan(40310000...)           3FF831516233F561,          BC97927FFEC
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/* i=   162 atan(40320000...) */  1.5152978215491796E+00,  9.2726583832060039
/* i=   162 atan(40320000...)            3FF83EA8EDB40F72,          3C9ABA03A56

/* i=   163 atan(40330000...) */  1.5182132651839548E+00,  7.1405321156001617
/* i=   163 atan(40330000...)            3FF84A99FE25186B,          3C9494C8619

/* i=   164 atan(40340000...) */  1.5208379310729538E+00,  1.6427546478977679
/* i=   164 atan(40340000...)            3FF8555A2787981F,          3C72F08E517

/* i=   165 atan(40350000...) */  1.5232132235179132E+00,  6.0651497755514614
/* i=   165 atan(40350000...)            3FF85F14D43D81BE,          3C5BF8770A7

/* i=   166 atan(40360000...) */  1.5253730473733196E+00,  2.4829833857003943
/* i=   166 atan(40360000...)            3FF867ED918AB138,          3C7CA07933F

/* i=   167 atan(40370000...) */  1.5273454314033659E+00, -9.4700421078009354
/* i=   167 atan(40370000...)            3FF87001C35928D4,          BC9B4BA860A

/* i=   168 atan(40380000...) */  1.5291537476963082E+00,  9.9602586103304809
/* i=   168 atan(40380000...)            3FF87769EB8E956B,          3C66F77FB9B

/* i=   169 atan(40390000...) */  1.5308176396716067E+00, -8.9133476334987223
/* i=   169 atan(40390000...)            3FF87E3AA32878AE,          BC99B0E3C3B

/* i=   170 atan(403A0000...) */  1.5323537367737086E+00,  7.3587623411192376
/* i=   170 atan(403A0000...)            3FF884855A158B25,          3C9535CEE7C

/* i=   171 atan(403B0000...) */  1.5337762109209665E+00,  9.3773548065728438
/* i=   171 atan(403B0000...)            3FF88A58EC949D14,          3C9B07443DD

/* i=   172 atan(403C0000...) */  1.5350972141155725E+00,  1.1061655545850178
/* i=   172 atan(403C0000...)            3FF88FC218ACE9DB,          3C9FE20FA7E

/* i=   173 atan(403D0000...) */  1.5363272257953886E+00, -1.7337321709389490
/* i=   173 atan(403D0000...)            3FF894CBDB6BEDFC,          BC3FFB5195F

/* i=   174 atan(403E0000...) */  1.5374753309166493E+00,  8.1168586007612420
/* i=   174 atan(403E0000...)            3FF8997FBB8B19C0,          3C97652F3D7

/* i=   175 atan(403F0000...) */  1.5385494443596428E+00, -1.0466306714301388
/* i=   175 atan(403F0000...)            3FF89DE605ACDBB3,          BC9E2AC570E

/* i=   176 atan(40400000...) */  1.5395564933646284E+00, -6.5948754553328312
/* i=   176 atan(40400000...)            3FF8A205FD558740,          BC930228C09

/* i=   177 atan(40410000...) */  1.5413930385908916E+00, -1.0257462197987628
/* i=   177 atan(40410000...)            3FF8A98BBF307AA8,          BC9D90ABD3C

/* i=   178 atan(40420000...) */  1.5430256902014756E+00, -3.6541001787278140
/* i=   178 atan(40420000...)            3FF8B03BB4C4D9C4,          BC851080044

/* i=   179 atan(40430000...) */  1.5444866095419744E+00, -4.8488696289655212
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/* i=   180 atan(40440000...) */  1.5458015331759764E+00, -1.2801774969469343
/* i=   180 atan(40440000...)            3FF8BB9A63718F45,          BC379D77A13

/* i=   181 atan(40450000...) */  1.5469913006098266E+00,  8.4038715647646991
/* i=   181 atan(40450000...)            3FF8C079F3350D26,          3C9838F674C

/* i=   182 atan(40460000...) */  1.5480729659532555E+00,  5.6337809464156819
/* i=   182 atan(40460000...)            3FF8C4E82889748C,          3C903CFF21E

/* i=   183 atan(40470000...) */  1.5490606199531039E+00,  1.0772067194703988
/* i=   183 atan(40470000...)            3FF8C8F3C9E38564,          3C9F0C61F67
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/* i=   184 atan(40480000...) */  1.5499660067586795E+00, -3.6586720263161075
/* i=   184 atan(40480000...)            3FF8CCA927CF0B3D,          BC85173F363

/* i=   185 atan(40490000...) */  1.5507989928217461E+00,  3.8815832274879404
/* i=   185 atan(40490000...)            3FF8D0129ACD6D1C,          3C866034AEC

/* i=   186 atan(404A0000...) */  1.5515679276951895E+00, -6.2593922082152636
/* i=   186 atan(404A0000...)            3FF8D338E42F92C4,          BC920A9DC23

/* i=   187 atan(404B0000...) */  1.5522799247268875E+00,  1.0305803826889237
/* i=   187 atan(404B0000...)            3FF8D623796F0778,          3C9DB4574D8

/* i=   188 atan(404C0000...) */  1.5529410816553442E+00, -6.3798789354713583
/* i=   188 atan(404C0000...)            3FF8D8D8BF65316F,          BC9263850ED

/* i=   189 atan(404D0000...) */  1.5535566556003668E+00,  1.0363637861762022
/* i=   189 atan(404D0000...)            3FF8DB5E3944965E,          3C9DDF03D7D

/* i=   190 atan(404E0000...) */  1.5541312030809560E+00, -1.1003278447465395
/* i=   190 atan(404E0000...)            3FF8DDB8AE2ED03E,          BC9FB6FC889

/* i=   191 atan(404F0000...) */  1.5546868629512603E+00,  7.1264237532612939
/* i=   191 atan(404F0000...)            3FF8DFEC478573A0,          3C948A5F631

/* i=   192 atan(40500000...) */  1.5551725981744198E+00,  1.4886166119650497
/* i=   192 atan(40500000...)            3FF8E1FCA98CB633,          3C71299EE93

};
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```
**********************************************************
   15244 Sat May 10 12:09:49 2014
new/usr/src/lib/libmvec/common/__vTBL_atan2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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#include "libm_inlines.h"

const double __vlibm_TBL_atan2[] = {
 7.8539816339744827900e-01,  3.0616169978683830179e-17,
 1.0000000000000000000e+00,  0,
 7.7198951265061121400e-01,  2.6989956960083153652e-16,
 9.7353506088256835938e-01,  0,
 7.6068143954461309164e-01, -3.5178810518941914972e-16,
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 7.1699492488093774512e-01, -4.0468841511547224071e-16,
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 7.5275802612304687500e-01,  0,
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 5.7748303053627658699e-01,  4.9400383775709159558e-17,
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**********************************************************
    8499 Sat May 10 12:09:49 2014
new/usr/src/lib/libmvec/common/__vTBL_rsqrt.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 *
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 */

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 */
/*
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 */

#pragma align 32 (__vlibm_TBL_rsqrt)

/*
 i = [0,128]
 TBL[2*i   ] = (double)(1.0 / sqrtl(*(double*)&(0x3fe0000000000000LL + (i << 46))
 TBL[2*i+1] = (double)(1.0 / sqrtl(*(double*)&(0x3fe0000000000000LL + (i << 46))
*/

const double __vlibm_TBL_rsqrt[] = {
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new/usr/src/lib/libmvec/common/__vTBL_sincos.c
patch01 - 693 import Sun Devpro Math Library
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};
```

```
**********************************************************
   10365 Sat May 10 12:09:50 2014
new/usr/src/lib/libmvec/common/__vTBL_sincos2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 */

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 */

/*
 * Let arg(x) denote a double precision number near x such that both
 * sin(arg(x)) and cos(arg(x)) are approximated by double precision
 * numbers to within a relative error less than 2^-61.
 *
 * Then for i = 5, ..., 101
 *
 *   __vlibm_TBL_sincos2[4*i]   := arg(i/128),
 *   __vlibm_TBL_sincos2[4*i+1] := sin(arg(i/128)), and
 *   __vlibm_TBL_sincos2[4*i+2] := cos(arg(i/128))
 *
 * (For i = 0, ..., 4, use zero instead of arg(i/128) above.)
 */
const double __vlibm_TBL_sincos2[] = {
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**********************************************************
   25448 Sat May 10 12:09:50 2014
new/usr/src/lib/libmvec/common/__vTBL_sqrtf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

#pragma align 32 (__vlibm_TBL_sqrtf)

/*
 i = [0,255]
 TBL[2*i+0] = 1.0 / (*(double*)&(0x3ff0000000000000LL + (i << 44)));
 TBL[2*i+1] = sqrt(*(double*)&(0x3ff0000000000000LL + (i << 44)))/sqrt(2);
 TBL[512+2*i+0] = 1.0 / (*(double*)&(0x3ff0000000000000LL + (i << 44)));
 TBL[512+2*i+1] = sqrt(*(double*)&(0x3ff0000000000000LL + (i << 44)));
*/

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   11255 Sat May 10 12:09:50 2014
new/usr/src/lib/libmvec/common/__vatan.c
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include <sys/isa_defs.h>
#include "libm_inlines.h"

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

void
__vatan( int n, double * restrict x, int stridex, double * restrict y, int strid
{
  double  f , z, ans = 0.0L, ansu , ansl , tmp , poly , conup , conlo , dummy;
  double  f1,   ans1, ansu1, ansl1, tmp1, poly1, conup1, conlo1;
  double  f2,   ans2, ansu2, ansl2, tmp2, poly2, conup2, conlo2;
  int index, sign, intf, intflo, intz, argcount;
  int index1, sign1 = 0;
  int index2, sign2 = 0;
  double *yaddr,*yaddr1 = 0,*yaddr2 = 0;
  extern const double __vlibm_TBL_atan1[];
  extern double fabs( double );

/*    Power series  atan(x) = x + p1*x**3 + p2*x**5 + p3*x**7
```



```
 *    Error =  -3.08254E-18   On the interval  |x| < 1/64 */

/* define dummy names for readability.  Use parray to help compiler optimize loa
#define p3    parray[0]
#define p2    parray[1]
#define p1    parray[2]

  static const double parray[] = {
   -1.428029046844299722E-01,           /* p[3]         */
    1.999999917247000615E-01,           /* p[2]         */
   -3.333333333329292858E-01,           /* p[1]         */
    1.0,                                /* not used for p[0], though
   -1.0,                                /* used to flip sign of answer
  };

  if( n <= 0 ) return;          /* if no. of elements is 0 or neg, do nothing */
  do
  {
  LOOP0:

    f        = fabs(*x);                        /* fetch argument
    intf     = HI(x);                   /* upper half of x, as integer  */
    intflo   = LO(x);                   /* lower half of x, as integer  */
    sign     = intf &  0x80000000;              /* sign of argument
    intf     = intf & ~0x80000000;              /* abs(upper argument)

    if( (intf > 0x43600000) || (intf < 0x3e300000) ) /* filter out special cases
    {
      if(  (intf > 0x7ff00000) || ((intf == 0x7ff00000) &&  (intflo !=0) ) )
      {
        ans   = f - f;                          /* return NaN if x=NaN*/
      }
      else if( intf < 0x3e300000 )              /* avoid underflow for small arg
      {
        dummy = 1.0e37 + f;
        dummy = dummy;
        ans   = f;
      }
      else if( intf > 0x43600000 )              /* avoid underflow for big arg
      {
        index = 2;
        ans   = __vlibm_TBL_atan1[index] + __vlibm_TBL_atan1[index+1];/* pi/2 up
      }
      *y      = (sign) ? -ans: ans;             /* store answer, with sign bit
      x      += stridex;
      y      += stridey;
      argcount = 0;                             /* initialize argcount
      if ( --n <=0 ) break;                     /* we are done
      goto LOOP0;                               /* otherwise, examine next arg
    }

    index    = 0;                               /* points to 0,0 in table
    if (intf > 0x40500000)                      /* if(|x| > 64
    { f = -1.0/f;
      index  = 2;                               /* point to pi/2 upper, lower
    }
    else if( intf >= 0x3f900000 )               /* if |x| >= (1/64)...
    {
      intz   = (intf + 0x00008000) & 0x7fff0000;/* round arg, keep upper
      HI(&z)  = intz;                           /* store as a double (z)
      LO(&z)  = 0;                              /* ...lower
      f      = (f - z)/(1.0 + f*z);             /* get reduced argument
      index  = (intz - 0x3f900000) >> 15;       /* (index >> 16) << 1)
      index  = index + 4;                       /* skip over 0,0,pi/2,pi/2
    }
    yaddr    = y;                               /* address to store this answer
```

```
    x       += stridex;                         /* point to next arg
    y       += stridey;                         /* point to next result
    argcount = 1;                               /* we now have 1 good argument
    if ( --n <=0 )
    {
      f1      = 0.0;                            /* put dummy values in args 1,2
      f2      = 0.0;
      index1  = 0;
      index2  = 0;
      goto UNROLL3;                             /* finish up with 1 good arg
    }

    /*--------------------------------------------------------------------------
    /*--------------------------------------------------------------------------
    /*--------------------------------------------------------------------------

  LOOP1:

    f1       = fabs(*x);                        /* fetch argument
    intf     = HI(x);                   /* upper half of x, as integer  */
    intflo   = LO(x);                   /* lower half of x, as integer  */
    sign1    = intf &  0x80000000;              /* sign of argument
    intf     = intf & ~0x80000000;              /* abs(upper argument)

    if( (intf > 0x43600000) || (intf < 0x3e300000) ) /* filter out special cases
    {
      if(  (intf > 0x7ff00000) || ((intf == 0x7ff00000) &&  (intflo !=0) ) )
      {
        ans   = f1 - f1;                        /* return NaN if x=NaN*/
      }
      else if( intf < 0x3e300000 )              /* avoid underflow for small arg
      {
        dummy = 1.0e37 + f1;
        dummy = dummy;
        ans   = f1;
      }
      else if( intf > 0x43600000 )              /* avoid underflow for big arg
      {
        index1 = 2;
        ans   = __vlibm_TBL_atan1[index1] + __vlibm_TBL_atan1[index1+1];/* pi/2
      }
      *y      = (sign1) ? -ans: ans;            /* store answer, with sign bit
      x      += stridex;
      y      += stridey;
      argcount = 1;                             /* we still have 1 good arg
      if ( --n <=0 )
      {
        f1      = 0.0;                          /* put dummy values in args 1,2
        f2      = 0.0;
        index1  = 0;
        index2  = 0;
        goto UNROLL3;                           /* finish up with 1 good arg
      }
      goto LOOP1;                               /* otherwise, examine next arg
    }

    index1   = 0;                               /* points to 0,0 in table
    if (intf > 0x40500000)                      /* if(|x| > 64
    { f1 = -1.0/f1;
      index1 = 2;                               /* point to pi/2 upper, lower
    }
    else if( intf >= 0x3f900000 )               /* if |x| >= (1/64)...
    {
      intz   = (intf + 0x00008000) & 0x7fff0000;/* round arg, keep upper
      HI(&z) = intz;                            /* store as a double (z)
      LO(&z) = 0;                               /* ...lower
```



```
      f1     = (f1 - z)/(1.0 + f1*z);           /* get reduced argument
      index1 = (intz - 0x3f900000) >> 15;       /* (index >> 16) << 1)
      index1 = index1 + 4;                      /* skip over 0,0,pi/2,pi/2
    }
    yaddr1   = y;                               /* address to store this answer
    x       += stridex;                         /* point to next arg
    y       += stridey;                         /* point to next result
    argcount = 2;                               /* we now have 2 good arguments
    if ( --n <=0 )
    {
      f2      = 0.0;                            /* put dummy value in arg 2 */
      index2  = 0;
      goto UNROLL3;                             /* finish up with 2 good args
    }

    /*--------------------------------------------------------------------------
    /*--------------------------------------------------------------------------
    /*--------------------------------------------------------------------------

  LOOP2:

    f2       = fabs(*x);                        /* fetch argument
    intf     = HI(x);                   /* upper half of x, as integer  */
    intflo   = LO(x);                   /* lower half of x, as integer  */
    sign2    = intf &  0x80000000;              /* sign of argument
    intf     = intf & ~0x80000000;              /* abs(upper argument)

    if( (intf > 0x43600000) || (intf < 0x3e300000) ) /* filter out special cases
    {
      if(  (intf > 0x7ff00000) || ((intf == 0x7ff00000) &&  (intflo !=0) ) )
      {
        ans   = f2 - f2;                        /* return NaN if x=NaN*/
      }
      else if( intf < 0x3e300000 )              /* avoid underflow for small arg
      {
        dummy = 1.0e37 + f2;
        dummy = dummy;
        ans   = f2;
      }
      else if( intf > 0x43600000 )              /* avoid underflow for big arg
      {
        index2 = 2;
        ans   = __vlibm_TBL_atan1[index2] + __vlibm_TBL_atan1[index2+1];/* pi/2
      }
      *y      = (sign2) ? -ans: ans;            /* store answer, with sign bit
      x      += stridex;
      y      += stridey;
      argcount = 2;                             /* we still have 2 good args
      if ( --n <=0 )
      {
        f2      = 0.0;                          /* put dummy value in arg 2 */
        index2  = 0;
        goto UNROLL3;                           /* finish up with 2 good args
      }
      goto LOOP2;                               /* otherwise, examine next arg
    }

    index2   = 0;                               /* points to 0,0 in table
    if (intf > 0x40500000)                      /* if(|x| > 64
    { f2 = -1.0/f2;
      index2 = 2;                               /* point to pi/2 upper, lower
    }
    else if( intf >= 0x3f900000 )               /* if |x| >= (1/64)...
    {
      intz   = (intf + 0x00008000) & 0x7fff0000;/* round arg, keep upper
      HI(&z) = intz;                            /* store as a double (z)
```

```
259       LO(&z) = 0;                                   /* ...lower
260       f2     = (f2 - z)/(1.0 + f2*z);               /* get reduced argument
261       index2 = (intz - 0x3f900000) >> 15;           /* (index >> 16) << 1)
262       index2 = index2 + 4;                          /* skip over 0,0,pi/2,pi/2
263     }
264     yaddr2   = y;                                   /* address to store this answer
265     x       += stridex;                             /* point to next arg
266     y       += stridey;                             /* point to next result
267     argcount = 3;                                   /* we now have 3 good arguments


270 /* here is the 3 way unrolled section,
271    note, we may actually only have
272    1,2, or 3 'real' arguments at this point
273 */

275 UNROLL3:

277     conup    = __vlibm_TBL_atan1[index ];       /* upper table
278     conup1   = __vlibm_TBL_atan1[index1];       /* upper table
279     conup2   = __vlibm_TBL_atan1[index2];       /* upper table

281     conlo    = __vlibm_TBL_atan1[index +1];     /* lower table
282     conlo1   = __vlibm_TBL_atan1[index1+1];     /* lower table
283     conlo2   = __vlibm_TBL_atan1[index2+1];     /* lower table

285     tmp      = f *f ;
286     tmp1     = f1*f1;
287     tmp2     = f2*f2;

289     poly     = f *((p3*tmp  + p2)*tmp  + p1)*tmp ;
290     poly1    = f1*((p3*tmp1 + p2)*tmp1 + p1)*tmp1;
291     poly2    = f2*((p3*tmp2 + p2)*tmp2 + p1)*tmp2;

293     ansu     = conup  + f ;                     /* compute atan(f)  upper
294     ansu1    = conup1 + f1;                     /* compute atan(f)  upper
295     ansu2    = conup2 + f2;                     /* compute atan(f)  upper

297     ansl     = (((conup  - ansu ) + f ) + poly ) + conlo ;
298     ansl1    = (((conup1 - ansu1) + f1) + poly1) + conlo1;
299     ansl2    = (((conup2 - ansu2) + f2) + poly2) + conlo2;

301     ans      = ansu  + ansl ;
302     ans1     = ansu1 + ansl1;
303     ans2     = ansu2 + ansl2;

305 /* now check to see if these are 'real' or 'dummy' arguments BEFORE storing */

307    *yaddr    = sign ? -ans: ans;                /* this one is always good
308    if(argcount < 3) break;                      /* end loop and finish up
309      *yaddr1   = sign1 ? -ans1: ans1;
310      *yaddr2   = sign2 ? -ans2: ans2;

312   }  while (--n > 0);

314  if(argcount == 2)
315    {  *yaddr1  = sign1 ? -ans1: ans1;
316    }
317 }
```

```
**********************************************************
    8612 Sat May 10 12:09:50 2014
new/usr/src/lib/libmvec/common/__vatan2.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include <sys/isa_defs.h>
#include "libm_inlines.h"

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_atan2[];

static const double
zero    =  0.0,
twom3   =  0.125,
one             =  1.0,
two110  =  1.29807421463370690 71e+33,
pio4    =  7.85398163397448279 00e-01,
pio2    =  1.57079632679489655 80e+00,
pio2_lo =  6.12323399573676588 60e-17,
pi              =  3.14159265358979311 60e+00,
pi_lo   =  1.22464679914735317 72e-16,
p1              = -3.33333333333327571893331786354179101074860633009e-0001,
p2              =  1.99999999426716242300864976103947218174386313 79e-0001,
p3              = -1.42856965565428636896183013324727205980484158356e-0001,
```



```
p4              =  1.10894981496317081405107718475040168084164825641e-0001;

/* Don't __ the following; acomp will handle it */
extern double fabs( double );

void
__vatan2( int n, double * restrict y, int stridey, double * restrict x,
        int stridex, double * restrict z, int stridez )
{
        double          x0, x1, x2, y0, y1, y2, *pz0, *pz1, *pz2;
        double          ah0, ah1, ah2, al0, al1, al2, t0, t1, t2;
        double          z0, z1, z2, sign0, sign1, sign2, xh;
        int                     i, k, hx, hy, sx, sy;

        do
        {
loop0:
                hy = HI(y);
                sy = hy & 0x80000000;
                hy &= ~0x80000000;
                sign0 = ( sy )? -one : one;

                hx = HI(x);
                sx = hx & 0x80000000;
                hx &= ~0x80000000;

                if ( hy > hx || ( hy == hx && LO(y) > LO(x) ) )
                {
                        i = hx;
                        hx = hy;
                        hy = i;
                        x0 = fabs( *y );
                        y0 = fabs( *x );
                        if ( sx )
                        {
                                ah0 = pio2;
                                al0 = pio2_lo;
                        }
                        else
                        {
                                ah0 = -pio2;
                                al0 = -pio2_lo;
                                sign0 = -sign0;
                        }
                }
                else
                {
                        x0 = fabs( *x );
                        y0 = fabs( *y );
                        if ( sx )
                        {
                                ah0 = -pi;
                                al0 = -pi_lo;
                                sign0 = -sign0;
                        }
                        else
                                ah0 = al0 = zero;
                }

                if ( hx >= 0x7fe00000 || hx - hy >= 0x03600000 )
                {
                        if ( hx >= 0x7ff00000 )
                        {
                                if ( ( hx ^ 0x7ff00000 ) | LO(&x0) ) /* nan */
                                        ah0 =  x0 + y0;
                                else if ( hy >= 0x7ff00000 )
```

```
128                                     ah0 += pio4;
129                             *z = sign0 * ah0;
130                             x += stridex;
131                             y += stridey;
132                             z += stridez;
133                             i = 0;
134                             if ( --n <= 0 )
135                                     break;
136                             goto loop0;
137                     }
138                     if ( hx - hy >= 0x03600000 )
139                     {
140                             if ( (int) ah0 == 0 )
141                                     ah0 = y0 / x0;
142                             *z = sign0 * ah0;
143                             x += stridex;
144                             y += stridey;
145                             z += stridez;
146                             i = 0;
147                             if ( --n <= 0 )
148                                     break;
149                             goto loop0;
150                     }
151                     y0 *= twom3;
152                     x0 *= twom3;
153                     hy -= 0x00300000;
154                     hx -= 0x00300000;
155             }
156             else if ( hy < 0x00100000 )
157             {
158                     if ( ( hy | LO(&y0) ) == 0 )
159                     {
160                             *z = sign0 * ah0;
161                             x += stridex;
162                             y += stridey;
163                             z += stridez;
164                             i = 0;
165                             if ( --n <= 0 )
166                                     break;
167                             goto loop0;
168                     }
169                     y0 *= two110;
170                     x0 *= two110;
171                     hy = HI(&y0);
172                     hx = HI(&x0);
173             }

175             k = ( ( ( hx - hy ) + 0x00004000 ) >> 13 ) & ~0x3;
176             if ( k > 644 )
177                     k = 644;
178             ah0 += __vlibm_TBL_atan2[k];
179             al0 += __vlibm_TBL_atan2[k+1];
180             t0 = __vlibm_TBL_atan2[k+2];

182             xh = x0;
183             LO(&xh) = 0;
184             z0 = ( ( y0 - t0 * xh ) - t0 * ( x0 - xh ) ) / ( x0 + y0 * t0 );
185             pz0 = z;
186             x += stridex;
187             y += stridey;
188             z += stridez;
189             i = 1;
190             if ( --n <= 0 )
191                     break;

193 loop1:
```



```
194             hy = HI(y);
195             sy = hy & 0x80000000;
196             hy &= ~0x80000000;
197             sign1 = ( sy )? -one : one;

199             hx = HI(x);
200             sx = hx & 0x80000000;
201             hx &= ~0x80000000;

203             if ( hy > hx || ( hy == hx && LO(y) > LO(x) ) )
204             {
205                     i = hx;
206                     hx = hy;
207                     hy = i;
208                     x1 = fabs( *y );
209                     y1 = fabs( *x );
210                     if ( sx )
211                     {
212                             ah1 = pio2;
213                             al1 = pio2_lo;
214                     }
215                     else
216                     {
217                             ah1 = -pio2;
218                             al1 = -pio2_lo;
219                             sign1 = -sign1;
220                     }
221             }
222             else
223             {
224                     x1 = fabs( *x );
225                     y1 = fabs( *y );
226                     if ( sx )
227                     {
228                             ah1 = -pi;
229                             al1 = -pi_lo;
230                             sign1 = -sign1;
231                     }
232                     else
233                             ah1 = al1 = zero;
234             }

236             if ( hx >= 0x7fe00000 || hx - hy >= 0x03600000 )
237             {
238                     if ( hx >= 0x7ff00000 )
239                     {
240                             if ( ( hx ^ 0x7ff00000 ) | LO(&x1) ) /* nan */
241                                     ah1 =  x1 + y1;
242                             else if ( hy >= 0x7ff00000 )
243                                     ah1 += pio4;
244                             *z = sign1 * ah1;
245                             x += stridex;
246                             y += stridey;
247                             z += stridez;
248                             i = 1;
249                             if ( --n <= 0 )
250                                     break;
251                             goto loop1;
252                     }
253                     if ( hx - hy >= 0x03600000 )
254                     {
255                             if ( (int) ah1 == 0 )
256                                     ah1 = y1 / x1;
257                             *z = sign1 * ah1;
258                             x += stridex;
259                             y += stridey;
```

```
260                                 z += stridez;
261                                 i = 1;
262                                 if ( --n <= 0 )
263                                         break;
264                                 goto loop1;
265                         }
266                         y1 *= twom3;
267                         x1 *= twom3;
268                         hy -= 0x00300000;
269                         hx -= 0x00300000;
270                 }
271                 else if ( hy < 0x00100000 )
272                 {
273                         if ( ( hy | LO(&y1) ) == 0 )
274                         {
275                                 *z = sign1 * ah1;
276                                 x += stridex;
277                                 y += stridey;
278                                 z += stridez;
279                                 i = 1;
280                                 if ( --n <= 0 )
281                                         break;
282                                 goto loop1;
283                         }
284                         y1 *= two110;
285                         x1 *= two110;
286                         hy = HI(&y1);
287                         hx = HI(&x1);
288                 }

290                 k = ( ( ( hx - hy ) + 0x00004000 ) >> 13 ) & ~0x3;
291                 if ( k > 644 )
292                         k = 644;
293                 ah1 += __vlibm_TBL_atan2[k];
294                 al1 += __vlibm_TBL_atan2[k+1];
295                 t1 = __vlibm_TBL_atan2[k+2];

297                 xh = x1;
298                 LO(&xh) = 0;
299                 z1 = ( ( y1 - t1 * xh ) - t1 * ( x1 - xh ) ) / ( x1 + y1 * t1 );
300                 pz1 = z;
301                 x += stridex;
302                 y += stridey;
303                 z += stridez;
304                 i = 2;
305                 if ( --n <= 0 )
306                         break;

308 loop2:
309                 hy = HI(y);
310                 sy = hy & 0x80000000;
311                 hy &= ~0x80000000;
312                 sign2 = ( sy )? -one : one;

314                 hx = HI(x);
315                 sx = hx & 0x80000000;
316                 hx &= ~0x80000000;

318                 if ( hy > hx || ( hy == hx && LO(y) > LO(x) ) )
319                 {
320                         i = hx;
321                         hx = hy;
322                         hy = i;
323                         x2 = fabs( *y );
324                         y2 = fabs( *x );
325                         if ( sx )
```



```
326                         {
327                                 ah2 = pio2;
328                                 al2 = pio2_lo;
329                         }
330                         else
331                         {
332                                 ah2 = -pio2;
333                                 al2 = -pio2_lo;
334                                 sign2 = -sign2;
335                         }
336                 }
337                 else
338                 {
339                         x2 = fabs( *x );
340                         y2 = fabs( *y );
341                         if ( sx )
342                         {
343                                 ah2 = -pi;
344                                 al2 = -pi_lo;
345                                 sign2 = -sign2;
346                         }
347                         else
348                                 ah2 = al2 = zero;
349                 }

351                 if ( hx >= 0x7fe00000 || hx - hy >= 0x03600000 )
352                 {
353                         if ( hx >= 0x7ff00000 )
354                         {
355                                 if ( ( hx ^ 0x7ff00000 ) | LO(&x2) ) /* nan */
356                                         ah2 =  x2 + y2;
357                                 else if ( hy >= 0x7ff00000 )
358                                         ah2 += pio4;
359                                 *z = sign2 * ah2;
360                                 x += stridex;
361                                 y += stridey;
362                                 z += stridez;
363                                 i = 2;
364                                 if ( --n <= 0 )
365                                         break;
366                                 goto loop2;
367                         }
368                         if ( hx - hy >= 0x03600000 )
369                         {
370                                 if ( (int) ah2 == 0 )
371                                         ah2 = y2 / x2;
372                                 *z = sign2 * ah2;
373                                 x += stridex;
374                                 y += stridey;
375                                 z += stridez;
376                                 i = 2;
377                                 if ( --n <= 0 )
378                                         break;
379                                 goto loop2;
380                         }
381                         y2 *= twom3;
382                         x2 *= twom3;
383                         hy -= 0x00300000;
384                         hx -= 0x00300000;
385                 }
386                 else if ( hy < 0x00100000 )
387                 {
388                         if ( ( hy | LO(&y2) ) == 0 )
389                         {
390                                 *z = sign2 * ah2;
391                                 x += stridex;
```

```
392                                 y += stridey;
393                                 z += stridez;
394                                 i = 2;
395                                 if ( --n <= 0 )
396                                         break;
397                                 goto loop2;
398                         }
399                         y2 *= two110;
400                         x2 *= two110;
401                         hy = HI(&y2);
402                         hx = HI(&x2);
403                 }

405                 k = ( ( ( hx - hy ) + 0x00004000 ) >> 13 ) & ~0x3;
406                 if ( k > 644 )
407                         k = 644;
408                 ah2 += __vlibm_TBL_atan2[k];
409                 al2 += __vlibm_TBL_atan2[k+1];
410                 t2 = __vlibm_TBL_atan2[k+2];

412                 xh = x2;
413                 LO(&xh) = 0;
414                 z2 = ( ( y2 - t2 * xh ) - t2 * ( x2 - xh ) ) / ( x2 + y2 * t2 );
415                 pz2 = z;

417                 x0 = z0 * z0;
418                 x1 = z1 * z1;
419                 x2 = z2 * z2;

421                 t0 = ah0 + ( z0 + ( al0 + ( z0 * x0 ) * ( p1 + x0 *
422                         ( p2 + x0 * ( p3 + x0 * p4 ) ) ) ) );
423                 t1 = ah1 + ( z1 + ( al1 + ( z1 * x1 ) * ( p1 + x1 *
424                         ( p2 + x1 * ( p3 + x1 * p4 ) ) ) ) );
425                 t2 = ah2 + ( z2 + ( al2 + ( z2 * x2 ) * ( p1 + x2 *
426                         ( p2 + x2 * ( p3 + x2 * p4 ) ) ) ) );

428                 *pz0 = sign0 * t0;
429                 *pz1 = sign1 * t1;
430                 *pz2 = sign2 * t2;

432                 x += stridex;
433                 y += stridey;
434                 z += stridez;
435                 i = 0;
436         } while ( --n > 0 );

438         if ( i > 0 )
439         {
440                 if ( i > 1 )
441                 {
442                         x1 = z1 * z1;
443                         t1 = ah1 + ( z1 + ( al1 + ( z1 * x1 ) * ( p1 + x1 *
444                                 ( p2 + x1 * ( p3 + x1 * p4 ) ) ) ) );
445                         *pz1 = sign1 * t1;
446                 }

448                 x0 = z0 * z0;
449                 t0 = ah0 + ( z0 + ( al0 + ( z0 * x0 ) * ( p1 + x0 *
450                         ( p2 + x0 * ( p3 + x0 * p4 ) ) ) ) );
451                 *pz0 = sign0 * t0;
452         }
453 }
```

```
**********************************************************
    8571 Sat May 10 12:09:50 2014
new/usr/src/lib/libmvec/common/__vatan2f.c
patch09 - update libmvec: fix build issues by gcc46
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_atan1[];

static const double
pio4    =  7.85398163397448279e-01,
pio2    =  1.57079632679489655e+00,
pi      =  3.14159265358979311e+00;

static const float
zero    =  0.0f,
one     =  1.0f,
q1      = -3.33333333329642804e-01f,
q2      =  1.99999991868537526e-01f,
twop24  =  16777216.0f;

void
__vatan2f( int n, float * restrict y, int stridey, float * restrict x,
        int stridex, float * restrict z, int stridez )
{
        float           x0, x1, x2, y0, y1, y2, *pz0 = 0, *pz1, *pz2;
        double          ah0, ah1, ah2;
        double          t0, t1, t2;
        double          sx0, sx1, sx2;
        double          sign0, sign1, sign2;
        int             i, k0 = 0, k1, k2, hx, sx, sy;
```



```
        int             hy0, hy1, hy2;
        float           base0 = 0.0, base1, base2;
        double          num0, num1, num2;
        double          den0, den1, den2;
        double          dx0, dx1, dx2;
        double          dy0, dy1, dy2;
        double          db0, db1, db2;

        do
        {
loop0:
                hy0 = *(int*)y;
                hx = *(int*)x;
                sign0 = one;
                sy = hy0 & 0x80000000;
                hy0 &= ~0x80000000;

                sx = hx & 0x80000000;
                hx &= ~0x80000000;

                if ( hy0 > hx )
                {
                        x0 = *y;
                        y0 = *x;
                        i = hx;
                        hx = hy0;
                        hy0 = i;
                        if ( sy )
                        {
                                x0 = -x0;
                                sign0 = -sign0;
                        }
                        if ( sx )
                        {
                                y0 = -y0;
                                ah0 = pio2;
                        }
                        else
                        {
                                ah0 = -pio2;
                                sign0 = -sign0;
                        }
                }
                else
                {
                        y0 = *y;
                        x0 = *x;
                        if ( sy )
                        {
                                y0 = -y0;
                                sign0 = -sign0;
                        }
                        if ( sx )
                        {
                                x0 = -x0;
                                ah0 = -pi;
                                sign0 = -sign0;
                        }
                        else
                                ah0 = zero;
                }

                if ( hx >= 0x7f800000 || hx - hy0 >= 0x0c800000 )
                {
                        if ( hx >= 0x7f800000 )
                        {
```

```
126                                 if ( hx ^ 0x7f800000 ) /* nan */
127                                         ah0 =  x0 + y0;
128                                 else if ( hy0 >= 0x7f800000 )
129                                         ah0 += pio4;
130                         }
131                         else if ( (int) ah0 == 0 )
132                                 ah0 = y0 / x0;
133                         *z = (sign0 == one) ? ah0 : -ah0;
134 /* sign0*ah0 would change nan behavior relative to previous release */
135                         x += stridex;
136                         y += stridey;
137                         z += stridez;
138                         i = 0;
139                         if ( --n <= 0 )
140                                 break;
141                         goto loop0;
142                 }
143                 if (hy0 < 0x00800000) {
144                         if ( hy0 == 0 )
145                         {
146                                 *z = sign0 * (float) ah0;
147                                 x += stridex;
148                                 y += stridey;
149                                 z += stridez;
150                                 i = 0;
151                                 if ( --n <= 0 )
152                                         break;
153                                 goto loop0;
154                         }
155                         y0 *= twop24; /* scale subnormal y */
156                         x0 *= twop24; /* scale possibly subnormal x */
157                         hy0 = *(int*)&y0;
158                         hx = *(int*)&x0;
159                 }
160                 pz0 = z;

162                 k0 = ( hy0 - hx + 0x3f800000 ) & 0xfff80000;
163                 if( k0 >= 0x3C800000 )          /* if |x| >= (1/64)... */
164                 {
165                         *(int*)&base0 = k0;
166                         k0 = (k0 - 0x3C800000) >> 18; /* (index >> 19) << 1) */
167                         k0 += 4;
168                                 /* skip over 0,0,pi/2,pi/2 */
169                 }
170                 else                            /* |x| < 1/64 */
171                 {
172                         k0 = 0;
173                         base0 = zero;
174                 }

176                 x += stridex;
177                 y += stridey;
178                 z += stridez;
179                 i = 1;
180                 if ( --n <= 0 )
181                         break;


184 loop1:
185                 hy1 = *(int*)y;
186                 hx = *(int*)x;
187                 sign1 = one;
188                 sy = hy1 & 0x80000000;
189                 hy1 &= ~0x80000000;

191                 sx = hx & 0x80000000;
```



```
192                 hx &= ~0x80000000;

194                 if ( hy1 > hx )
195                 {
196                         x1 = *y;
197                         y1 = *x;
198                         i = hx;
199                         hx = hy1;
200                         hy1 = i;
201                         if ( sy )
202                         {
203                                 x1 = -x1;
204                                 sign1 = -sign1;
205                         }
206                         if ( sx )
207                         {
208                                 y1 = -y1;
209                                 ah1 = pio2;
210                         }
211                         else
212                         {
213                                 ah1 = -pio2;
214                                 sign1 = -sign1;
215                         }
216                 }
217                 else
218                 {
219                         y1 = *y;
220                         x1 = *x;
221                         if ( sy )
222                         {
223                                 y1 = -y1;
224                                 sign1 = -sign1;
225                         }
226                         if ( sx )
227                         {
228                                 x1 = -x1;
229                                 ah1 = -pi;
230                                 sign1 = -sign1;
231                         }
232                         else
233                                 ah1 = zero;
234                 }

236                 if ( hx >= 0x7f800000 || hx - hy1 >= 0x0c800000 )
237                 {
238                         if ( hx >= 0x7f800000 )
239                         {
240                                 if ( hx ^ 0x7f800000 ) /* nan */
241                                         ah1 =  x1 + y1;
242                                 else if ( hy1 >= 0x7f800000 )
243                                         ah1 += pio4;
244                         }
245                         else if ( (int) ah1 == 0 )
246                                 ah1 = y1 / x1;
247                         *z = (sign1 == one)? ah1 : -ah1;
248                         x += stridex;
249                         y += stridey;
250                         z += stridez;
251                         i = 1;
252                         if ( --n <= 0 )
253                                 break;
254                         goto loop1;
255                 }
256                 if (hy1 < 0x00800000) {
257                         if ( hy1 == 0 )
```

```
258                         {
259                                 *z = sign1 * (float) ah1;
260                                 x += stridex;
261                                 y += stridey;
262                                 z += stridez;
263                                 i = 1;
264                                 if ( --n <= 0 )
265                                         break;
266                                 goto loop1;
267                         }
268                         y1 *= twop24; /* scale subnormal y */
269                         x1 *= twop24; /* scale possibly subnormal x */
270                         hy1 = *(int*)&y1;
271                         hx = *(int*)&x1;
272                 }
273                 pz1 = z;
274
275                 k1 = ( hy1 - hx + 0x3f800000 ) & 0xfff80000;
276                 if( k1 >= 0x3C800000 )          /* if |x| >= (1/64)... */
277                 {
278                         *(int*)&base1 = k1;
279                         k1 = (k1 - 0x3C800000) >> 18; /* (index >> 19) << 1) */
280                         k1 += 4;
281                                 /* skip over 0,0,pi/2,pi/2 */
282                 }
283                 else                            /* |x| < 1/64 */
284                 {
285                         k1 = 0;
286                         base1 = zero;
287                 }
288
289                 x += stridex;
290                 y += stridey;
291                 z += stridez;
292                 i = 2;
293                 if ( --n <= 0 )
294                         break;
295
296 loop2:
297                 hy2 = *(int*)y;
298                 hx = *(int*)x;
299                 sign2 = one;
300                 sy = hy2 & 0x80000000;
301                 hy2 &= ~0x80000000;
302
303                 sx = hx & 0x80000000;
304                 hx &= ~0x80000000;
305
306                 if ( hy2 > hx )
307                 {
308                         x2 = *y;
309                         y2 = *x;
310                         i = hx;
311                         hx = hy2;
312                         hy2 = i;
313                         if ( sy )
314                         {
315                                 x2 = -x2;
316                                 sign2 = -sign2;
317                         }
318                         if ( sx )
319                         {
320                                 y2 = -y2;
321                                 ah2 = pio2;
322                         }
323                         else
```



```
324                         {
325                                 ah2 = -pio2;
326                                 sign2 = -sign2;
327                         }
328                 }
329                 else
330                 {
331                         y2 = *y;
332                         x2 = *x;
333                         if ( sy )
334                         {
335                                 y2 = -y2;
336                                 sign2 = -sign2;
337                         }
338                         if ( sx )
339                         {
340                                 x2 = -x2;
341                                 ah2 = -pi;
342                                 sign2 = -sign2;
343                         }
344                         else
345                                 ah2 = zero;
346                 }
347
348                 if ( hx >= 0x7f800000 || hx - hy2 >= 0x0c800000 )
349                 {
350                         if ( hx >= 0x7f800000 )
351                         {
352                                 if ( hx ^ 0x7f800000 ) /* nan */
353                                         ah2 =  x2 + y2;
354                                 else if ( hy2 >= 0x7f800000 )
355                                         ah2 += pio4;
356                         }
357                         else if ( (int) ah2 == 0 )
358                                 ah2 = y2 / x2;
359                         *z = (sign2 == one)? ah2 : -ah2;
360                         x += stridex;
361                         y += stridey;
362                         z += stridez;
363                         i = 2;
364                         if ( --n <= 0 )
365                                 break;
366                         goto loop2;
367                 }
368                 if (hy2 < 0x00800000) {
369                         if ( hy2 == 0 )
370                         {
371                                 *z = sign2 * (float) ah2;
372                                 x += stridex;
373                                 y += stridey;
374                                 z += stridez;
375                                 i = 2;
376                                 if ( --n <= 0 )
377                                         break;
378                                 goto loop2;
379                         }
380                         y2 *= twop24; /* scale subnormal y */
381                         x2 *= twop24; /* scale possibly subnormal x */
382                         hy2 = *(int*)&y2;
383                         hx = *(int*)&x2;
384                 }
385
386                 pz2 = z;
387
388                 k2 = ( hy2 - hx + 0x3f800000 ) & 0xfff80000;
389                 if( k2 >= 0x3C800000 )          /* if |x| >= (1/64)... */
```

```
390                 {
391                         *(int*)&base2 = k2;
392                         k2 = (k2 - 0x3C800000) >> 18; /* (index >> 19) << 1) */
393                         k2 += 4;
394                                 /* skip over 0,0,pi/2,pi/2 */
395                 }
396                 else                            /* |x| < 1/64 */
397                 {
398                         k2 = 0;
399                         base2 = zero;
400                 }

402                 goto endloop;

404 endloop:

406                 ah2 += __vlibm_TBL_atan1[k2];
407                 ah1 += __vlibm_TBL_atan1[k1];
408                 ah0 += __vlibm_TBL_atan1[k0];

410                 db2 = base2;
411                 db1 = base1;
412                 db0 = base0;
413                 dy2 = y2;
414                 dy1 = y1;
415                 dy0 = y0;
416                 dx2 = x2;
417                 dx1 = x1;
418                 dx0 = x0;

420                 num2 = dy2 - dx2 * db2;
421                 den2 = dx2 + dy2 * db2;

423                 num1 = dy1 - dx1 * db1;
424                 den1 = dx1 + dy1 * db1;

426                 num0 = dy0 - dx0 * db0;
427                 den0 = dx0 + dy0 * db0;

429                 t2 = num2 / den2;
430                 t1 = num1 / den1;
431                 t0 = num0 / den0;

433                 sx2 = t2 * t2;
434                 sx1 = t1 * t1;
435                 sx0 = t0 * t0;
436
437                 t2 += t2 * sx2 * ( q1 + sx2 * q2 );
438                 t1 += t1 * sx1 * ( q1 + sx1 * q2 );
439                 t0 += t0 * sx0 * ( q1 + sx0 * q2 );

441                 t2 += ah2;
442                 t1 += ah1;
443                 t0 += ah0;

445                 *pz2 = sign2 * t2;
446                 *pz1 = sign1 * t1;
447                 *pz0 = sign0 * t0;

449                 x += stridex;
450                 y += stridey;
451                 z += stridez;
452                 i = 0;
453         } while ( --n > 0 );

455         if ( i > 1 )
```



```
456         {
457                 ah1 += __vlibm_TBL_atan1[k1];
458                 t1 = ( y1 - x1 * (double)base1 ) /
459                         ( x1 + y1 * (double)base1 );
460                 sx1 = t1 * t1;
461                 t1 += t1 * sx1 * ( q1 + sx1 * q2 );
462                 t1 += ah1;
463                 *pz1 = sign1 * t1;
464         }

466         if ( i > 0 )
467         {
468                 ah0 += __vlibm_TBL_atan1[k0];
469                 t0 = ( y0 - x0 * (double)base0 ) /
470                         ( x0 + y0 * (double)base0 );
471                 sx0 = t0 * t0;
472                 t0 += t0 * sx0 * ( q1 + sx0 * q2 );
473                 t0 += ah0;
474                 *pz0 = sign0 * t0;
475         }
476 }
```

```
**********************************************************
   12272 Sat May 10 12:09:50 2014
new/usr/src/lib/libmvec/common/__vatanf.c
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

void
__vatanf( int n, float * restrict x, int stridex, float * restrict y, int stride
{
  extern const double __vlibm_TBL_atan1[];
  double  conup0, conup1, conup2;
  float dummy, ansf = 0.0;
  float f0, f1, f2;
  float ans0, ans1, ans2;
  float poly0, poly1, poly2;
  float sign0, sign1, sign2;
  int intf, intz, argcount;
  int index0, index1, index2;
  float z,*yaddr0,*yaddr1,*yaddr2;
  int *pz = (int *) &z;
#ifdef UNROLL4
  double conup3;
  int index3;
  float f3, ans3, poly3, sign3, *yaddr3;
#endif

/*    Power series  atan(x) = x + p1*x**3 + p2*x**5 + p3*x**7
 *    Error =  -3.08254E-18   On the interval  |x| < 1/64 */

  static const float p1 = -0.33329644f /* -3.3333333329292858E-01f */ ;
  static const float pone = 1.0f;
```



```
if( n <= 0 ) return;          /* if no. of elements is 0 or neg, do nothing */
do
{
LOOP0:

       intf     = *(int *) x;          /* upper half of x, as integer */
       f0 = *x;
       sign0 = pone;
       if (intf < 0) {
              intf = intf & ~0x80000000; /* abs(upper argument) */
              f0 = -f0;
              sign0 = -sign0;
       }

  if( (intf > 0x5B000000) || (intf < 0x31800000) ) /* filter out special cases
  {
    if( intf > 0x7f800000 )
    {
      ansf  = f0- f0;                              /* return NaN if x=NaN*/
    }
    else if( intf < 0x31800000 )              /* avoid underflow for small arg
    {
      dummy = 1.0e37 + f0;
      dummy = dummy;
      ansf  = f0;
    }
    else if( intf > 0x5B000000 )              /* avoid underflow for big arg
    {
      index0= 2;
      ansf  = __vlibm_TBL_atan1[index0];/* pi/2 up */
    }
    *y      = sign0*ansf;             /* store answer, with sign bit  */
    x      += stridex;
    y      += stridey;
    argcount = 0;                             /* initialize argcount
    if ( --n <=0 ) break;                     /* we are done
    goto LOOP0;                               /* otherwise, examine next arg
  }

  if (intf > 0x42800000)                      /* if(|x| > 64
  {
  f0 = -pone/f0;
      index0 = 2;                             /* point to pi/2 upper, lower
  }
  else if( intf >= 0x3C800000 )               /* if |x| >= (1/64)...
  {
    intz   = (intf + 0x00040000) & 0x7ff80000;/* round arg, keep upper
    pz[0]  = intz;                            /* store as a float (z)
  f0 = (f0 - z)/(pone + f0*z);
      index0 = (intz - 0x3C800000) >> 18;     /* (index >> 19) << 1)
      index0 = index0+ 4;                     /* skip over 0,0,pi/2,pi/2
  }
  else                                        /* |x| < 1/64 */
  {
      index0   = 0;                           /* points to 0,0 in table
  }
  yaddr0   = y;                               /* address to store this answer
  x       += stridex;                         /* point to next arg
  y       += stridey;                         /* point to next result
  argcount = 1;                               /* we now have 1 good argument
  if ( --n <=0 )
  {
    goto UNROLL;                              /* finish up with 1 good arg
  }
```

```
127     /*--------------------------------------------------------------------------
128     /*--------------------------------------------------------------------------
129     /*--------------------------------------------------------------------------

131   LOOP1:

133         intf     = *(int *) x;          /* upper half of x, as integer */
134         f1 = *x;
135         sign1 = pone;
136         if (intf < 0) {
137                 intf = intf & ~0x80000000; /* abs(upper argument) */
138                 f1 = -f1;
139                 sign1 = -sign1;
140         }
141
142     if( (intf > 0x5B000000) || (intf < 0x31800000) ) /* filter out special cases
143     {
144       if( intf > 0x7f800000 )
145       {
146         ansf   = f1 - f1;                       /* return NaN if x=NaN*/
147       }
148       else if( intf < 0x31800000 )              /* avoid underflow for small arg
149       {
150         dummy = 1.0e37 + f1;
151         dummy = dummy;
152         ansf   = f1;
153       }
154       else if( intf > 0x5B000000 )              /* avoid underflow for big arg
155       {
156         index1 = 2;
157         ansf   = __vlibm_TBL_atan1[index1] ;/* pi/2 up */
158       }
159       *y      = sign1 * ansf;           /* store answer, with sign bit  */
160       x      += stridex;
161       y      += stridey;
162       argcount = 1;                             /* we still have 1 good arg
163       if ( --n <=0 )
164       {
165         goto UNROLL;                            /* finish up with 1 good arg
166       }
167       goto LOOP1;                               /* otherwise, examine next arg
168     }
169
170     if (intf > 0x42800000)                      /* if(|x| > 64
171     {
172     f1 = -pone/f1;
173       index1 = 2;                               /* point to pi/2 upper, lower
174     }
175     else if( intf >= 0x3C800000 )               /* if |x| >= (1/64)...
176     {
177       intz   = (intf + 0x00040000) & 0x7ff80000;/* round arg, keep upper
178       pz[0]  = intz;                            /* store as a float (z)
179     f1 = (f1 - z)/(pone + f1*z);
180       index1 = (intz - 0x3C800000) >> 18;       /* (index >> 19) << 1)
181       index1 = index1 + 4;                      /* skip over 0,0,pi/2,pi/2
182     }
183     else
184     {
185         index1   = 0;                           /* points to 0,0 in table
186     }

188     yaddr1   = y;                               /* address to store this answer
189     x       += stridex;                         /* point to next arg
190     y       += stridey;                         /* point to next result
191     argcount = 2;                               /* we now have 2 good arguments
192     if ( --n <=0 )
```



```
193     {
194       goto UNROLL;                              /* finish up with 2 good args
195     }

197     /*--------------------------------------------------------------------------
198     /*--------------------------------------------------------------------------
199     /*--------------------------------------------------------------------------

201   LOOP2:

203         intf     = *(int *) x;          /* upper half of x, as integer */
204         f2 = *x;
205         sign2 = pone;
206         if (intf < 0) {
207                 intf = intf & ~0x80000000; /* abs(upper argument) */
208                 f2 = -f2;
209                 sign2 = -sign2;
210         }
211
212     if( (intf > 0x5B000000) || (intf < 0x31800000) ) /* filter out special cases
213     {
214       if( intf > 0x7f800000 )
215       {
216         ansf   = f2 - f2;                       /* return NaN if x=NaN*/
217       }
218       else if( intf < 0x31800000 )              /* avoid underflow for small arg
219       {
220         dummy = 1.0e37 + f2;
221         dummy = dummy;
222         ansf   = f2;
223       }
224       else if( intf > 0x5B000000 )              /* avoid underflow for big arg
225       {
226         index2 = 2;
227         ansf   = __vlibm_TBL_atan1[index2] ;/* pi/2 up */
228       }
229       *y      = sign2 * ansf;           /* store answer, with sign bit  */
230       x      += stridex;
231       y      += stridey;
232       argcount = 2;                             /* we still have 2 good args
233       if ( --n <=0 )
234       {
235         goto UNROLL;                            /* finish up with 2 good args
236       }
237       goto LOOP2;                               /* otherwise, examine next arg
238     }
239
240     if (intf > 0x42800000)                      /* if(|x| > 64
241     {
242     f2 = -pone/f2;
243       index2 = 2;                               /* point to pi/2 upper, lower
244     }
245     else if( intf >= 0x3C800000 )               /* if |x| >= (1/64)...
246     {
247       intz   = (intf + 0x00040000) & 0x7ff80000;/* round arg, keep upper
248       pz[0]  = intz;                            /* store as a float (z)
249     f2 = (f2 - z)/(pone + f2*z);
250       index2 = (intz - 0x3C800000) >> 18;       /* (index >> 19) << 1)
251       index2 = index2 + 4;                      /* skip over 0,0,pi/2,pi/2
252     }
253     else
254     {
255         index2   = 0;                           /* points to 0,0 in table
256     }
257     yaddr2   = y;                               /* address to store this answer
258     x       += stridex;                         /* point to next arg
```

```
259     y       += stridey;                             /* point to next result
260     argcount = 3;                                   /* we now have 3 good arguments
261     if ( --n <=0 )
262     {
263       goto UNROLL;                                  /* finish up with 2 good args
264     }


267     /*--------------------------------------------------------------------------
268     /*--------------------------------------------------------------------------
269     /*--------------------------------------------------------------------------

271 #ifdef UNROLL4
272   LOOP3:

274         intf     = *(int *) x;          /* upper half of x, as integer */
275         f3 = *x;
276         sign3 = pone;
277         if (intf < 0) {
278                 intf = intf & ~0x80000000; /* abs(upper argument) */
279                 f3 = -f3;
280                 sign3 = -sign3;
281         }
282
283     if( (intf > 0x5B000000) || (intf < 0x31800000) ) /* filter out special cases
284     {
285       if( intf > 0x7f800000 )
286       {
287         ansf   = f3 - f3;                           /* return NaN if x=NaN*/
288       }
289       else if( intf < 0x31800000 )                  /* avoid underflow for small arg
290       {
291         dummy = 1.0e37 + f3;
292         dummy = dummy;
293         ansf   = f3;
294       }
295       else if( intf > 0x5B000000 )                  /* avoid underflow for big arg
296       {
297         index3 = 2;
298         ansf   = __vlibm_TBL_atan1[index3] ;/* pi/2 up */
299       }
300       *y      = sign3 * ansf;           /* store answer, with sign bit  */
301       x      += stridex;
302       y      += stridey;
303       argcount = 3;                                 /* we still have 3 good args
304       if ( --n <=0 )
305       {
306         goto UNROLL;                                /* finish up with 3 good args
307       }
308       goto LOOP3;                                   /* otherwise, examine next arg
309     }
310
311     if (intf > 0x42800000)                          /* if(|x| > 64
312     {
313         n3 = -pone;
314         d3 = f3;
315     f3 = n3/d3;
316       index3 = 2;                                   /* point to pi/2 upper, lower
317     }
318     else if( intf >= 0x3C800000 )                   /* if |x| >= (1/64)...
319     {
320       intz   = (intf + 0x00040000) & 0x7ff80000;/* round arg, keep upper
321       pz[0]  = intz;                                /* store as a float (z)
322         n3     = (f3 - z);
323         d3     = (pone + f3*z);                     /* get reduced argument
324     f3 = n3/d3;
```



```
325       index3 = (intz - 0x3C800000) >> 18;       /* (index >> 19) << 1)
326       index3 = index3 + 4;                      /* skip over 0,0,pi/2,pi/2
327     }
328     else
329     {
330         n3 = f3;
331         d3 = pone;
332         index3   = 0;                           /* points to 0,0 in table
333     }
334     yaddr3   = y;                               /* address to store this answer
335     x       += stridex;                         /* point to next arg
336     y       += stridey;                         /* point to next result
337     argcount = 4;                               /* we now have 4 good arguments
338     if ( --n <=0 )
339     {
340       goto UNROLL;                              /* finish up with 3 good args
341     }
342 #endif /* UNROLL4 */

344 /* here is the n-way unrolled section,
345    but we may actually have less than n
346    arguments at this point
347 */

349 UNROLL:

351 #ifdef UNROLL4
352     if (argcount == 4)
353     {
354     conup0   = __vlibm_TBL_atan1[index0];
355     conup1   = __vlibm_TBL_atan1[index1];
356     conup2   = __vlibm_TBL_atan1[index2];
357     conup3   = __vlibm_TBL_atan1[index3];
358     poly0    = p1*f0*f0*f0 + f0;
359     ans0     = sign0 * (float)(conup0 + poly0);
360     poly1    = p1*f1*f1*f1 + f1;
361     ans1     = sign1 * (float)(conup1 + poly1);
362     poly2    = p1*f2*f2*f2 + f2;
363     ans2     = sign2 * (float)(conup2 + poly2);
364     poly3    = p1*f3*f3*f3 + f3;
365     ans3     = sign3 * (float)(conup3 + poly3);
366     *yaddr0  = ans0;
367     *yaddr1  = ans1;
368     *yaddr2  = ans2;
369     *yaddr3  = ans3;
370     }
371     else
372 #endif
373     if (argcount == 3)
374     {
375     conup0   = __vlibm_TBL_atan1[index0];
376     conup1   = __vlibm_TBL_atan1[index1];
377     conup2   = __vlibm_TBL_atan1[index2];
378     poly0    = p1*f0*f0*f0 + f0;
379     poly1    = p1*f1*f1*f1 + f1;
380     poly2    = p1*f2*f2*f2 + f2;
381     ans0     = sign0 * (float)(conup0 + poly0);
382     ans1     = sign1 * (float)(conup1 + poly1);
383     ans2     = sign2 * (float)(conup2 + poly2);
384     *yaddr0  = ans0;
385     *yaddr1  = ans1;
386     *yaddr2  = ans2;
387     }
388     else
389     if (argcount == 2)
390     {
```

```
391     conup0   = __vlibm_TBL_atan1[index0];
392     conup1   = __vlibm_TBL_atan1[index1];
393     poly0    = p1*f0*f0*f0 + f0;
394     poly1    = p1*f1*f1*f1 + f1;
395     ans0     = sign0 * (float)(conup0 + poly0);
396     ans1     = sign1 * (float)(conup1 + poly1);
397     *yaddr0  = ans0;
398     *yaddr1  = ans1;
399     }
400     else
401     if (argcount == 1)
402     {
403     conup0   = __vlibm_TBL_atan1[index0];
404     poly0    = p1*f0*f0*f0 + f0;
405     ans0     = sign0 * (float)(conup0 + poly0);
406     *yaddr0  = ans0;
407      }

409   }  while (n > 0);

411 }
```

****
1313 Sat May 10 12:09:50 2014
new/usr/src/lib/libmvec/common/__vc_abs.c
patch01 - 693 import Sun Devpro Math Library
****

```
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#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern void __vhypotf( int, float *, int, float *, int, float *, int );

void
__vc_abs( int n, float * restrict x, int stridex, float * restrict y,
        int stridey )
{
        stridex <<= 1;
        __vhypotf( n, x, stridex, x + 1, stridex, y, stridey );
}
```

```
**********************************************************
    1550 Sat May 10 12:09:50 2014
new/usr/src/lib/libmvec/common/__vc_exp.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern void __vexpf( int, float *, int, float *, int );
extern void __vsincosf( int, float *, int, float *, int, float *, int );

void
__vc_exp( int n, float * restrict x, int stridex, float * restrict y,
        int stridey, float * restrict tmp )
{
        int             i, j;

        stridex <<= 1;
        stridey <<= 1;
        __vexpf( n, x, stridex, tmp, 1 );
        __vsincosf( n, x + 1, stridex, y + 1, stridey, y, stridey );
        for ( i = j = 0; i < n; i++, j += stridey )
        {
                y[j] *= tmp[i];
                y[j+1] *= tmp[i];
        }
}
```

****
1565 Sat May 10 12:09:51 2014
new/usr/src/lib/libmvec/common/__vc_log.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern void __vatan2f( int, float *, int, float *, int, float *, int );
extern void __vhypotf( int, float *, int, float *, int, float *, int );
extern void __vlogf( int, float *, int, float *, int );

void
__vc_log( int n, float * restrict x, int stridex, float * restrict y,
        int stridey )
{
        stridex <<= 1;
        stridey <<= 1;
        __vhypotf( n, x, stridex, x + 1, stridex, y + 1, stridey );
        __vlogf( n, y + 1, stridey, y, stridey );
        __vatan2f( n, x + 1, stridex, x, stridex, y + 1, stridey );
}
```

****
1641 Sat May 10 12:09:51 2014
new/usr/src/lib/libmvec/common/__vc_pow.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern void __vc_exp( int, float *, int, float *, int, float * );
extern void __vc_log( int, float *, int, float *, int );

void
__vc_pow( int n, float * restrict x, int stridex, float * restrict y,
        int stridey, float * restrict z, int stridez, float * restrict tmp )
{
        float   r;
        int             i, j, k;

        __vc_log( n, x, stridex, tmp, 1 );
        stridey <<= 1;
        for ( i = j = 0; i < n; i++, j += stridey )
        {
                k = i << 1;
                r = y[j] * tmp[k] - y[j+1] * tmp[k+1];
                tmp[k+1] = y[j+1] * tmp[k] + y[j] * tmp[k+1];
                tmp[k] = r;
        }
        __vc_exp( n, tmp, 1, z, stridez, tmp + n + n );
}
```

```
**********************************************************
   29704 Sat May 10 12:09:51 2014
new/usr/src/lib/libmvec/common/__vcos.c
remove unused v from libmvec
fix for patch09 - use __GNU_UNUSED - fix cstyle
fix for patch09 - use __GNU_UNUSED
patch09 - update libmvec: fix build issues by gcc46
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include <sys/isa_defs.h>
#include <sys/ccompile.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/*
 * vcos.1.c
 *
 * Vector cosine function.  Just slight modifications to vsin.8.c, mainly
 * in the primary range part.
 *
 * Modification to primary range processing.  If an argument that does not
 * fall in the primary range is encountered, then processing is continued
 * in the medium range.
 *
```



```
 */

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];

static const double
        half[2] = { 0.5, -0.5 },
        one             = 1.0,
        invpio2 = 0.63661977236758134307553505,  /* 53 bits of pi/2 */
        pio2_1  = 1.57079632673412561416600,      /* first 33 bits of pi/2 */
        pio2_2  = 6.07710050630396597659600e-11, /* second 33 bits of pi/2 */
        pio2_3  = 2.02226248711166455796000e-21, /* third 33 bits of pi/2 */
        pio2_3t = 8.47842766036889964395900e-32, /* pi/2 - pio2_3 */
        pp1             = -1.66666666660576046527626394313498255467600e-0001,
        pp2             =  8.33326120969096312671837656614618094444200e-0003,
        qq1             = -4.99999999977710986407023955908711557870000e-0001,
        qq2             =  4.16665486385721935064505588101884208958000e-0002,
        poly1[2]= { -1.66666666666629669805215138920301589656000e-0001,
                                -4.99999999999931701464060878888294524481000e-0001
        poly2[2]= {  8.33333332390951295683993455280336376663000e-0003,
                                 4.16666666639486191753564059396370822231900e-0002
        poly3[2]= { -1.98412623799797669279155177823009840396000e-0004,
                                -1.38888855265614286783275668773685168146200e-0003
        poly4[2]= {  2.75340362485427723764998762284833035111000e-0006,
                                 2.47851942368146079661812828945453052475900e-0005

static const unsigned thresh[2] = { 0x3fc90000, 0x3fc40000 };

/* Don't __ the following; acomp will handle it */
extern double fabs( double );
extern void __vlibm_vcos_big( int, double *, int, double *, int, int );

/*
 * y[i*stridey] := cos( x[i*stridex] ), for i = 0..n.
 *
 * Calls __vlibm_vcos_big to handle all elts which have abs >~ 1.647e+06.
 * Argument reduction is done here for elts pi/4 < arg < 1.647e+06.
 *
 * elts < 2^-27 use the approximation 1.0 ~ cos(x).
 */
void
__vcos( int n, double * restrict x, int stridex, double * restrict y,
        int stridey )
{
        double          x0_or_one[4], x1_or_one[4], x2_or_one[4];
        double          y0_or_zero[4], y1_or_zero[4], y2_or_zero[4];
        double          x0, x1, x2, *py0 = 0, *py1 = 0, *py2, *xsave, *ysave;
        unsigned        hx0, hx1, hx2, xsb0, xsb1 = 0, xsb2;
        int             i, biguns, nsave, sxsave, sysave;
        nsave = n;
        xsave = x;
        sxsave = stridex;
        ysave = y;
        sysave = stridey;
        biguns = 0;

        do /* MAIN LOOP */
        {
                /* Gotos here so _break_ exits MAIN LOOP. */
LOOP0:  /* Find first arg in right range. */
                xsb0 = HI(x); /* get most significant word */
                hx0 = xsb0 & ~0x80000000; /* mask off sign bit */
                if ( hx0 > 0x3fe921fb ) {
                        /* Too big: arg reduction needed, so leave for second pa
                        biguns = 1;
                        goto MEDIUM;
                }
```

```
123                 if ( hx0 < 0x3e400000 ) {
124                         /* Too small.  cos x ~ 1. */
125                         *y = 1.0;
126                         x += stridex;
127                         y += stridey;
128                         i = 0;
129                         if ( --n <= 0 )
130                                 break;
131                         goto LOOP0;
132                 }
133                 x0 = *x;
134                 py0 = y;
135                 x += stridex;
136                 y += stridey;
137                 i = 1;
138                 if ( --n <= 0 )
139                         break;

141 LOOP1: /* Get second arg, same as above. */
142                 xsb1 = HI(x);
143                 hx1 = xsb1 & ~0x80000000;
144                 if ( hx1 > 0x3fe921fb )
145                 {
146                         biguns = 2;
147                         goto MEDIUM;
148                 }
149                 if ( hx1 < 0x3e400000 )
150                 {
151                         *y = 1.0;
152                         x += stridex;
153                         y += stridey;
154                         i = 1;
155                         if ( --n <= 0 )
156                                 break;
157                         goto LOOP1;
158                 }
159                 x1 = *x;
160                 py1 = y;
161                 x += stridex;
162                 y += stridey;
163                 i = 2;
164                 if ( --n <= 0 )
165                         break;

167 LOOP2: /* Get third arg, same as above. */
168                 xsb2 = HI(x);
169                 hx2 = xsb2 & ~0x80000000;
170                 if ( hx2 > 0x3fe921fb )
171                 {
172                         biguns = 3;
173                         goto MEDIUM;
174                 }
175                 if ( hx2 < 0x3e400000 )
176                 {
177                         *y = 1.0;
178                         x += stridex;
179                         y += stridey;
180                         i = 2;
181                         if ( --n <= 0 )
182                                 break;
183                         goto LOOP2;
184                 }
185                 x2 = *x;
186                 py2 = y;

188                 /*
```



```
189                  * 0x3fc40000 = 5/32 ~ 0.15625
190                  * Get msb after subtraction.  Will be 1 only if
191                  * hx0 - 5/32 is negative.
192                  */
193                 i = ( hx0 - 0x3fc40000 ) >> 31;
194                 i |= ( ( hx1 - 0x3fc40000 ) >> 30 ) & 2;
195                 i |= ( ( hx2 - 0x3fc40000 ) >> 29 ) & 4;
196                 switch ( i )
197                 {
198                         double          a0, a1, a2, w0, w1, w2;
199                         double          t0, t1, t2, z0, z1, z2;
200                         unsigned        j0, j1, j2;

202                 case 0: /* All are > 5/32 */
203                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
204                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
205                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
206                         HI(&t0) = j0;
207                         HI(&t1) = j1;
208                         HI(&t2) = j2;
209                         LO(&t0) = 0;
210                         LO(&t1) = 0;
211                         LO(&t2) = 0;
212                         x0 -= t0;
213                         x1 -= t1;
214                         x2 -= t2;
215                         z0 = x0 * x0;
216                         z1 = x1 * x1;
217                         z2 = x2 * x2;
218                         t0 = z0 * ( qq1 + z0 * qq2 );
219                         t1 = z1 * ( qq1 + z1 * qq2 );
220                         t2 = z2 * ( qq1 + z2 * qq2 );
221                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
222                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
223                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
224                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
225                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
226                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
227                         xsb0 = ( xsb0 >> 30 ) & 2;
228                         xsb1 = ( xsb1 >> 30 ) & 2;
229                         xsb2 = ( xsb2 >> 30 ) & 2;
230                         a0 = __vlibm_TBL_sincos_hi[j0+1]; /* cos_hi(t) */
231                         a1 = __vlibm_TBL_sincos_hi[j1+1];
232                         a2 = __vlibm_TBL_sincos_hi[j2+1];
233                           /*   cos_lo(t)                        sin_hi(t) */
234                         t0 = __vlibm_TBL_sincos_lo[j0+1] - ( __vlibm_TBL_sincos_
235                         t1 = __vlibm_TBL_sincos_lo[j1+1] - ( __vlibm_TBL_sincos_
236                         t2 = __vlibm_TBL_sincos_lo[j2+1] - ( __vlibm_TBL_sincos_

238                         *py0 = a0 + t0;
239                         *py1 = a1 + t1;
240                         *py2 = a2 + t2;
241                         break;

243                 case 1:
244                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
245                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
246                         HI(&t1) = j1;
247                         HI(&t2) = j2;
248                         LO(&t1) = 0;
249                         LO(&t2) = 0;
250                         x1 -= t1;
251                         x2 -= t2;
252                         z0 = x0 * x0;
253                         z1 = x1 * x1;
254                         z2 = x2 * x2;
```

```
255                     t0 = z0 * ( poly3[1] + z0 * poly4[1] );
256                     t1 = z1 * ( qq1 + z1 * qq2 );
257                     t2 = z2 * ( qq1 + z2 * qq2 );
258                     t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
259                     w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
260                     w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
261                     j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
262                     j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
263                     xsb1 = ( xsb1 >> 30 ) & 2;
264                     xsb2 = ( xsb2 >> 30 ) & 2;
265                     a1 = __vlibm_TBL_sincos_hi[j1+1];
266                     a2 = __vlibm_TBL_sincos_hi[j2+1];
267                     t1 = __vlibm_TBL_sincos_lo[j1+1] - ( __vlibm_TBL_sincos_
268                     t2 = __vlibm_TBL_sincos_lo[j2+1] - ( __vlibm_TBL_sincos_
269                     *py0 = one + t0;
270                     *py1 = a1 + t1;
271                     *py2 = a2 + t2;
272                     break;

274             case 2:
275                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
276                     j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
277                     HI(&t0) = j0;
278                     HI(&t2) = j2;
279                     LO(&t0) = 0;
280                     LO(&t2) = 0;
281                     x0 -= t0;
282                     x2 -= t2;
283                     z0 = x0 * x0;
284                     z1 = x1 * x1;
285                     z2 = x2 * x2;
286                     t0 = z0 * ( qq1 + z0 * qq2 );
287                     t1 = z1 * ( poly3[1] + z1 * poly4[1] );
288                     t2 = z2 * ( qq1 + z2 * qq2 );
289                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
290                     t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
291                     w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
292                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
293                     j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
294                     xsb0 = ( xsb0 >> 30 ) & 2;
295                     xsb2 = ( xsb2 >> 30 ) & 2;
296                     a0 = __vlibm_TBL_sincos_hi[j0+1];
297                     a2 = __vlibm_TBL_sincos_hi[j2+1];
298                     t0 = __vlibm_TBL_sincos_lo[j0+1] - ( __vlibm_TBL_sincos_
299                     t2 = __vlibm_TBL_sincos_lo[j2+1] - ( __vlibm_TBL_sincos_
300                     *py0 = a0 + t0;
301                     *py1 = one + t1;
302                     *py2 = a2 + t2;
303                     break;

305             case 3:
306                     j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
307                     HI(&t2) = j2;
308                     LO(&t2) = 0;
309                     x2 -= t2;
310                     z0 = x0 * x0;
311                     z1 = x1 * x1;
312                     z2 = x2 * x2;
313                     t0 = z0 * ( poly3[1] + z0 * poly4[1] );
314                     t1 = z1 * ( poly3[1] + z1 * poly4[1] );
315                     t2 = z2 * ( qq1 + z2 * qq2 );
316                     t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
317                     t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
318                     w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
319                     j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
320                     xsb2 = ( xsb2 >> 30 ) & 2;
```



```
321                     a2 = __vlibm_TBL_sincos_hi[j2+1];
322                     t2 = __vlibm_TBL_sincos_lo[j2+1] - ( __vlibm_TBL_sincos_
323                     *py0 = one + t0;
324                     *py1 = one + t1;
325                     *py2 = a2 + t2;
326                     break;

328             case 4:
329                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
330                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
331                     HI(&t0) = j0;
332                     HI(&t1) = j1;
333                     LO(&t0) = 0;
334                     LO(&t1) = 0;
335                     x0 -= t0;
336                     x1 -= t1;
337                     z0 = x0 * x0;
338                     z1 = x1 * x1;
339                     z2 = x2 * x2;
340                     t0 = z0 * ( qq1 + z0 * qq2 );
341                     t1 = z1 * ( qq1 + z1 * qq2 );
342                     t2 = z2 * ( poly3[1] + z2 * poly4[1] );
343                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
344                     w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
345                     t2 = z2 * ( poly1[1] + z2 * ( poly2[1] + t2 ) );
346                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
347                     j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
348                     xsb0 = ( xsb0 >> 30 ) & 2;
349                     xsb1 = ( xsb1 >> 30 ) & 2;
350                     a0 = __vlibm_TBL_sincos_hi[j0+1];
351                     a1 = __vlibm_TBL_sincos_hi[j1+1];
352                     t0 = __vlibm_TBL_sincos_lo[j0+1] - ( __vlibm_TBL_sincos_
353                     t1 = __vlibm_TBL_sincos_lo[j1+1] - ( __vlibm_TBL_sincos_
354                     *py0 = a0 + t0;
355                     *py1 = a1 + t1;
356                     *py2 = one + t2;
357                     break;

359             case 5:
360                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
361                     HI(&t1) = j1;
362                     LO(&t1) = 0;
363                     x1 -= t1;
364                     z0 = x0 * x0;
365                     z1 = x1 * x1;
366                     z2 = x2 * x2;
367                     t0 = z0 * ( poly3[1] + z0 * poly4[1] );
368                     t1 = z1 * ( qq1 + z1 * qq2 );
369                     t2 = z2 * ( poly3[1] + z2 * poly4[1] );
370                     t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
371                     w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
372                     t2 = z2 * ( poly1[1] + z2 * ( poly2[1] + t2 ) );
373                     j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
374                     xsb1 = ( xsb1 >> 30 ) & 2;
375                     a1 = __vlibm_TBL_sincos_hi[j1+1];
376                     t1 = __vlibm_TBL_sincos_lo[j1+1] - ( __vlibm_TBL_sincos_
377                     *py0 = one + t0;
378                     *py1 = a1 + t1;
379                     *py2 = one + t2;
380                     break;

382             case 6:
383                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
384                     HI(&t0) = j0;
385                     LO(&t0) = 0;
386                     x0 -= t0;
```

```
387                         z0 = x0 * x0;
388                         z1 = x1 * x1;
389                         z2 = x2 * x2;
390                         t0 = z0 * ( qq1 + z0 * qq2 );
391                         t1 = z1 * ( poly3[1] + z1 * poly4[1] );
392                         t2 = z2 * ( poly3[1] + z2 * poly4[1] );
393                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
394                         t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
395                         t2 = z2 * ( poly1[1] + z2 * ( poly2[1] + t2 ) );
396                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
397                         xsb0 = ( xsb0 >> 30 ) & 2;
398                         a0 = __vlibm_TBL_sincos_hi[j0+1];
399                         t0 = __vlibm_TBL_sincos_lo[j0+1] - ( __vlibm_TBL_sincos_
400                         *py0 = a0 + t0;
401                         *py1 = one + t1;
402                         *py2 = one + t2;
403                         break;

405                 case 7: /* All are < 5/32 */
406                         z0 = x0 * x0;
407                         z1 = x1 * x1;
408                         z2 = x2 * x2;
409                         t0 = z0 * ( poly3[1] + z0 * poly4[1] );
410                         t1 = z1 * ( poly3[1] + z1 * poly4[1] );
411                         t2 = z2 * ( poly3[1] + z2 * poly4[1] );
412                         t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
413                         t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
414                         t2 = z2 * ( poly1[1] + z2 * ( poly2[1] + t2 ) );
415                         *py0 = one + t0;
416                         *py1 = one + t1;
417                         *py2 = one + t2;
418                         break;
419                 }

421                 x += stridex;
422                 y += stridey;
423                 i = 0;
424         } while ( --n > 0 ); /* END MAIN LOOP */

426         /*
427          * CLEAN UP last 0, 1, or 2 elts.
428          */
429         if ( i > 0 ) /* Clean up elts at tail.  i < 3. */
430         {
431                 double          a0, a1, w0, w1;
432                 double          t0, t1, z0, z1;
433                 unsigned        j0, j1;

435                 if ( i > 1 )
436                 {
437                         if ( hx1 < 0x3fc40000 )
438                         {
439                                 z1 = x1 * x1;
440                                 t1 = z1 * ( poly3[1] + z1 * poly4[1] );
441                                 t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
442                                 t1 = one + t1;
443                                 *py1 = t1;
444                         }
445                         else
446                         {
447                                 j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
448                                 HI(&t1) = j1;
449                                 LO(&t1) = 0;
450                                 x1 -= t1;
451                                 z1 = x1 * x1;
452                                 t1 = z1 * ( qq1 + z1 * qq2 );
```



```
453                                 w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
454                                 j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >>
455                                 xsb1 = ( xsb1 >> 30 ) & 2;
456                                 a1 = __vlibm_TBL_sincos_hi[j1+1];
457                                 t1 = __vlibm_TBL_sincos_lo[j1+1]
458                                         - ( __vlibm_TBL_sincos_hi[j1+xsb1]*w1 -
459                                 *py1 = a1 + t1;
460                         }
461                 }
462                 if ( hx0 < 0x3fc40000 )
463                 {
464                         z0 = x0 * x0;
465                         t0 = z0 * ( poly3[1] + z0 * poly4[1] );
466                         t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
467                         t0 = one + t0;
468                         *py0 = t0;
469                 }
470                 else
471                 {
472                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
473                         HI(&t0) = j0;
474                         LO(&t0) = 0;
475                         x0 -= t0;
476                         z0 = x0 * x0;
477                         t0 = z0 * ( qq1 + z0 * qq2 );
478                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
479                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
480                         xsb0 = ( xsb0 >> 30 ) & 2;
481                         a0 = __vlibm_TBL_sincos_hi[j0+1];
482                         t0 = __vlibm_TBL_sincos_lo[j0+1] - ( __vlibm_TBL_sincos_
483                         *py0 = a0 + t0;
484                 }
485         } /* END CLEAN UP */

487         return;

489         /*
490          * Take care of BIGUNS.
491          *
492          * We have jumped here in the middle of processing after having
493          * encountered a medium range argument.  Therefore things are in a
494          * bit of a tizzy.
495          */

497 MEDIUM:

499         x0_or_one[1] = 1.0;
500         x1_or_one[1] = 1.0;
501         x2_or_one[1] = 1.0;
502         x0_or_one[3] = -1.0;
503         x1_or_one[3] = -1.0;
504         x2_or_one[3] = -1.0;
505         y0_or_zero[1] = 0.0;
506         y1_or_zero[1] = 0.0;
507         y2_or_zero[1] = 0.0;
508         y0_or_zero[3] = 0.0;
509         y1_or_zero[3] = 0.0;
510         y2_or_zero[3] = 0.0;

512         if ( biguns == 3 )
513         {
514                 biguns = 0;
515                 xsb0 = xsb0 >> 31;
516                 xsb1 = xsb1 >> 31;
517                 goto loop2;
518         }
```

```
519         else if ( biguns == 2 )
520         {
521                 xsb0 = xsb0 >> 31;
522                 biguns = 0;
523                 goto loop1;
524         }
525         biguns = 0;

527         do
528         {
529                 double          fn0, fn1, fn2, a0, a1, a2, w0, w1, w2, y0, y1, y
530                 unsigned        hx;
531                 int                     n0, n1, n2;

533                 /*
534                  * Find 3 more to work on: Not already done, not too big.
535                  */

537 loop0:
538                 hx = HI(x);
539                 xsb0 = hx >> 31;
540                 hx &= ~0x80000000;
541                 if ( hx > 0x413921fb ) /* (1.6471e+06) Too big: leave it. */
542                 {
543                         if ( hx >= 0x7ff00000 ) /* Inf or NaN */
544                         {
545                                 x0 = *x;
546                                 *y = x0 - x0;
547                         }
548                         else
549                                 biguns = 1;
550                         x += stridex;
551                         y += stridey;
552                         i = 0;
553                         if ( --n <= 0 )
554                                 break;
555                         goto loop0;
556                 }
557                 x0 = *x;
558                 py0 = y;
559                 x += stridex;
560                 y += stridey;
561                 i = 1;
562                 if ( --n <= 0 )
563                         break;

565 loop1:
566                 hx = HI(x);
567                 xsb1 = hx >> 31;
568                 hx &= ~0x80000000;
569                 if ( hx > 0x413921fb )
570                 {
571                         if ( hx >= 0x7ff00000 )
572                         {
573                                 x1 = *x;
574                                 *y = x1 - x1;
575                         }
576                         else
577                                 biguns = 1;
578                         x += stridex;
579                         y += stridey;
580                         i = 1;
581                         if ( --n <= 0 )
582                                 break;
583                         goto loop1;
584                 }
```



```
585                 x1 = *x;
586                 py1 = y;
587                 x += stridex;
588                 y += stridey;
589                 i = 2;
590                 if ( --n <= 0 )
591                         break;

593 loop2:
594                 hx = HI(x);
595                 xsb2 = hx >> 31;
596                 hx &= ~0x80000000;
597                 if ( hx > 0x413921fb )
598                 {
599                         if ( hx >= 0x7ff00000 )
600                         {
601                                 x2 = *x;
602                                 *y = x2 - x2;
603                         }
604                         else
605                                 biguns = 1;
606                         x += stridex;
607                         y += stridey;
608                         i = 2;
609                         if ( --n <= 0 )
610                                 break;
611                         goto loop2;
612                 }
613                 x2 = *x;
614                 py2 = y;

616                 n0 = (int) ( x0 * invpio2 + half[xsb0] );
617                 n1 = (int) ( x1 * invpio2 + half[xsb1] );
618                 n2 = (int) ( x2 * invpio2 + half[xsb2] );
619                 fn0 = (double) n0;
620                 fn1 = (double) n1;
621                 fn2 = (double) n2;
622                 n0 = (n0 + 1) & 3; /* Add 1 (before the mod) to make sin into co
623                 n1 = (n1 + 1) & 3;
624                 n2 = (n2 + 1) & 3;
625                 a0 = x0 - fn0 * pio2_1;
626                 a1 = x1 - fn1 * pio2_1;
627                 a2 = x2 - fn2 * pio2_1;
628                 w0 = fn0 * pio2_2;
629                 w1 = fn1 * pio2_2;
630                 w2 = fn2 * pio2_2;
631                 x0 = a0 - w0;
632                 x1 = a1 - w1;
633                 x2 = a2 - w2;
634                 y0 = ( a0 - x0 ) - w0;
635                 y1 = ( a1 - x1 ) - w1;
636                 y2 = ( a2 - x2 ) - w2;
637                 a0 = x0;
638                 a1 = x1;
639                 a2 = x2;
640                 w0 = fn0 * pio2_3 - y0;
641                 w1 = fn1 * pio2_3 - y1;
642                 w2 = fn2 * pio2_3 - y2;
643                 x0 = a0 - w0;
644                 x1 = a1 - w1;
645                 x2 = a2 - w2;
646                 y0 = ( a0 - x0 ) - w0;
647                 y1 = ( a1 - x1 ) - w1;
648                 y2 = ( a2 - x2 ) - w2;
649                 a0 = x0;
650                 a1 = x1;
```

```
651                 a2 = x2;
652                 w0 = fn0 * pio2_3t - y0;
653                 w1 = fn1 * pio2_3t - y1;
654                 w2 = fn2 * pio2_3t - y2;
655                 x0 = a0 - w0;
656                 x1 = a1 - w1;
657                 x2 = a2 - w2;
658                 y0 = ( a0 - x0 ) - w0;
659                 y1 = ( a1 - x1 ) - w1;
660                 y2 = ( a2 - x2 ) - w2;
661                 xsb0 = HI(&x0);
662                 i = ( ( xsb0 & ~0x80000000 ) - thresh[n0&1] ) >> 31;
663                 xsb1 = HI(&x1);
664                 i |= ( ( ( xsb1 & ~0x80000000 ) - thresh[n1&1] ) >> 30 ) & 2;
665                 xsb2 = HI(&x2);
666                 i |= ( ( ( xsb2 & ~0x80000000 ) - thresh[n2&1] ) >> 29 ) & 4;
667                 switch ( i )
668                 {
669                         double          t0, t1, t2, z0, z1, z2;
670                         unsigned        j0, j1, j2;

672                 case 0:
673                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
674                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
675                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
676                         HI(&t0) = j0;
677                         HI(&t1) = j1;
678                         HI(&t2) = j2;
679                         LO(&t0) = 0;
680                         LO(&t1) = 0;
681                         LO(&t2) = 0;
682                         x0 = ( x0 - t0 ) + y0;
683                         x1 = ( x1 - t1 ) + y1;
684                         x2 = ( x2 - t2 ) + y2;
685                         z0 = x0 * x0;
686                         z1 = x1 * x1;
687                         z2 = x2 * x2;
688                         t0 = z0 * ( qq1 + z0 * qq2 );
689                         t1 = z1 * ( qq1 + z1 * qq2 );
690                         t2 = z2 * ( qq1 + z2 * qq2 );
691                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
692                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
693                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
694                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
695                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
696                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
697                         xsb0 = ( xsb0 >> 30 ) & 2;
698                         xsb1 = ( xsb1 >> 30 ) & 2;
699                         xsb2 = ( xsb2 >> 30 ) & 2;
700                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
701                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
702                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
703                         xsb0 |= 1;
704                         xsb1 |= 1;
705                         xsb2 |= 1;
706                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
707                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
708                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
709                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
710                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
711                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
712                         *py0 = ( a0 + t0 );
713                         *py1 = ( a1 + t1 );
714                         *py2 = ( a2 + t2 );
715                         break;
```



```
717                 case 1:
718                         j0 = n0 & 1;
719                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
720                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
721                         HI(&t1) = j1;
722                         HI(&t2) = j2;
723                         LO(&t1) = 0;
724                         LO(&t2) = 0;
725                         x0_or_one[0] = x0;
726                         x0_or_one[2] = -x0;
727                         y0_or_zero[0] = y0;
728                         y0_or_zero[2] = -y0;
729                         x1 = ( x1 - t1 ) + y1;
730                         x2 = ( x2 - t2 ) + y2;
731                         z0 = x0 * x0;
732                         z1 = x1 * x1;
733                         z2 = x2 * x2;
734                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
735                         t1 = z1 * ( qq1 + z1 * qq2 );
736                         t2 = z2 * ( qq1 + z2 * qq2 );
737                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
738                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
739                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
740                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
741                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
742                         xsb1 = ( xsb1 >> 30 ) & 2;
743                         xsb2 = ( xsb2 >> 30 ) & 2;
744                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
745                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
746                         xsb1 |= 1;
747                         xsb2 |= 1;
748                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
749                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
750                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
751                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
752                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
753                         *py0 = t0;
754                         *py1 = ( a1 + t1 );
755                         *py2 = ( a2 + t2 );
756                         break;

758                 case 2:
759                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
760                         j1 = n1 & 1;
761                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
762                         HI(&t0) = j0;
763                         HI(&t2) = j2;
764                         LO(&t0) = 0;
765                         LO(&t2) = 0;
766                         x1_or_one[0] = x1;
767                         x1_or_one[2] = -x1;
768                         x0 = ( x0 - t0 ) + y0;
769                         y1_or_zero[0] = y1;
770                         y1_or_zero[2] = -y1;
771                         x2 = ( x2 - t2 ) + y2;
772                         z0 = x0 * x0;
773                         z1 = x1 * x1;
774                         z2 = x2 * x2;
775                         t0 = z0 * ( qq1 + z0 * qq2 );
776                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
777                         t2 = z2 * ( qq1 + z2 * qq2 );
778                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
779                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
780                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
781                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
782                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
```

```
783                     xsb0 = ( xsb0 >> 30 ) & 2;
784                     xsb2 = ( xsb2 >> 30 ) & 2;
785                     n0 ^= ( xsb0 & ~( n0 << 1 ) );
786                     n2 ^= ( xsb2 & ~( n2 << 1 ) );
787                     xsb0 |= 1;
788                     xsb2 |= 1;
789                     a0 = __vlibm_TBL_sincos_hi[j0+n0];
790                     a2 = __vlibm_TBL_sincos_hi[j2+n2];
791                     t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
792                     t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
793                     t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
794                     *py0 = ( a0 + t0 );
795                     *py1 = t1;
796                     *py2 = ( a2 + t2 );
797                     break;

799             case 3:
800                     j0 = n0 & 1;
801                     j1 = n1 & 1;
802                     j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
803                     HI(&t2) = j2;
804                     LO(&t2) = 0;
805                     x0_or_one[0] = x0;
806                     x0_or_one[2] = -x0;
807                     x1_or_one[0] = x1;
808                     x1_or_one[2] = -x1;
809                     y0_or_zero[0] = y0;
810                     y0_or_zero[2] = -y0;
811                     y1_or_zero[0] = y1;
812                     y1_or_zero[2] = -y1;
813                     x2 = ( x2 - t2 ) + y2;
814                     z0 = x0 * x0;
815                     z1 = x1 * x1;
816                     z2 = x2 * x2;
817                     t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
818                     t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
819                     t2 = z2 * ( qq1 + z2 * qq2 );
820                     t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
821                     t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
822                     w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
823                     j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
824                     xsb2 = ( xsb2 >> 30 ) & 2;
825                     n2 ^= ( xsb2 & ~( n2 << 1 ) );
826                     xsb2 |= 1;
827                     a2 = __vlibm_TBL_sincos_hi[j2+n2];
828                     t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
829                     t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
830                     t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
831                     *py0 = t0;
832                     *py1 = t1;
833                     *py2 = ( a2 + t2 );
834                     break;

836             case 4:
837                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
838                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
839                     j2 = n2 & 1;
840                     HI(&t0) = j0;
841                     HI(&t1) = j1;
842                     LO(&t0) = 0;
843                     LO(&t1) = 0;
844                     x2_or_one[0] = x2;
845                     x2_or_one[2] = -x2;
846                     x0 = ( x0 - t0 ) + y0;
847                     x1 = ( x1 - t1 ) + y1;
848                     y2_or_zero[0] = y2;
```



```
849                     y2_or_zero[2] = -y2;
850                     z0 = x0 * x0;
851                     z1 = x1 * x1;
852                     z2 = x2 * x2;
853                     t0 = z0 * ( qq1 + z0 * qq2 );
854                     t1 = z1 * ( qq1 + z1 * qq2 );
855                     t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
856                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
857                     w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
858                     t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
859                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
860                     j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
861                     xsb0 = ( xsb0 >> 30 ) & 2;
862                     xsb1 = ( xsb1 >> 30 ) & 2;
863                     n0 ^= ( xsb0 & ~( n0 << 1 ) );
864                     n1 ^= ( xsb1 & ~( n1 << 1 ) );
865                     xsb0 |= 1;
866                     xsb1 |= 1;
867                     a0 = __vlibm_TBL_sincos_hi[j0+n0];
868                     a1 = __vlibm_TBL_sincos_hi[j1+n1];
869                     t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
870                     t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
871                     t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
872                     *py0 = ( a0 + t0 );
873                     *py1 = ( a1 + t1 );
874                     *py2 = t2;
875                     break;

877             case 5:
878                     j0 = n0 & 1;
879                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
880                     j2 = n2 & 1;
881                     HI(&t1) = j1;
882                     LO(&t1) = 0;
883                     x0_or_one[0] = x0;
884                     x0_or_one[2] = -x0;
885                     x2_or_one[0] = x2;
886                     x2_or_one[2] = -x2;
887                     y0_or_zero[0] = y0;
888                     y0_or_zero[2] = -y0;
889                     x1 = ( x1 - t1 ) + y1;
890                     y2_or_zero[0] = y2;
891                     y2_or_zero[2] = -y2;
892                     z0 = x0 * x0;
893                     z1 = x1 * x1;
894                     z2 = x2 * x2;
895                     t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
896                     t1 = z1 * ( qq1 + z1 * qq2 );
897                     t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
898                     t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
899                     w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
900                     t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
901                     j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
902                     xsb1 = ( xsb1 >> 30 ) & 2;
903                     n1 ^= ( xsb1 & ~( n1 << 1 ) );
904                     xsb1 |= 1;
905                     a1 = __vlibm_TBL_sincos_hi[j1+n1];
906                     t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
907                     t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
908                     t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
909                     *py0 = t0;
910                     *py1 = ( a1 + t1 );
911                     *py2 = t2;
912                     break;

914             case 6:
```

```
915                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
916                         j1 = n1 & 1;
917                         j2 = n2 & 1;
918                         HI(&t0) = j0;
919                         LO(&t0) = 0;
920                         x1_or_one[0] = x1;
921                         x1_or_one[2] = -x1;
922                         x2_or_one[0] = x2;
923                         x2_or_one[2] = -x2;
924                         x0 = ( x0 - t0 ) + y0;
925                         y1_or_zero[0] = y1;
926                         y1_or_zero[2] = -y1;
927                         y2_or_zero[0] = y2;
928                         y2_or_zero[2] = -y2;
929                         z0 = x0 * x0;
930                         z1 = x1 * x1;
931                         z2 = x2 * x2;
932                         t0 = z0 * ( qq1 + z0 * qq2 );
933                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
934                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
935                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
936                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
937                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
938                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
939                         xsb0 = ( xsb0 >> 30 ) & 2;
940                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
941                         xsb0 |= 1;
942                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
943                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
944                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
945                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
946                         *py0 = ( a0 + t0 );
947                         *py1 = t1;
948                         *py2 = t2;
949                         break;

951                 case 7:
952                         j0 = n0 & 1;
953                         j1 = n1 & 1;
954                         j2 = n2 & 1;
955                         x0_or_one[0] = x0;
956                         x0_or_one[2] = -x0;
957                         x1_or_one[0] = x1;
958                         x1_or_one[2] = -x1;
959                         x2_or_one[0] = x2;
960                         x2_or_one[2] = -x2;
961                         y0_or_zero[0] = y0;
962                         y0_or_zero[2] = -y0;
963                         y1_or_zero[0] = y1;
964                         y1_or_zero[2] = -y1;
965                         y2_or_zero[0] = y2;
966                         y2_or_zero[2] = -y2;
967                         z0 = x0 * x0;
968                         z1 = x1 * x1;
969                         z2 = x2 * x2;
970                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
971                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
972                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
973                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
974                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
975                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
976                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
977                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
978                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
979                         *py0 = t0;
980                         *py1 = t1;
```



```
981                         *py2 = t2;
982                         break;
983                 }

985                 x += stridex;
986                 y += stridey;
987                 i = 0;
988         } while ( --n > 0 );

990         if ( i > 0 )
991         {
992                 double          fn0, fn1, a0, a1, w0, w1, y0, y1;
993                 double          t0, t1, z0, z1;
994                 unsigned        j0, j1;
995                 int                     n0, n1;

997                 if ( i > 1 )
998                 {
999                         n1 = (int) ( x1 * invpio2 + half[xsb1] );
1000                        fn1 = (double) n1;
1001                        n1 = (n1 + 1) & 3; /* Add 1 (before the mod) to make sin
1002                        a1 = x1 - fn1 * pio2_1;
1003                        w1 = fn1 * pio2_2;
1004                        x1 = a1 - w1;
1005                        y1 = ( a1 - x1 ) - w1;
1006                        a1 = x1;
1007                        w1 = fn1 * pio2_3 - y1;
1008                        x1 = a1 - w1;
1009                        y1 = ( a1 - x1 ) - w1;
1010                        a1 = x1;
1011                        w1 = fn1 * pio2_3t - y1;
1012                        x1 = a1 - w1;
1013                        y1 = ( a1 - x1 ) - w1;
1014                        xsb1 = HI(&x1);
1015                        if ( ( xsb1 & ~0x80000000 ) < thresh[n1&1] )
1016                        {
1017                                j1 = n1 & 1;
1018                                x1_or_one[0] = x1;
1019                                x1_or_one[2] = -x1;
1020                                y1_or_zero[0] = y1;
1021                                y1_or_zero[2] = -y1;
1022                                z1 = x1 * x1;
1023                                t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1024                                t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 )
1025                                t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_on
1026                                *py1 = t1;
1027                        }
1028                        else
1029                        {
1030                                j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
1031                                HI(&t1) = j1;
1032                                LO(&t1) = 0;
1033                                x1 = ( x1 - t1 ) + y1;
1034                                z1 = x1 * x1;
1035                                t1 = z1 * ( qq1 + z1 * qq2 );
1036                                w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
1037                                j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >>
1038                                xsb1 = ( xsb1 >> 30 ) & 2;
1039                                n1 ^= ( xsb1 & ~( n1 << 1 ) );
1040                                xsb1 |= 1;
1041                                a1 = __vlibm_TBL_sincos_hi[j1+n1];
1042                                t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] *
1043                                *py1 = ( a1 + t1 );
1044                        }
1045                }
1046                n0 = (int) ( x0 * invpio2 + half[xsb0] );
```

```
1047                fn0 = (double) n0;
1048                n0 = (n0 + 1) & 3; /* Add 1 (before the mod) to make sin into co
1049                a0 = x0 - fn0 * pio2_1;
1050                w0 = fn0 * pio2_2;
1051                x0 = a0 - w0;
1052                y0 = ( a0 - x0 ) - w0;
1053                a0 = x0;
1054                w0 = fn0 * pio2_3 - y0;
1055                x0 = a0 - w0;
1056                y0 = ( a0 - x0 ) - w0;
1057                a0 = x0;
1058                w0 = fn0 * pio2_3t - y0;
1059                x0 = a0 - w0;
1060                y0 = ( a0 - x0 ) - w0;
1061                xsb0 = HI(&x0);
1062                if ( ( xsb0 & ~0x80000000 ) < thresh[n0&1] )
1063                {
1064                        j0 = n0 & 1;
1065                        x0_or_one[0] = x0;
1066                        x0_or_one[2] = -x0;
1067                        y0_or_zero[0] = y0;
1068                        y0_or_zero[2] = -y0;
1069                        z0 = x0 * x0;
1070                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1071                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1072                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1073                        *py0 = t0;
1074                }
1075                else
1076                {
1077                        j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
1078                        HI(&t0) = j0;
1079                        LO(&t0) = 0;
1080                        x0 = ( x0 - t0 ) + y0;
1081                        z0 = x0 * x0;
1082                        t0 = z0 * ( qq1 + z0 * qq2 );
1083                        w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
1084                        j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1085                        xsb0 = ( xsb0 >> 30 ) & 2;
1086                        n0 ^= ( xsb0 & ~( n0 << 1 ) );
1087                        xsb0 |= 1;
1088                        a0 = __vlibm_TBL_sincos_hi[j0+n0];
1089                        t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
1090                        *py0 = ( a0 + t0 );
1091                }
1092        }

1094        if ( biguns )
1095                __vlibm_vcos_big( nsave, xsave, sxsave, ysave, sysave, 0x413921f
1096 }
```

```
**********************************************************
    4489 Sat May 10 12:09:51 2014
new/usr/src/lib/libmvec/common/__vcosbig.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];
extern int __vlibm_rem_pio2m( double *, double *, int, int, int );

static const double
        zero    = 0.0,
        one             = 1.0,
        two24   = 16777216.0,
        pp1             = -1.6666666666057604652762639431349825546 76e-0001,
        pp2             =  8.3332612096909631267183765661461809444 42e-0003,
        p1              = -1.6666666666666629669805215138920301589656e-0001,
        p2              =  8.3333333239095129568399345528033637666 3e-0003,
        p3              = -1.9841262379979766927915517782300984039 60e-0004,
        p4              =  2.7534036248542772376499876228483303511 10e-0006,
        qq1             = -4.9999999999771098640702395590871155787 0e-0001,
        qq2             =  4.1666548638572193506450558810188420895 80e-0002,
        q1              = -4.9999999999999317014640608788882945244 81e-0001,
        q2              =  4.1666666663948619175356405939637082223 19e-0002,
        q3              = -1.3888885526561428678327566873685168146 2e-0003,
        q4              =  2.4785194236814607966181282894545305247 59e-0005;

void
__vlibm_vcos_big( int n, double * restrict x, int stridex, double * restrict y,
        int stridey, int thresh )
{
        for ( ; n--; x += stridex, y += stridey )
        {
                double          tx, tt[3], ty[2], t, w, z, a;
                unsigned        hx, xsb;
                int                     e0, nx, j;

                hx = HI(x);
                xsb = hx & 0x80000000;
                hx &= ~0x80000000;
                if ( hx <= thresh || hx >= 0x7ff00000 )
                        continue;
                e0 = ( hx >> 20 ) - 1046;
                HI(&tx) = 0x41600000 | ( hx & 0xfffff );
                LO(&tx) = LO(x);
                tt[0] = (double)( (int) tx );
                tx = ( tx - tt[0] ) * two24;
                if ( tx != zero )
                {
                        nx = 2;
                        tt[1] = (double)( (int) tx );
                        tt[2] = ( tx - tt[1] ) * two24;
                        if ( tt[2] != zero )
                                nx = 3;
                }
                else
                {
                        nx = 1;
                        tt[1] = tt[2] = zero;
                }
                nx = __vlibm_rem_pio2m( tt, ty, e0, nx, 2 );
                if ( xsb )
                {
                        nx = -nx;
                        ty[0] = -ty[0];
                        ty[1] = -ty[1];
                }
                nx = (nx + 1) & 3; /* Add 1 to turn sin into cos */

                /* now nx and ty[*] are the quadrant and reduced arg */
                xsb = ( nx & 2 ) << 30;
                hx = HI(&ty[0]);
                if ( nx & 1 )
                {
                        if ( hx & 0x80000000 )
                        {
                                ty[0] = -ty[0];
                                ty[1] = -ty[1];
                                hx &= ~0x80000000;
                        }
                        if ( hx < 0x3fc40000 )
                        {
                                z = ty[0] * ty[0];
                                t = z * ( q1 + z * ( q2 + z * ( q3 + z * q4 ) )
                                a = one + t;
                        }
                        else
                        {
                                j = ( hx + 0x4000 ) & 0x7fff8000;
```

```
128                                 HI(&t) = j;
129                                 LO(&t) = 0;
130                                 ty[0] = ( ty[0] - t ) + ty[1];
131                                 z = ty[0] * ty[0];
132                                 t = z * ( qq1 + z * qq2 );
133                                 w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
134                                 j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;
135                                 a = __vlibm_TBL_sincos_hi[j+1];
136                                 t = __vlibm_TBL_sincos_lo[j+1] - ( __vlibm_TBL_s
137                                 a += t;
138                         }
139                 }
140                 else
141                 {
142                         if ( hx & 0x80000000 )
143                         {
144                                 ty[0] = -ty[0];
145                                 ty[1] = -ty[1];
146                                 hx &= ~0x80000000;
147                                 xsb ^= 0x80000000;
148                         }
149                         if ( hx < 0x3fc90000 )
150                         {
151                                 z = ty[0] * ty[0];
152                                 t = z * ( p1 + z * ( p2 + z * ( p3 + z * p4 ) )
153                                 a = ty[0] + ( ty[1] + ty[0] * t );
154                         }
155                         else
156                         {
157                                 j = ( hx + 0x4000 ) & 0x7fff8000;
158                                 HI(&t) = j;
159                                 LO(&t) = 0;
160                                 ty[0] = ( ty[0] - t ) + ty[1];
161                                 z = ty[0] * ty[0];
162                                 t = z * ( qq1 + z * qq2 );
163                                 w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
164                                 j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;
165                                 a = __vlibm_TBL_sincos_hi[j];
166                                 t = ( __vlibm_TBL_sincos_hi[j+1] * w + a * t ) +
167                                 a += t;
168                         }
169                 }
170                 if ( xsb ) a = -a;
171                 *y = a;
172         }
173 }
```

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   18251 Sat May 10 12:09:51 2014
new/usr/src/lib/libmvec/common/__vcosbig_ultra3.c
patch01 - 693 import Sun Devpro Math Library
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#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];

static const double
        half[2] = { 0.5, -0.5 },
        one             = 1.0,
        invpio2 = 0.63661977236758134307553505,
        pio2_1  = 1.57079632673412561417,
        pio2_2  = 6.07710050630396597660e-11,
        pio2_3  = 2.02226246narrow711166458796e-21,
        pio2_3t = 8.47842766036889964329e-32,
        pp1             = -1.66666666605760465276263943134982554676e-0001,
        pp2             =  8.33326120969096312671837656614618094444e-0003,
        qq1             = -4.99999999977710986407023955908711557870e-0001,
        qq2             =  4.16665486385721935064505588101884208958e-0002,
        poly1[2]= { -1.66666666666629669805215138920301589656e-0001,
                                -4.99999999999931701464060878888294524481e-0001
        poly2[2]= {  8.33333333239095129568399345528033637663e-0003,
                                 4.16666666394861917535640593963708222319e-0002
        poly3[2]= { -1.98412623799797669279155177823009840396e-0004,
                                -1.38888855265614286783275668773685168146e-0003
        poly4[2]= {  2.75340362485427723764998762284833035111e-0006,
                                 2.47851942368146079661812828945453052475e-0005

static const unsigned thresh[2] = { 0x3fc90000, 0x3fc40000 };

extern void __vlibm_vcos_big( int, double *, int, double *, int, int );

void
__vlibm_vcos_big_ultra3( int n, double * restrict x, int stridex, double * restr
        int stridey, int pthresh )
{
        double          x0_or_one[4], x1_or_one[4], x2_or_one[4];
        double          y0_or_zero[4], y1_or_zero[4], y2_or_zero[4];
        double          x0, x1, x2, *py0, *py1, *py2, *xsave, *ysave;
        unsigned        xsb0, xsb1, xsb2;
        int                     i, biguns, nsave, sxsave, sysave;

        nsave = n;
        xsave = x;
        sxsave = stridex;
        ysave = y;
        sysave = stridey;
        biguns = 0;

        x0_or_one[1] = 1.0;
        x1_or_one[1] = 1.0;
        x2_or_one[1] = 1.0;
        x0_or_one[3] = -1.0;
        x1_or_one[3] = -1.0;
        x2_or_one[3] = -1.0;
        y0_or_zero[1] = 0.0;
        y1_or_zero[1] = 0.0;
        y2_or_zero[1] = 0.0;
        y0_or_zero[3] = 0.0;
        y1_or_zero[3] = 0.0;
        y2_or_zero[3] = 0.0;

        do
        {
                double          fn0, fn1, fn2, a0, a1, a2, w0, w1, w2, y0, y1, y
                unsigned        hx;
                int                     n0, n1, n2;

loop0:
                hx = HI(x);
                xsb0 = hx >> 31;
                hx &= ~0x80000000;
                if ( hx <= pthresh || hx > 0x413921fb )
                {
                        if ( hx > 0x413921fb && hx < 0x7ff00000)
                                biguns = 1;
                        x += stridex;
                        y += stridey;
                        i = 0;
                        if ( --n <= 0 )
                                break;
                        goto loop0;
                }
                x0 = *x;
                py0 = y;
                x += stridex;
                y += stridey;
```

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128                 i = 1;
129                 if ( --n <= 0 )
130                         break;

132 loop1:
133                 hx = HI(x);
134                 xsb1 = hx >> 31;
135                 hx &= ~0x80000000;
136                 if ( hx <= pthresh || hx > 0x413921fb )
137                 {
138                         if ( hx > 0x413921fb && hx < 0x7ff00000)
139                                 biguns = 1;
140                         x += stridex;
141                         y += stridey;
142                         i = 1;
143                         if ( --n <= 0 )
144                                 break;
145                         goto loop1;
146                 }
147                 x1 = *x;
148                 py1 = y;
149                 x += stridex;
150                 y += stridey;
151                 i = 2;
152                 if ( --n <= 0 )
153                         break;

155 loop2:
156                 hx = HI(x);
157                 xsb2 = hx >> 31;
158                 hx &= ~0x80000000;
159                 if ( hx <= pthresh || hx > 0x413921fb )
160                 {
161                         if ( hx > 0x413921fb && hx < 0x7ff00000)
162                                 biguns = 1;
163                         x += stridex;
164                         y += stridey;
165                         i = 2;
166                         if ( --n <= 0 )
167                                 break;
168                         goto loop2;
169                 }
170                 x2 = *x;
171                 py2 = y;

173                 n0 = (int) ( x0 * invpio2 + half[xsb0] );
174                 n1 = (int) ( x1 * invpio2 + half[xsb1] );
175                 n2 = (int) ( x2 * invpio2 + half[xsb2] );
176                 fn0 = (double) n0;
177                 fn1 = (double) n1;
178                 fn2 = (double) n2;
179                 n0 = (n0 + 1) & 3; /* Add 1 (before the mod) to make sin into co
180                 n1 = (n1 + 1) & 3;
181                 n2 = (n2 + 1) & 3;
182                 a0 = x0 - fn0 * pio2_1;
183                 a1 = x1 - fn1 * pio2_1;
184                 a2 = x2 - fn2 * pio2_1;
185                 w0 = fn0 * pio2_2;
186                 w1 = fn1 * pio2_2;
187                 w2 = fn2 * pio2_2;
188                 x0 = a0 - w0;
189                 x1 = a1 - w1;
190                 x2 = a2 - w2;
191                 y0 = ( a0 - x0 ) - w0;
192                 y1 = ( a1 - x1 ) - w1;
193                 y2 = ( a2 - x2 ) - w2;
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194                 a0 = x0;
195                 a1 = x1;
196                 a2 = x2;
197                 w0 = fn0 * pio2_3 - y0;
198                 w1 = fn1 * pio2_3 - y1;
199                 w2 = fn2 * pio2_3 - y2;
200                 x0 = a0 - w0;
201                 x1 = a1 - w1;
202                 x2 = a2 - w2;
203                 y0 = ( a0 - x0 ) - w0;
204                 y1 = ( a1 - x1 ) - w1;
205                 y2 = ( a2 - x2 ) - w2;
206                 a0 = x0;
207                 a1 = x1;
208                 a2 = x2;
209                 w0 = fn0 * pio2_3t - y0;
210                 w1 = fn1 * pio2_3t - y1;
211                 w2 = fn2 * pio2_3t - y2;
212                 x0 = a0 - w0;
213                 x1 = a1 - w1;
214                 x2 = a2 - w2;
215                 y0 = ( a0 - x0 ) - w0;
216                 y1 = ( a1 - x1 ) - w1;
217                 y2 = ( a2 - x2 ) - w2;
218                 xsb0 = HI(&x0);
219                 i = ( ( xsb0 & ~0x80000000 ) - thresh[n0&1] ) >> 31;
220                 xsb1 = HI(&x1);
221                 i |= ( ( ( xsb1 & ~0x80000000 ) - thresh[n1&1] ) >> 30 ) & 2;
222                 xsb2 = HI(&x2);
223                 i |= ( ( ( xsb2 & ~0x80000000 ) - thresh[n2&1] ) >> 29 ) & 4;
224                 switch ( i )
225                 {
226                         double          t0, t1, t2, z0, z1, z2;
227                         unsigned        j0, j1, j2;

229                 case 0:
230                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
231                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
232                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
233                         HI(&t0) = j0;
234                         HI(&t1) = j1;
235                         HI(&t2) = j2;
236                         LO(&t0) = 0;
237                         LO(&t1) = 0;
238                         LO(&t2) = 0;
239                         x0 = ( x0 - t0 ) + y0;
240                         x1 = ( x1 - t1 ) + y1;
241                         x2 = ( x2 - t2 ) + y2;
242                         z0 = x0 * x0;
243                         z1 = x1 * x1;
244                         z2 = x2 * x2;
245                         t0 = z0 * ( qq1 + z0 * qq2 );
246                         t1 = z1 * ( qq1 + z1 * qq2 );
247                         t2 = z2 * ( qq1 + z2 * qq2 );
248                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
249                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
250                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
251                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
252                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
253                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
254                         xsb0 = ( xsb0 >> 30 ) & 2;
255                         xsb1 = ( xsb1 >> 30 ) & 2;
256                         xsb2 = ( xsb2 >> 30 ) & 2;
257                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
258                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
259                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
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```
260                         xsb0 |= 1;
261                         xsb1 |= 1;
262                         xsb2 |= 1;
263                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
264                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
265                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
266                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
267                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
268                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
269                         *py0 = ( a0 + t0 );
270                         *py1 = ( a1 + t1 );
271                         *py2 = ( a2 + t2 );
272                         break;

274                 case 1:
275                         j0 = n0 & 1;
276                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
277                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
278                         HI(&t1) = j1;
279                         HI(&t2) = j2;
280                         LO(&t1) = 0;
281                         LO(&t2) = 0;
282                         x0_or_one[0] = x0;
283                         x0_or_one[2] = -x0;
284                         y0_or_zero[0] = y0;
285                         y0_or_zero[2] = -y0;
286                         x1 = ( x1 - t1 ) + y1;
287                         x2 = ( x2 - t2 ) + y2;
288                         z0 = x0 * x0;
289                         z1 = x1 * x1;
290                         z2 = x2 * x2;
291                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
292                         t1 = z1 * ( qq1 + z1 * qq2 );
293                         t2 = z2 * ( qq1 + z2 * qq2 );
294                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
295                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
296                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
297                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
298                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
299                         xsb1 = ( xsb1 >> 30 ) & 2;
300                         xsb2 = ( xsb2 >> 30 ) & 2;
301                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
302                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
303                         xsb1 |= 1;
304                         xsb2 |= 1;
305                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
306                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
307                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
308                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
309                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
310                         *py0 = t0;
311                         *py1 = ( a1 + t1 );
312                         *py2 = ( a2 + t2 );
313                         break;

315                 case 2:
316                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
317                         j1 = n1 & 1;
318                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
319                         HI(&t0) = j0;
320                         HI(&t2) = j2;
321                         LO(&t0) = 0;
322                         LO(&t2) = 0;
323                         x1_or_one[0] = x1;
324                         x1_or_one[2] = -x1;
325                         x0 = ( x0 - t0 ) + y0;
```



```
326                         y1_or_zero[0] = y1;
327                         y1_or_zero[2] = -y1;
328                         x2 = ( x2 - t2 ) + y2;
329                         z0 = x0 * x0;
330                         z1 = x1 * x1;
331                         z2 = x2 * x2;
332                         t0 = z0 * ( qq1 + z0 * qq2 );
333                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
334                         t2 = z2 * ( qq1 + z2 * qq2 );
335                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
336                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
337                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
338                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
339                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
340                         xsb0 = ( xsb0 >> 30 ) & 2;
341                         xsb2 = ( xsb2 >> 30 ) & 2;
342                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
343                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
344                         xsb0 |= 1;
345                         xsb2 |= 1;
346                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
347                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
348                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
349                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
350                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
351                         *py0 = ( a0 + t0 );
352                         *py1 = t1;
353                         *py2 = ( a2 + t2 );
354                         break;

356                 case 3:
357                         j0 = n0 & 1;
358                         j1 = n1 & 1;
359                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
360                         HI(&t2) = j2;
361                         LO(&t2) = 0;
362                         x0_or_one[0] = x0;
363                         x0_or_one[2] = -x0;
364                         x1_or_one[0] = x1;
365                         x1_or_one[2] = -x1;
366                         y0_or_zero[0] = y0;
367                         y0_or_zero[2] = -y0;
368                         y1_or_zero[0] = y1;
369                         y1_or_zero[2] = -y1;
370                         x2 = ( x2 - t2 ) + y2;
371                         z0 = x0 * x0;
372                         z1 = x1 * x1;
373                         z2 = x2 * x2;
374                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
375                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
376                         t2 = z2 * ( qq1 + z2 * qq2 );
377                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
378                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
379                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
380                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
381                         xsb2 = ( xsb2 >> 30 ) & 2;
382                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
383                         xsb2 |= 1;
384                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
385                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
386                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
387                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
388                         *py0 = t0;
389                         *py1 = t1;
390                         *py2 = ( a2 + t2 );
391                         break;
```

```
393                 case 4:
394                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
395                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
396                         j2 = n2 & 1;
397                         HI(&t0) = j0;
398                         HI(&t1) = j1;
399                         LO(&t0) = 0;
400                         LO(&t1) = 0;
401                         x2_or_one[0] = x2;
402                         x2_or_one[2] = -x2;
403                         x0 = ( x0 - t0 ) + y0;
404                         x1 = ( x1 - t1 ) + y1;
405                         y2_or_zero[0] = y2;
406                         y2_or_zero[2] = -y2;
407                         z0 = x0 * x0;
408                         z1 = x1 * x1;
409                         z2 = x2 * x2;
410                         t0 = z0 * ( qq1 + z0 * qq2 );
411                         t1 = z1 * ( qq1 + z1 * qq2 );
412                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
413                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
414                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
415                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
416                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
417                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
418                         xsb0 = ( xsb0 >> 30 ) & 2;
419                         xsb1 = ( xsb1 >> 30 ) & 2;
420                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
421                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
422                         xsb0 |= 1;
423                         xsb1 |= 1;
424                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
425                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
426                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
427                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
428                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
429                         *py0 = ( a0 + t0 );
430                         *py1 = ( a1 + t1 );
431                         *py2 = t2;
432                         break;

434                 case 5:
435                         j0 = n0 & 1;
436                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
437                         j2 = n2 & 1;
438                         HI(&t1) = j1;
439                         LO(&t1) = 0;
440                         x0_or_one[0] = x0;
441                         x0_or_one[2] = -x0;
442                         x2_or_one[0] = x2;
443                         x2_or_one[2] = -x2;
444                         y0_or_zero[0] = y0;
445                         y0_or_zero[2] = -y0;
446                         x1 = ( x1 - t1 ) + y1;
447                         y2_or_zero[0] = y2;
448                         y2_or_zero[2] = -y2;
449                         z0 = x0 * x0;
450                         z1 = x1 * x1;
451                         z2 = x2 * x2;
452                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
453                         t1 = z1 * ( qq1 + z1 * qq2 );
454                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
455                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
456                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
457                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
```



```
458                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
459                         xsb1 = ( xsb1 >> 30 ) & 2;
460                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
461                         xsb1 |= 1;
462                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
463                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
464                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
465                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
466                         *py0 = t0;
467                         *py1 = ( a1 + t1 );
468                         *py2 = t2;
469                         break;

471                 case 6:
472                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
473                         j1 = n1 & 1;
474                         j2 = n2 & 1;
475                         HI(&t0) = j0;
476                         LO(&t0) = 0;
477                         x1_or_one[0] = x1;
478                         x1_or_one[2] = -x1;
479                         x2_or_one[0] = x2;
480                         x2_or_one[2] = -x2;
481                         x0 = ( x0 - t0 ) + y0;
482                         y1_or_zero[0] = y1;
483                         y1_or_zero[2] = -y1;
484                         y2_or_zero[0] = y2;
485                         y2_or_zero[2] = -y2;
486                         z0 = x0 * x0;
487                         z1 = x1 * x1;
488                         z2 = x2 * x2;
489                         t0 = z0 * ( qq1 + z0 * qq2 );
490                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
491                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
492                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
493                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
494                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
495                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
496                         xsb0 = ( xsb0 >> 30 ) & 2;
497                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
498                         xsb0 |= 1;
499                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
500                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
501                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
502                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
503                         *py0 = ( a0 + t0 );
504                         *py1 = t1;
505                         *py2 = t2;
506                         break;

508                 case 7:
509                         j0 = n0 & 1;
510                         j1 = n1 & 1;
511                         j2 = n2 & 1;
512                         x0_or_one[0] = x0;
513                         x0_or_one[2] = -x0;
514                         x1_or_one[0] = x1;
515                         x1_or_one[2] = -x1;
516                         x2_or_one[0] = x2;
517                         x2_or_one[2] = -x2;
518                         y0_or_zero[0] = y0;
519                         y0_or_zero[2] = -y0;
520                         y1_or_zero[0] = y1;
521                         y1_or_zero[2] = -y1;
522                         y2_or_zero[0] = y2;
523                         y2_or_zero[2] = -y2;
```

```
524                     z0 = x0 * x0;
525                     z1 = x1 * x1;
526                     z2 = x2 * x2;
527                     t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
528                     t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
529                     t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
530                     t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
531                     t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
532                     t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
533                     t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
534                     t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
535                     t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
536                     *py0 = t0;
537                     *py1 = t1;
538                     *py2 = t2;
539                     break;
540             }

542             x += stridex;
543             y += stridey;
544             i = 0;
545     } while ( --n > 0 );

547     if ( i > 0 )
548     {
549             double          fn0, fn1, a0, a1, w0, w1, y0, y1;
550             double          t0, t1, z0, z1;
551             unsigned        j0, j1;
552             int                     n0, n1;

554             if ( i > 1 )
555             {
556                     n1 = (int) ( x1 * invpio2 + half[xsb1] );
557                     fn1 = (double) n1;
558                     n1 = (n1 + 1) & 3; /* Add 1 (before the mod) to make sin
559                     a1 = x1 - fn1 * pio2_1;
560                     w1 = fn1 * pio2_2;
561                     x1 = a1 - w1;
562                     y1 = ( a1 - x1 ) - w1;
563                     a1 = x1;
564                     w1 = fn1 * pio2_3 - y1;
565                     x1 = a1 - w1;
566                     y1 = ( a1 - x1 ) - w1;
567                     a1 = x1;
568                     w1 = fn1 * pio2_3t - y1;
569                     x1 = a1 - w1;
570                     y1 = ( a1 - x1 ) - w1;
571                     xsb1 = HI(&x1);
572                     if ( ( xsb1 & ~0x80000000 ) < thresh[n1&1] )
573                     {
574                             j1 = n1 & 1;
575                             x1_or_one[0] = x1;
576                             x1_or_one[2] = -x1;
577                             y1_or_zero[0] = y1;
578                             y1_or_zero[2] = -y1;
579                             z1 = x1 * x1;
580                             t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
581                             t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 )
582                             t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_on
583                             *py1 = t1;
584                     }
585                     else
586                     {
587                             j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
588                             HI(&t1) = j1;
589                             LO(&t1) = 0;
```



```
590                             x1 = ( x1 - t1 ) + y1;
591                             z1 = x1 * x1;
592                             t1 = z1 * ( qq1 + z1 * qq2 );
593                             w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
594                             j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >>
595                             xsb1 = ( xsb1 >> 30 ) & 2;
596                             n1 ^= ( xsb1 & ~( n1 << 1 ) );
597                             xsb1 |= 1;
598                             a1 = __vlibm_TBL_sincos_hi[j1+n1];
599                             t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] *
600                             *py1 = ( a1 + t1 );
601                     }
602             }
603             n0 = (int) ( x0 * invpio2 + half[xsb0] );
604             fn0 = (double) n0;
605             n0 = (n0 + 1) & 3; /* Add 1 (before the mod) to make sin into co
606             a0 = x0 - fn0 * pio2_1;
607             w0 = fn0 * pio2_2;
608             x0 = a0 - w0;
609             y0 = ( a0 - x0 ) - w0;
610             a0 = x0;
611             w0 = fn0 * pio2_3 - y0;
612             x0 = a0 - w0;
613             y0 = ( a0 - x0 ) - w0;
614             a0 = x0;
615             w0 = fn0 * pio2_3t - y0;
616             x0 = a0 - w0;
617             y0 = ( a0 - x0 ) - w0;
618             xsb0 = HI(&x0);
619             if ( ( xsb0 & ~0x80000000 ) < thresh[n0&1] )
620             {
621                     j0 = n0 & 1;
622                     x0_or_one[0] = x0;
623                     x0_or_one[2] = -x0;
624                     y0_or_zero[0] = y0;
625                     y0_or_zero[2] = -y0;
626                     z0 = x0 * x0;
627                     t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
628                     t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
629                     t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
630                     *py0 = t0;
631             }
632             else
633             {
634                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
635                     HI(&t0) = j0;
636                     LO(&t0) = 0;
637                     x0 = ( x0 - t0 ) + y0;
638                     z0 = x0 * x0;
639                     t0 = z0 * ( qq1 + z0 * qq2 );
640                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
641                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
642                     xsb0 = ( xsb0 >> 30 ) & 2;
643                     n0 ^= ( xsb0 & ~( n0 << 1 ) );
644                     xsb0 |= 1;
645                     a0 = __vlibm_TBL_sincos_hi[j0+n0];
646                     t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
647                     *py0 = ( a0 + t0 );
648             }
649     }

651     if ( biguns )
652             __vlibm_vcos_big( nsave, xsave, sxsave, ysave, sysave, 0x413921f
653 }
```

```
**********************************************************
    4475 Sat May 10 12:09:51 2014
new/usr/src/lib/libmvec/common/__vcosbigf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */
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 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];
extern int __vlibm_rem_pio2m( double *, double *, int, int, int );

static const double
        zero    = 0.0,
        one             = 1.0,
        two24   = 16777216.0,
        pp1             = -1.6666666666057604652762639431349825546 76e-0001,
        pp2             =  8.3332612096909631267183765661461809444 42e-0003,
        p1              = -1.6666666666666629669805215138920301589656e-0001,
        p2              =  8.3333333239095129568399345528033637666 3e-0003,
        p3              = -1.9841262379979766927915517782300984039 60e-0004,
        p4              =  2.7534036248542772376499876228483303511 10e-0006,
        qq1             = -4.9999999999777109864070239559087115578 70e-0001,
        qq2             =  4.1666548638572193506450558810188420895 80e-0002,
        q1              = -4.9999999999999317014640608788882945244 81e-0001,
        q2              =  4.1666666663948619175356405939637082223 19e-0002,
        q3              = -1.3888885526561428678327566873736851681 462e-0003,
        q4              =  2.4785194236814607966181282894545305247 59e-0005;

void
__vlibm_vcos_bigf( int n, float * restrict x, int stridex, float * restrict y,
        int stridey )
{
        for ( ; n--; x += stridex, y += stridey )
        {
                double          tx, tt[3], ty[2], t, w, z, a;
                unsigned        hx, xsb;
                int                     e0, nx, j;

                tx = *x;
                hx = HI(&tx);
                xsb = hx & 0x80000000;
                hx &= ~0x80000000;
                if ( hx <= 0x413921fb || hx >= 0x7ff00000 )
                        continue;
                e0 = ( hx >> 20 ) - 1046;
                HI(&tx) = 0x41600000 | ( hx & 0xfffff );

                tt[0] = (double)( (int) tx );
                tx = ( tx - tt[0] ) * two24;
                if ( tx != zero )
                {
                        nx = 2;
                        tt[1] = (double)( (int) tx );
                        tt[2] = ( tx - tt[1] ) * two24;
                        if ( tt[2] != zero )
                                nx = 3;
                }
                else
                {
                        nx = 1;
                        tt[1] = tt[2] = zero;
                }
                nx = __vlibm_rem_pio2m( tt, ty, e0, nx, 2 );
                if ( xsb )
                {
                        nx = -nx;
                        ty[0] = -ty[0];
                        ty[1] = -ty[1];
                }
                nx = (nx + 1) & 3; /* Add 1 to turn sin into cos */

                /* now nx and ty[*] are the quadrant and reduced arg */
                xsb = ( nx & 2 ) << 30;
                hx = HI(&ty[0]);
                if ( nx & 1 )
                {
                        if ( hx & 0x80000000 )
                        {
                                ty[0] = -ty[0];
                                ty[1] = -ty[1];
                                hx &= ~0x80000000;
                        }
                        if ( hx < 0x3fc40000 )
                        {
                                z = ty[0] * ty[0];
                                t = z * ( q1 + z * ( q2 + z * ( q3 + z * q4 ) )
                                a = one + t;
                        }
                        else
                        {
```

```
128                                 j = ( hx + 0x4000 ) & 0x7fff8000;
129                                 HI(&t) = j;
130                                 LO(&t) = 0;
131                                 ty[0] = ( ty[0] - t ) + ty[1];
132                                 z = ty[0] * ty[0];
133                                 t = z * ( qq1 + z * qq2 );
134                                 w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
135                                 j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;
136                                 a = __vlibm_TBL_sincos_hi[j+1];
137                                 t = __vlibm_TBL_sincos_lo[j+1] - ( __vlibm_TBL_s
138                                 a += t;
139                         }
140                 }
141                 else
142                 {
143                         if ( hx & 0x80000000 )
144                         {
145                                 ty[0] = -ty[0];
146                                 ty[1] = -ty[1];
147                                 hx &= ~0x80000000;
148                                 xsb ^= 0x80000000;
149                         }
150                         if ( hx < 0x3fc90000 )
151                         {
152                                 z = ty[0] * ty[0];
153                                 t = z * ( p1 + z * ( p2 + z * ( p3 + z * p4 ) )
154                                 a = ty[0] + ( ty[1] + ty[0] * t );
155                         }
156                         else
157                         {
158                                 j = ( hx + 0x4000 ) & 0x7fff8000;
159                                 HI(&t) = j;
160                                 LO(&t) = 0;
161                                 ty[0] = ( ty[0] - t ) + ty[1];
162                                 z = ty[0] * ty[0];
163                                 t = z * ( qq1 + z * qq2 );
164                                 w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
165                                 j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;
166                                 a = __vlibm_TBL_sincos_hi[j];
167                                 t = ( __vlibm_TBL_sincos_hi[j+1] * w + a * t ) +
168                                 a += t;
169                         }
170                 }
171                 if ( xsb ) a = -a;
172                 *y = a;
173         }
174 }
```

```
**********************************************************
   10431 Sat May 10 12:09:51 2014
new/usr/src/lib/libmvec/common/__vcosf.c
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
 * __vcosf: single precision vector cos
 *
 * Algorithm:
 *
 * For |x| < pi/4, approximate sin(x) by a polynomial x+x*z*(S0+
 * z*(S1+z*S2)) and cos(x) by a polynomial 1+z*(-1/2+z*(C0+z*(C1+
 * z*C2))), where z = x*x, all evaluated in double precision.
 *
 * Accuracy:
 *
 * The largest error is less than 0.6 ulps.
 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int *)&x)
#define LO(x)   *(unsigned *)&x
#else
#define HI(x)   *(int *)&x
#define LO(x)   *(1+(unsigned *)&x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern int __vlibm_rem_pio2m(double *, double *, int, int, int);
```



```
static const double C[] = {
        -1.666665524424430847168e-01,    /* 2^ -3 * -1.5555460000000 */
        8.332191966474056243390e-03,     /* 2^ -7 *  1.11077E0000000 */
        -1.951879094121977686688e-04,    /* 2^-13 * -1.9956B60000000 */
        1.0,
        -0.5,
        4.166664555668830871580e-02,     /* 2^ -5 *  1.55554A0000000 */
        -1.388730364851653575900e-03,    /* 2^-10 * -1.6C0C1E0000000 */
        2.443099037918727849950e-05,     /* 2^-16 *  1.99E24E0000000 */
        0.636619772367581343075535,      /* 2^ -1  * 1.45F306DC9C883 */
        6755399441055744.0,              /* 2^ 52  * 1.8000000000000 */
        1.570796326734125614166,         /* 2^  0  * 1.921FB54400000 */
        6.077100506506192601475e-11,     /* 2^-34  * 1.0B4611A626331 */
};

#define S0      C[0]
#define S1      C[1]
#define S2      C[2]
#define one     C[3]
#define mhalf   C[4]
#define C0      C[5]
#define C1      C[6]
#define C2      C[7]
#define invpio2 C[8]
#define c3two51 C[9]
#define pio2_1  C[10]
#define pio2_t  C[11]

#define PREPROCESS(N, index, label)                                     \
        hx = *(int *)x;                                                 \
        ix = hx & 0x7fffffff;                                           \
        t = *x;                                                         \
        x += stridex;                                                   \
        if (ix <= 0x3f490fdb) { /* |x| < pi/4 */                        \
                if (ix == 0) {                                          \
                        y[index] = one;                                 \
                        goto label;                                     \
                }                                                       \
                y##N = (double)t;                                       \
                n##N = 1;                                               \
        } else if (ix <= 0x49c90fdb) { /* |x| < 2^19*pi */              \
                y##N = (double)t;                                       \
                medium = 1;                                             \
        } else {                                                        \
                if (ix >= 0x7f800000) { /* inf or nan */                \
                        y[index] = t / t;                               \
                        goto label;                                     \
                }                                                       \
                z##N = y##N = (double)t;                                \
                hx = HI(y##N);                                          \
                n##N = ((hx >> 20) & 0x7ff) - 1046;                     \
                HI(z##N) = (hx & 0xfffff) | 0x41600000;                 \
                n##N = __vlibm_rem_pio2m(&z##N, &y##N, n##N, 1, 0) + 1; \
                z##N = y##N * y##N;                                     \
                if (n##N & 1) { /* compute cos y */                     \
                        f##N = (float)(one + z##N * (mhalf + z##N *     \
                            (C0 + z##N * (C1 + z##N * C2))));           \
                } else { /* compute sin y */                            \
                        f##N = (float)(y##N + y##N * z##N * (S0 +       \
                            z##N * (S1 + z##N * S2)));                  \
                }                                                       \
                y[index] = (n##N & 2)? -f##N : f##N;                    \
                goto label;                                             \
        }

#define PROCESS(N)                                                      \
```

```
127         if (medium) {                                               \
128                 z##N = y##N * invpio2 + c3two51;                    \
129                 n##N = LO(z##N) + 1;                                \
130                 z##N -= c3two51;                                    \
131                 y##N = (y##N - z##N * pio2_1) - z##N * pio2_t;       \
132         }                                                           \
133         z##N = y##N * y##N;                                         \
134         if (n##N & 1) { /* compute cos y */                         \
135                 f##N = (float)(one + z##N * (mhalf + z##N * (C0 +    \
136                     z##N * (C1 + z##N * C2))));                     \
137         } else { /* compute sin y */                                \
138                 f##N = (float)(y##N + y##N * z##N * (S0 + z##N * (S1 + \
139                     z##N * S2)));                                   \
140         }                                                           \
141         *y = (n##N & 2)? -f##N : f##N;                               \
142         y += stridey

144 void
145 __vcosf(int n, float *restrict x, int stridex, float *restrict y,
146     int stridey)
147 {
148         double          y0, y1, y2, y3;
149         double          z0, z1, z2, z3;
150         float           f0, f1, f2, f3, t;
151         int             n0 = 0, n1 = 0, n2 = 0, n3, hx, ix, medium;

153         y -= stridey;

155         for (;;) {
156 begin:
157                 y += stridey;

159                 if (--n < 0)
160                         break;

162                 medium = 0;
163                 PREPROCESS(0, 0, begin);

165                 if (--n < 0)
166                         goto process1;

168                 PREPROCESS(1, stridey, process1);

170                 if (--n < 0)
171                         goto process2;

173                 PREPROCESS(2, (stridey << 1), process2);

175                 if (--n < 0)
176                         goto process3;

178                 PREPROCESS(3, (stridey << 1) + stridey, process3);

180                 if (medium) {
181                         z0 = y0 * invpio2 + c3two51;
182                         z1 = y1 * invpio2 + c3two51;
183                         z2 = y2 * invpio2 + c3two51;
184                         z3 = y3 * invpio2 + c3two51;

186                         n0 = LO(z0) + 1;
187                         n1 = LO(z1) + 1;
188                         n2 = LO(z2) + 1;
189                         n3 = LO(z3) + 1;

191                         z0 -= c3two51;
192                         z1 -= c3two51;
```



```
193                         z2 -= c3two51;
194                         z3 -= c3two51;

196                         y0 = (y0 - z0 * pio2_1) - z0 * pio2_t;
197                         y1 = (y1 - z1 * pio2_1) - z1 * pio2_t;
198                         y2 = (y2 - z2 * pio2_1) - z2 * pio2_t;
199                         y3 = (y3 - z3 * pio2_1) - z3 * pio2_t;
200                 }

202                 z0 = y0 * y0;
203                 z1 = y1 * y1;
204                 z2 = y2 * y2;
205                 z3 = y3 * y3;

207                 hx = (n0 & 1) | ((n1 & 1) << 1) | ((n2 & 1) << 2) |
208                     ((n3 & 1) << 3);
209                 switch (hx) {
210                 case 0:
211                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
212                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
213                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
214                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
215                         break;

217                 case 1:
218                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
219                             z0 * (C1 + z0 * C2))));
220                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
221                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
222                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
223                         break;

225                 case 2:
226                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
227                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
228                             z1 * (C1 + z1 * C2))));
229                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
230                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
231                         break;

233                 case 3:
234                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
235                             z0 * (C1 + z0 * C2))));
236                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
237                             z1 * (C1 + z1 * C2))));
238                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
239                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
240                         break;

242                 case 4:
243                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
244                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
245                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
246                             z2 * (C1 + z2 * C2))));
247                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
248                         break;

250                 case 5:
251                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
252                             z0 * (C1 + z0 * C2))));
253                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
254                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
255                             z2 * (C1 + z2 * C2))));
256                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
257                         break;
```

```
259                 case 6:
260                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
261                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
262                             z1 * (C1 + z1 * C2))));
263                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
264                             z2 * (C1 + z2 * C2))));
265                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
266                         break;
267
268                 case 7:
269                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
270                             z0 * (C1 + z0 * C2))));
271                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
272                             z1 * (C1 + z1 * C2))));
273                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
274                             z2 * (C1 + z2 * C2))));
275                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
276                         break;
277
278                 case 8:
279                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
280                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
281                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
282                         f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
283                             z3 * (C1 + z3 * C2))));
284                         break;
285
286                 case 9:
287                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
288                             z0 * (C1 + z0 * C2))));
289                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
290                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
291                         f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
292                             z3 * (C1 + z3 * C2))));
293                         break;
294
295                 case 10:
296                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
297                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
298                             z1 * (C1 + z1 * C2))));
299                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
300                         f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
301                             z3 * (C1 + z3 * C2))));
302                         break;
303
304                 case 11:
305                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
306                             z0 * (C1 + z0 * C2))));
307                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
308                             z1 * (C1 + z1 * C2))));
309                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
310                         f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
311                             z3 * (C1 + z3 * C2))));
312                         break;
313
314                 case 12:
315                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
316                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
317                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
318                             z2 * (C1 + z2 * C2))));
319                         f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
320                             z3 * (C1 + z3 * C2))));
321                         break;
322
323                 case 13:
324                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
```



```
325                             z0 * (C1 + z0 * C2))));
326                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
327                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
328                             z2 * (C1 + z2 * C2))));
329                         f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
330                             z3 * (C1 + z3 * C2))));
331                         break;
332
333                 case 14:
334                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
335                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
336                             z1 * (C1 + z1 * C2))));
337                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
338                             z2 * (C1 + z2 * C2))));
339                         f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
340                             z3 * (C1 + z3 * C2))));
341                         break;
342
343                 default:
344                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
345                             z0 * (C1 + z0 * C2))));
346                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
347                             z1 * (C1 + z1 * C2))));
348                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
349                             z2 * (C1 + z2 * C2))));
350                         f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
351                             z3 * (C1 + z3 * C2))));
352                 }
353
354                 *y = (n0 & 2)? -f0 : f0;
355                 y += stridey;
356                 *y = (n1 & 2)? -f1 : f1;
357                 y += stridey;
358                 *y = (n2 & 2)? -f2 : f2;
359                 y += stridey;
360                 *y = (n3 & 2)? -f3 : f3;
361                 continue;
362
363 process1:
364                 PROCESS(0);
365                 continue;
366
367 process2:
368                 PROCESS(0);
369                 PROCESS(1);
370                 continue;
371
372 process3:
373                 PROCESS(0);
374                 PROCESS(1);
375                 PROCESS(2);
376         }
377 }
```

```
**********************************************************
   22489 Sat May 10 12:09:51 2014
new/usr/src/lib/libmvec/common/__vexp.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
 *
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 * Common Development and Distribution License (the "License").
 * You may not use this file except in compliance with the License.
 *
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 * file and include the License file at usr/src/OPENSOLARIS.LICENSE.
 * If applicable, add the following below this CDDL HEADER, with the
 * fields enclosed by brackets "[]" replaced with your own identifying
 * information: Portions Copyright [yyyy] [name of copyright owner]
 *
 * CDDL HEADER END
 */
/*
 * Copyright 2011 Nexenta Systems, Inc.  All rights reserved.
 */
/*
 * Copyright 2005 Sun Microsystems, Inc.  All rights reserved.
 * Use is subject to license terms.
 */

/*
 * __vexp: double precision vector exp
 *
 * Algorithm:
 *
 * Write x = (k + j/256)ln2 + r, where k and j are integers, j >= 0,
 * and |r| <= ln2/512.  Then exp(x) = 2^k * 2^(j/256) * exp(r).
 * Compute exp(r) by a polynomial approximation exp(r) ~ 1 + p(r)
 * where p(r) := r*(1+r*(B1+r*(B2+r*B3))).  From a table, obtain
 * h and l such that h ~ 2^(j/256) to double precision and h+l
 * ~ 2^(j/256) to well more than double precision.  Then exp(x)
 * ~ 2^k * (h + (l + h * p(r))) to about double precision.  Note
 * that the multiplication by 2^k requires some finagling when
 * the result might be subnormal.
 *
 * Accuracy:
 *
 * For normal results, the largest error observed is less than
 * 0.6 ulps.  For subnormal results, the largest error observed
 * is 0.737 ulps.
 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int *)&x)
#define LO(x)   *(unsigned *)&x
#define DBLWORD(x, y)   y, x
#else
#define HI(x)   *(int *)&x
#define LO(x)   *(1+(unsigned *)&x)
#define DBLWORD(x, y)   x, y
#endif
```



```
#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

static const double TBL[] = {
        1.00000000000000000000e+00,  0.00000000000000000000e+00,
        1.00271127505020252180e+00, -3.63661592869226394432e-17,
        1.00542990111280272636e+00,  9.49918653545503175702e-17,
        1.00815589811841754830e+00, -3.25205875608430806089e-17,
        1.01088928605170047526e+00, -1.52347786033685771763e-17,
        1.01363008495148942956e+00,  9.28359976818356758749e-18,
        1.01637831491095309566e+00, -5.77217007319966002766e-17,
        1.01913399607773791367e+00,  3.60190498225966110587e-17,
        1.02189714865411662714e+00,  5.10922502897344389359e-17,
        1.02466779289713572076e+00, -7.56160786848777820704e-17,
        1.02744594911876374610e+00, -4.95607417464536982418e-17,
        1.03023163768604097967e+00,  3.31983004108081294377e-17,
        1.03302487902122841490e+00,  7.60083887402708848935e-18,
        1.03582569360195719810e+00, -7.80678239133763616702e-17,
        1.03863410196137873065e+00,  5.99627378885251061843e-17,
        1.04145012468831610342e+00,  3.78483048028757620966e-17,
        1.04427378242741375480e+00,  8.55188970553796365958e-17,
        1.04710509587928979336e+00,  7.27707724310431474861e-17,
        1.04994408580068721015e+00,  5.59293784812700258637e-17,
        1.05279077300462642341e+00, -9.62948289902693573942e-17,
        1.05564517836055715705e+00,  1.75932573877209198414e-18,
        1.05850732279451276163e+00, -7.15265185663778073796e-17,
        1.06137722728926209292e+00, -1.19735370853656575649e-17,
        1.06425491288446449900e+00,  5.07875419861123039357e-17,
        1.06714040067682369717e+00, -7.89985396684158212226e-17,
        1.07003371182024187291e+00, -9.93716271128891938112e-17,
        1.07293486752597555522e+00, -3.83966884335882380671e-18,
        1.07584388906279104781e+00, -1.00027161511441361125e-17,
        1.07876079775711986031e+00, -6.65666043605659260344e-17,
        1.08168561499321524977e+00, -4.78262390299708626556e-17,
        1.08461836221330920615e+00,  3.16615284581634611576e-17,
        1.08755906091776965994e+00,  5.40934930782029075923e-18,
        1.09050773266525768967e+00, -3.04678207981247114697e-17,
        1.09346399072885839810e+00,  1.44139581472692093420e-17,
        1.09642908181637688259e+00, -5.91993348444931582405e-17,
        1.09940180263022191376e+00,  7.17045959970192322483e-17,
        1.10238258330784089090e+00,  5.26603687157069438656e-17,
        1.10537144570174117320e+00,  8.23928876050021358995e-17,
        1.10836841172367872588e+00, -8.78681384518052661558e-17,
        1.11137350334481754821e+00,  5.56394502666969764311e-17,
        1.11438674259589243221e+00,  1.04102784568455709549e-16,
        1.11740815156736927882e+00, -7.97680590262822045601e-17,
        1.12043775240960674644e+00, -6.20108590655417874998e-17,
        1.12347556733301989773e+00, -9.69973758898704299544e-17,
        1.12652161860824184814e+00,  5.16585675879545612073e-17,
        1.12957592856628807887e+00,  6.71280585872625658758e-17,
        1.13263851959871919561e+00,  3.23735616673800026374e-17,
        1.13570941415780546357e+00,  5.06659992612615524241e-17,
        1.13878863475669156458e+00,  8.91281267602540777782e-17,
        1.14187620396956157620e+00,  4.65109117753141238741e-17,
        1.14497214443180417298e+00,  4.64128989217001065651e-17,
        1.14807647884017893780e+00,  6.89774023662719177044e-17,
        1.15118922995298267331e+00,  3.25071021886382721198e-17,
        1.15431042059021593538e+00,  1.04171289462732661865e-16,
        1.15744007363375112085e+00, -9.12387123113440028710e-17,
        1.16057821202749877898e+00, -3.26104020541739310553e-17,
        1.16372485877757747552e+00,  3.82920483692409349872e-17,
        1.16688003695248165847e+00, -8.79187957999916974198e-17,
```

```
128         1.17004376968325018993e+00, -1.84774420179000469438e-18,
129         1.17321608016363732041e+00, -7.28756258658499447915e-17,
130         1.17639699165028122074e+00,  5.55420325421807896277e-17,
131         1.17958652746287584456e+00,  1.00923127751003904354e-16,
132         1.18278471098434101449e+00,  1.54297543007907605845e-17,
133         1.18599156566099384058e+00, -9.20950683529310590495e-18,
134         1.18920711500272102690e+00,  3.98201523146564611098e-17,
135         1.19243138258315117817e+00,  4.39755141560972082715e-17,
136         1.19566439203982732842e+00,  4.61660367048148139743e-17,
137         1.19890616707438057986e+00, -9.80919335600842311848e-17,
138         1.20215673145270307565e+00,  6.64498149925230124489e-17,
139         1.20541610900512385918e+00, -3.35727219326752963448e-17,
140         1.20868432362658162482e+00, -4.74672594522898409739e-17,
141         1.21196139927680124337e+00, -4.89061107752111835732e-17,
142         1.21524735998046895524e+00, -7.71263069268148813091e-17,
143         1.21854222982740845183e+00, -9.00672695836383767487e-17,
144         1.22184603297275762301e+00, -1.06110212114026911612e-16,
145         1.22515879363714552674e+00, -8.90353381426998342947e-17,
146         1.22848053610687002468e+00, -1.89878163130252995312e-17,
147         1.23181128473407586199e+00,  7.38938247161005024655e-17,
148         1.23515106393693341325e+00, -1.07552443443078413783e-16,
149         1.23849898199816540016e+00,  2.76770205557396742995e-17,
150         1.24185781207348400201e+00,  4.65802759183693679123e-17,
151         1.24522483017525797955e+00, -4.67724044984672750044e-17,
152         1.24860097718920481924e+00, -8.26181099902196355046e-17,
153         1.25198627786631622172e+00,  4.83416715246989759959e-17,
154         1.25538075702469109629e+00, -6.71138982129687841853e-18,
155         1.25878443954971652730e+00, -8.42178258773059935677e-17,
156         1.26219735039425073886e+00, -3.08446488747384584900e-17,
157         1.26561951457880628169e+00,  4.25057700345086802072e-17,
158         1.26905095719173321989e+00,  2.66793213134218609523e-18,
159         1.27249170338940276181e+00, -1.05779162672124210291e-17,
160         1.27594177839639200123e+00,  9.91543024421429032951e-17,
161         1.27940120750566932450e+00, -9.75909500835606221035e-17,
162         1.28287001607877826359e+00,  1.71359491824356096814e-17,
163         1.28634822954602556777e+00, -3.41695570693618197638e-17,
164         1.28983587340666572274e+00,  8.94925753089759172195e-17,
165         1.29333297322908946647e+00, -2.97459044313275164581e-17,
166         1.29683955465100964055e+00,  2.53825027948883149593e-17,
167         1.30035564337965059423e+00,  5.67872810280221742200e-17,
168         1.30388126519193581210e+00,  8.64767559826787117946e-17,
169         1.30741644593467731816e+00, -7.33664565287886889230e-17,
170         1.31096121152476441374e+00, -7.18153613551945385697e-17,
171         1.31451558794935463581e+00,  2.26754331510458564505e-17,
172         1.31807960126606404927e+00, -5.45795582714915288619e-17,
173         1.32165327760315753913e+00, -2.48063824591302174150e-17,
174         1.32523664315974132322e+00, -2.85873121003886075697e-17,
175         1.32882972420595435459e+00,  4.08908622391016005195e-17,
176         1.33243254708316150037e+00, -5.10158663091674334319e-17,
177         1.33604513820414583236e+00, -5.89186635638880135250e-17,
178         1.33966752405330291609e+00,  8.92728259483173198426e-17,
179         1.34329973118683532185e+00, -5.80258089020143775130e-17,
180         1.34694178623294580355e+00,  3.22406510125467916913e-17,
181         1.35059371589203447428e+00, -8.28711038146241653260e-17,
182         1.35425554693689265129e+00,  7.70094837980298946162e-17,
183         1.35792730621290114179e+00, -9.52963574482518886709e-17,
184         1.36160902063822475405e+00,  1.53378766127066804593e-18,
185         1.36530071720401191548e+00, -1.00053631259747639350e-16,
186         1.36900242297459051599e+00,  9.59379791911884877256e-17,
187         1.37271416508766841424e+00, -4.49596059523484126201e-17,
188         1.37643597075453016920e+00, -6.89858893587180104162e-17,
189         1.38016786726023799048e+00,  1.05103145799699839462e-16,
190         1.38390988196383202258e+00, -6.77051165879478628716e-17,
191         1.38766204229852907481e+00,  8.42298427487541531762e-17,
192         1.39142437577192623621e+00, -4.90617486528898870821e-17,
193         1.39519690996620027157e+00, -9.32933622422549531960e-17,
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194         1.39897967253831123635e+00, -9.61421320905132307233e-17,
195         1.40277269122020475933e+00, -5.29578324940798922316e-17,
196         1.40657593819015435545e+00,  7.03491481213642218800e-18,
197         1.41038960821727066275e+00,  4.16654872843506164270e-17,
198         1.41421356237309514547e+00, -9.66729331345291345105e-17,
199         1.41804788432041517510e+00,  2.27443854218552945230e-17,
200         1.42189260216916557589e+00, -1.60778289158902441338e-17,
201         1.42574774410549420800e+00,  9.88609075850060728430e-17,
202         1.42961333839197002327e+00, -1.20316424890536551792e-17,
203         1.43348941336778890054e+00, -5.80245424392682610310e-17,
204         1.43737599744898236764e+00, -4.20403401646755661225e-17,
205         1.44127311912862565713e+00,  5.60250365087898567501e-18,
206         1.44518080697704665027e+00, -3.02375813499398731940e-17,
207         1.44909908964203504311e+00, -6.25940500081930925441e-17,
208         1.45302799584905262265e+00, -5.77994860939610610226e-17,
209         1.45696755440144376514e+00,  5.64867945387699814049e-17,
210         1.46091779418064704466e+00, -5.60037718607521580013e-17,
211         1.46487874414640573129e+00,  9.53076754358715731900e-17,
212         1.46885043333698184220e+00,  8.46588275653362637570e-17,
213         1.47283289086936752810e+00,  6.69177408194058937165e-17,
214         1.47682614593949934623e+00, -3.48399455689279579579e-17,
215         1.48083022782247186733e+00, -9.68695210263061857841e-17,
216         1.48484516587275239274e+00,  1.07800867644074807559e-16,
217         1.48887098952439700383e+00,  6.15536715774287133031e-17,
218         1.49290772891264835010e+00,  1.41929201542840357707e-17,
219         1.49695541176723545540e+00, -2.86166325389915821109e-17,
220         1.50101406962642558440e+00, -6.41376727579023503859e-17,
221         1.50508373623406473333e+00,  7.07471061358284636429e-17,
222         1.50916442759342284141e+00, -1.01645532775429503911e-16,
223         1.51325618745260981335e+00,  8.88449785133871209093e-17,
224         1.51735904119821474190e+00, -4.30869947204334080070e-17,
225         1.52147301890881458952e+00, -5.99638767594568341985e-18,
226         1.52559815074453819506e+00,  1.11795187801605698722e-16,
227         1.52973446694728698603e+00,  3.78579211515721903683e-17,
228         1.53388199784095591305e+00,  8.87522684443844614135e-17,
229         1.53804077383165682669e+00,  1.01746723511613580618e-16,
230         1.54221082540794074411e+00,  7.94983480969762085616e-17,
231         1.54639218314102144802e+00,  1.06839600056572198028e-16,
232         1.55058487768499997372e+00, -1.46007065906893851791e-17,
233         1.55478893977708865215e+00, -8.00316135011603564104e-17,
234         1.55900440023783692922e+00,  3.78120705335752750188e-17,
235         1.56323128997135762930e+00,  7.48477764559073438896e-17,
236         1.56746963996555299659e+00, -1.03520617688497219883e-16,
237         1.57171948129234140268e+00, -3.34298400468720006928e-17,
238         1.57598084510788649659e+00, -1.01369164712783039808e-17,
239         1.58025376265282457844e+00, -5.16340292955446806159e-17,
240         1.58453826525249374946e+00, -1.93377170345857029304e-17,
241         1.58883438431716395023e+00, -5.99495011882447940052e-18,
242         1.59314215342266998888e+00, -1.00944065423119624890e-16,
243         1.59746159790862707339e+00,  2.48683927962209992069e-17,
244         1.60179275568269341434e+00, -6.05491745352778434252e-17,
245         1.60613565641677102924e+00, -1.03545452880599952591e-16,
246         1.61049033194925428347e+00,  2.47071925697978878522e-17,
247         1.61485681420486071325e+00, -7.31666339912512326264e-17,
248         1.61923513519486372836e+00,  2.09413341542290924068e-17,
249         1.62362532701732886764e+00, -3.58451285141447470996e-17,
250         1.62802742185734783398e+00, -6.71295508470708408630e-17,
251         1.63244145198727497181e+00,  9.85281923042999296414e-17,
252         1.63686744976696441078e+00,  7.69832507131987557450e-17,
253         1.64130544764400632118e+00, -9.24756873764070550805e-17,
254         1.64575547815396494578e+00, -1.01256799136747726038e-16,
255         1.65021757392061774183e+00,  9.13327958872990419009e-18,
256         1.65469176765619430114e+00,  9.64329430319602742879e-17,
257         1.65917809216161615815e+00, -7.27554555082304942180e-17,
258         1.66367658032673637614e+00,  5.89099269671309967045e-17,
259         1.66818726513058246397e+00,  4.26917801957061447430e-17,
```

```
260         1.6727101796415966283 9e+00, -5.4767159645995630761 6e-17,
261         1.6772453570187784687 5e+00,  8.3039495099507315527 5e-17,
262         1.6817928305074290040 7e+00,  8.1990100205814965201 3e-17,
263         1.6863526334483933677 4e+00, -7.1814632783580094421 2e-17,
264         1.6909247992693052786 7e+00, -9.6696714743948801659 0e-17,
265         1.6955093614893326226 0e+00,  7.2384168728451666408 1e-17,
266         1.7001063537185234775 3e+00, -8.0237193703977002458 9e-18,
267         1.7047158096580512509 6e+00, -2.7288832847972815625 7e-17,
268         1.7093377631004629257 9e+00, -9.8687794566329310762 8e-17,
269         1.7139722479299259738 6e+00,  6.4739751077533670641 2e-17,
270         1.7186192981224779341 4e+00, -1.8513804182631109882 1e-17,
271         1.7232789477462739924 4e+00, -9.5221238003937999627 5e-17,
272         1.7279512309618376697 5e+00, -1.0750981861204642455 9e-16,
273         1.7326361820223110665 8e+00, -1.6980510743154154940 7e-18,
274         1.7373338352737062173 5e+00,  3.1643892992929569465 9e-17,
275         1.7420442251551564449 8e+00, -1.5259591189507887923 6e-18,
276         1.7467673861991690476 0e+00, -1.0752290483507514504 2e-16,
277         1.7515033530318782073 5e+00, -5.1244504205967246593 9e-17,
278         1.7562521603732994535 1e+00,  2.9601406954488733070 3e-17,
279         1.7610138430375839035 9e+00, -7.9432531250392277105 7e-17,
280         1.7657884359332727264 3e+00,  9.4613150180832678666 0e-17,
281         1.7705759740635547139 2e+00,  5.9617945100405558476 7e-17,
282         1.7753764925265211882 5e+00,  6.4297317965565720339 6e-17,
283         1.7801900265154244618 1e+00, -5.2846272890916173651 7e-17,
284         1.7850166113189349648 1e+00,  1.5330400121031313818 4e-17,
285         1.7898562823214010375 5e+00, -4.1543546606833497709 8e-17,
286         1.7947090750031071682 0e+00,  1.8227458427912086769 8e-17,
287         1.7995750249405351173 2e+00, -2.5268892333588979522 4e-17,
288         1.8044541678066239320 8e+00, -5.1772224087933178832 8e-17,
289         1.8093465393710319588 6e+00, -9.0326414024500296819 0e-17,
290         1.8142521755003988559 5e+00, -9.9695315389203488198 3e-17,
291         1.8191711121586084942 7e+00,  7.4026769011458388899 7e-17,
292         1.8241033854070534125 9e+00, -1.0159627862277083065 0e-16,
293         1.8290490314048972742 0e+00,  6.8891929088356956369 7e-17,
294         1.8340080864093424306 6e+00,  3.2831072242456265872 2e-17,
295         1.8389805867758937107 9e+00,  6.9189697402725119423 3e-18,
296         1.8439665689586259844 6e+00, -5.9397420269499645502 8e-17,
297         1.8489660695104508381 1e+00,  9.0275804462610892881 6e-17,
298         1.8539791250833854707 7e+00,  9.7618874907275935384 0e-17,
299         1.8590057724288204799 0e+00, -9.5287054619899406866 3e-17,
300         1.8640460483977889794 0e+00,  6.5409126806205704779 1e-17,
301         1.8690999899412386042 7e+00, -9.9385052142550670829 0e-17,
302         1.8741676341102999625 6e+00, -6.1227634130041256164 6e-17,
303         1.8792490180565601942 7e+00, -1.6226315557835844779 9e-17,
304         1.8843441790323345319 5e+00, -8.2265931255337109055 1e-17,
305         1.8894531543909391352 6e+00, -9.0051682850591254853 1e-17,
306         1.8945759815869656073 1e+00,  3.4034035352165296706 0e-17,
307         1.8997126981765553033 2e+00, -3.8597397693785137067 8e-17,
308         1.9048633418176741383 1e+00,  6.5338751471827862895 6e-17,
309         1.9100279502703898515 4e+00, -5.9096880067440602368 6e-17,
310         1.9152065613971474000 7e+00, -1.0619946056195962637 6e-16,
311         1.9203992131630474027 3e+00,  7.1166815406303141862 1e-17,
312         1.9256059436361250281 1e+00, -9.9149637696937409274 9e-17,
313         1.9308267909876271062 3e+00,  6.1671497061691095528 4e-17,
314         1.9360617934922943472 7e+00,  1.0332385960676325744 8e-16,
315         1.9413109895286404516 0e+00, -6.6380298916214878984 6e-17,
316         1.9465744175792332182 3e+00,  6.8110223495338771843 6e-17,
317         1.9518521162309783179 0e+00, -2.1990169699793510860 3e-17,
318         1.9571441241754001794 1e+00,  8.9607677910366677676 0e-17,
319         1.9624504802089273169 9e+00,  1.0976844000913546949 3e-16,
320         1.9677712232331758812 6e+00, -1.0314928011531131510 9e-16,
321         1.9731063922552343203 9e+00, -7.4516178639560374860 8e-18,
322         1.9784560263879509278 7e+00,  4.0388753109278166575 0e-17,
323         1.9838201648502193918 9e+00, -2.2034544123910626571 6e-17,
324         1.9891988469672663431 0e+00,  8.2051326383691994155 3e-18,
325         1.9945921121709402346 1e+00,  1.7909710352002645085 4e-17
```



```
326 };

328 static const union {
329         unsigned        i[2];
330         double          d;
331 } C[] = {
332         { DBLWORD(0x43380000, 0x00000000) },
333         { DBLWORD(0x40771547, 0x652b82fe) },
334         { DBLWORD(0x3f662e42, 0xfee00000) },
335         { DBLWORD(0x3d6a39ef, 0x35793c76) },
336         { DBLWORD(0x3ff00000, 0x00000000) },
337         { DBLWORD(0x3fdfffff, 0xfffffff6) },
338         { DBLWORD(0x3fc55555, 0x721a1d14) },
339         { DBLWORD(0x3fa55555, 0x6e0896af) },
340         { DBLWORD(0x01000000, 0x00000000) },
341         { DBLWORD(0x7f000000, 0x00000000) },
342         { DBLWORD(0x40862e42, 0xfefa39ef) },
343         { DBLWORD(0xc0874910, 0xd52d3051) },
344         { DBLWORD(0xfff00000, 0x00000000) },
345         { DBLWORD(0x00000000, 0x00000000) }
346 };

348 #define round           C[0].d
349 #define invln2_256      C[1].d
350 #define ln2_256h        C[2].d
351 #define ln2_256l        C[3].d
352 #define one             C[4].d
353 #define B1              C[5].d
354 #define B2              C[6].d
355 #define B3              C[7].d
356 #define tiny            C[8].d
357 #define huge            C[9].d
358 #define othresh         C[10].d
359 #define uthresh         C[11].d
360 #define neginf          C[12].d
361 #define zero            C[13].d

363 #define PROCESS(N)                                                      \
364         y##N = (x##N * invln2_256) + round;                             \
365         j##N = LO(y##N);                                                \
366         y##N -= round;                                                  \
367         k##N = j##N >> 8;                                               \
368         j##N = (j##N & 0xff) << 1;                                      \
369         x##N = (x##N - y##N * ln2_256h) - y##N * ln2_256l;              \
370         y##N = x##N * (one + x##N * (B1 + x##N * (B2 + x##N * B3)));    \
371         t##N = TBL[j##N];                                               \
372         y##N = t##N + (TBL[j##N + 1] + t##N * y##N);                    \
373         if (k##N < -1021) {                                             \
374                 HI(y##N) += (k##N + 0x3ef) << 20;                       \
375                 y##N *= tiny;                                           \
376         } else {                                                        \
377                 HI(y##N) += k##N << 20;                                 \
378         }                                                               \
379         *y = y##N;                                                      \
380         y += stridey

382 #define PREPROCESS(N, index, label)                                     \
383         hx = HI(x[0]);                                                  \
384         ix = hx & ~0x80000000;                                          \
385         x##N = *x;                                                      \
386         x += stridex;                                                   \
387         if (ix >= 0x40862e42) {                                         \
388                 if (ix >= 0x7ff00000) { /* x is inf or nan */           \
389                         y[index] = (x##N == neginf)? zero :             \
390                                    x##N * x##N;                         \
391                         goto label;                                     \
```

```
392                 }                                                   \
393                 if (x##N > othresh) {                               \
394                         y[index] = huge * huge;                     \
395                         goto label;                                 \
396                 }                                                   \
397                 if (x##N < uthresh) {                               \
398                         y[index] = tiny * tiny;                     \
399                         goto label;                                 \
400                 }                                                   \
401         } else if (ix < 0x3e300000) { /* |x| < 2^-28 */             \
402                 y[index] = one + x##N;                              \
403                 goto label;                                         \
404         }

406 void
407 __vexp(int n, double *restrict x, int stridex, double *restrict y,
408     int stridey)
409 {
410         double          x0, x1, x2, x3, x4, x5;
411         double          y0, y1, y2, y3, y4, y5;
412         double          t0, t1, t2, t3, t4, t5;
413         int             k0, k1, k2, k3, k4, k5;
414         int             j0, j1, j2, j3, j4, j5;
415         int             hx, ix;

417         y -= stridey;

419         for (;;) {
420 begin:
421                 if (--n < 0)
422                         break;
423                 y += stridey;

425                 PREPROCESS(0, 0, begin);

427                 if (--n < 0)
428                         goto process1;

430                 PREPROCESS(1, stridey, process1);

432                 if (--n < 0)
433                         goto process2;

435                 PREPROCESS(2, stridey << 1, process2);

437                 if (--n < 0)
438                         goto process3;

440                 PREPROCESS(3, (stridey << 1) + stridey, process3);

442                 if (--n < 0)
443                         goto process4;

445                 PREPROCESS(4, stridey << 2, process4);

447                 if (--n < 0)
448                         goto process5;

450                 PREPROCESS(5, (stridey << 2) + stridey, process5);

452                 y0 = (x0 * invln2_256) + round;
453                 y1 = (x1 * invln2_256) + round;
454                 y2 = (x2 * invln2_256) + round;
455                 y3 = (x3 * invln2_256) + round;
456                 y4 = (x4 * invln2_256) + round;
457                 y5 = (x5 * invln2_256) + round;
```



```
459                 j0 = LO(y0);
460                 j1 = LO(y1);
461                 j2 = LO(y2);
462                 j3 = LO(y3);
463                 j4 = LO(y4);
464                 j5 = LO(y5);

466                 y0 -= round;
467                 y1 -= round;
468                 y2 -= round;
469                 y3 -= round;
470                 y4 -= round;
471                 y5 -= round;

473                 k0 = j0 >> 8;
474                 k1 = j1 >> 8;
475                 k2 = j2 >> 8;
476                 k3 = j3 >> 8;
477                 k4 = j4 >> 8;
478                 k5 = j5 >> 8;

480                 j0 = (j0 & 0xff) << 1;
481                 j1 = (j1 & 0xff) << 1;
482                 j2 = (j2 & 0xff) << 1;
483                 j3 = (j3 & 0xff) << 1;
484                 j4 = (j4 & 0xff) << 1;
485                 j5 = (j5 & 0xff) << 1;

487                 x0 = (x0 - y0 * ln2_256h) - y0 * ln2_256l;
488                 x1 = (x1 - y1 * ln2_256h) - y1 * ln2_256l;
489                 x2 = (x2 - y2 * ln2_256h) - y2 * ln2_256l;
490                 x3 = (x3 - y3 * ln2_256h) - y3 * ln2_256l;
491                 x4 = (x4 - y4 * ln2_256h) - y4 * ln2_256l;
492                 x5 = (x5 - y5 * ln2_256h) - y5 * ln2_256l;

494                 y0 = x0 * (one + x0 * (B1 + x0 * (B2 + x0 * B3)));
495                 y1 = x1 * (one + x1 * (B1 + x1 * (B2 + x1 * B3)));
496                 y2 = x2 * (one + x2 * (B1 + x2 * (B2 + x2 * B3)));
497                 y3 = x3 * (one + x3 * (B1 + x3 * (B2 + x3 * B3)));
498                 y4 = x4 * (one + x4 * (B1 + x4 * (B2 + x4 * B3)));
499                 y5 = x5 * (one + x5 * (B1 + x5 * (B2 + x5 * B3)));

501                 t0 = TBL[j0];
502                 t1 = TBL[j1];
503                 t2 = TBL[j2];
504                 t3 = TBL[j3];
505                 t4 = TBL[j4];
506                 t5 = TBL[j5];

508                 y0 = t0 + (TBL[j0 + 1] + t0 * y0);
509                 y1 = t1 + (TBL[j1 + 1] + t1 * y1);
510                 y2 = t2 + (TBL[j2 + 1] + t2 * y2);
511                 y3 = t3 + (TBL[j3 + 1] + t3 * y3);
512                 y4 = t4 + (TBL[j4 + 1] + t4 * y4);
513                 y5 = t5 + (TBL[j5 + 1] + t5 * y5);

515                 if (k0 < -1021) {
516                         HI(y0) += (k0 + 0x3ef) << 20;
517                         y0 *= tiny;
518                 } else {
519                         HI(y0) += k0 << 20;
520                 }
521                 if (k1 < -1021) {
522                         HI(y1) += (k1 + 0x3ef) << 20;
523                         y1 *= tiny;
```

```
524                 } else {
525                         HI(y1) += k1 << 20;
526                 }
527                 if (k2 < -1021) {
528                         HI(y2) += (k2 + 0x3ef) << 20;
529                         y2 *= tiny;
530                 } else {
531                         HI(y2) += k2 << 20;
532                 }
533                 if (k3 < -1021) {
534                         HI(y3) += (k3 + 0x3ef) << 20;
535                         y3 *= tiny;
536                 } else {
537                         HI(y3) += k3 << 20;
538                 }
539                 if (k4 < -1021) {
540                         HI(y4) += (k4 + 0x3ef) << 20;
541                         y4 *= tiny;
542                 } else {
543                         HI(y4) += k4 << 20;
544                 }
545                 if (k5 < -1021) {
546                         HI(y5) += (k5 + 0x3ef) << 20;
547                         y5 *= tiny;
548                 } else {
549                         HI(y5) += k5 << 20;
550                 }

552                 y[0] = y0;
553                 y[stridey] = y1;
554                 y[stridey << 1] = y2;
555                 y[(stridey << 1) + stridey] = y3;
556                 y[stridey << 2] = y4;
557                 y[(stridey << 2) + stridey] = y5;
558                 y += (stridey << 2) + stridey;
559                 continue;

561 process1:
562                 PROCESS(0);
563                 continue;

565 process2:
566                 PROCESS(0);
567                 PROCESS(1);
568                 continue;

570 process3:
571                 PROCESS(0);
572                 PROCESS(1);
573                 PROCESS(2);
574                 continue;

576 process4:
577                 PROCESS(0);
578                 PROCESS(1);
579                 PROCESS(2);
580                 PROCESS(3);
581                 continue;

583 process5:
584                 PROCESS(0);
585                 PROCESS(1);
586                 PROCESS(2);
587                 PROCESS(3);
588                 PROCESS(4);
589         }
```



```
590 }
```

```
**********************************************************
   12891 Sat May 10 12:09:52 2014
new/usr/src/lib/libmvec/common/__vexpf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
 *
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 */

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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/* float expf(float x)
 *
 * Method :
 *      1. Special cases:
 *              for x > 88.722839355...(0x42B17218) => Inf + overflow;
 *              for x < -103.97207642..(0xc2CFF1B4) => 0 + underflow;
 *              for x = Inf                         => Inf;
 *              for x = -Inf                        => 0;
 *              for x = +-NaN                       => QNaN.
 *      2. Computes exponential from:
 *              exp(x) = 2**a  *  2**(k/256)  *  2**(y/256)
 *      Where:
 *              a    =    int  ( 256 * log2(e) * x ) >> 8;
 *              k    =    int  ( 256 * log2(e) * x ) & 0xFF;
 *              y    =    frac ( 256 * x * log2(e)).
 *      Note that:
 *              k = 0, 1, ..., 255;
 *              y = (-1, 1).
 *      Then:
 *              2**(k/256) is looked up in a table of 2**0, 2**1/256, ...
 *              2**(y/256) is computed using approximation:
 *                      2**(y/256) =  a0 + a1 * y + a2 * y**2
 *              Multiplication by 2**a is done by adding "a" to
 *              the biased exponent.
 * Accuracy:
 *      The maximum relative error for the approximating
```



```
 *      polynomial is 2**(-29.18).  All calculations are of
 *      double precision.
 *      Maximum error observed: less than 0.528 ulp for the whole
 *      float type range.
 *
 * NOTE: This implementation has been modified for SPARC to deliver
 * zero instead of a subnormal result whenever the argument is less
 * than log(2^-126).  Therefore the worst case relative error is 1.
 */

static const double __TBL_exp2f[] = {
        /* 2^(i/256) - (((i & 0xff) << 44), i = [0, 255] */
1.0000000000000000e+00, 9.9940251252510126e09-01, 9.98808700556401363 2e-01,
9.9821857405920877 42e-01, 9.9763214302585023 76e-01, 9.9704941747574471 48e-01,
9.9647040745547654 78e-01, 9.9589512303886895 68e-01, 9.9532357432705831 36e-01,
9.9475577144856786 04e-01, 9.9419172455938187 30e-01, 9.9363144384302048 98e-01,
9.9307493951061420 74e-01, 9.9252222180097859 90e-01, 9.9197330098068936 53e-01,
9.9142818734415805 17e-01, 9.9088689121370687 74e-01, 9.9034942293964489 67e-01,
9.8981579290034360 51e-01, 9.8928601150231321 17e-01, 9.8876008918027857 85e-01,
9.8823803639725638 08e-01, 9.8771986364463104 65e-01, 9.8720558144223224 95e-01,
9.8669520033841184 86e-01, 9.8618873091012093 65e-01, 9.8568618376298777 76e-01,
9.8518756953139552 39e-01, 9.8469289887855993 02e-01, 9.8420218249660762 49e-01,
9.8371543110665460 31e-01, 9.8323265545888483 00e-01, 9.8275386633262884 48e-01,
9.8227907453644291 99e-01, 9.8180829090818844 13e-01, 9.8134152631511095 69e-01,
9.8087879165392044 54e-01, 9.8042009785087058 66e-01, 9.7996545586183936 29e-01,
9.7951487667240877 41e-01, 9.7906837129794621 61e-01, 9.7862595078368463 94e-01,
9.7818762620480337 32e-01, 9.7775340866650994 89e-01, 9.7732330930412092 41e-01,
9.7689733928314403 94e-01, 9.7647550979935959 78e-01, 9.7605783207890273 18e-01,
9.7564431737834578 23e-01, 9.7523497698478078 81e-01, 9.7482982221590208 65e-01,
9.7442886442008946 89e-01, 9.7403211497649134 67e-01, 9.7363958529510796 77e-01,
9.7325128681687556 04e-01, 9.7286723101374938 95e-01, 9.7248742938878873 78e-01,
9.7211189347624082 92e-01, 9.7174063484162509 50e-01, 9.7137366508181866 02e-01,
9.7101099582514061 04e-01, 9.7065263873143792 23e-01, 9.7029860549217050 72e-01,
9.6994890783049692 03e-01, 9.6960355750136051 34e-01, 9.6926256629157558 91e-01,
9.6892594601991366 42e-01, 9.6859370853719028 99e-01, 9.6826586572635153 78e-01,
9.6794242950256192 96e-01, 9.6762341181329081 24e-01, 9.6730882463840062 17e-01,
9.6699867999023447 76e-01, 9.6669298991370422 59e-01, 9.6639176648637881 15e-01,
9.6609502181857276 34e-01, 9.6580276805343501 23e-01, 9.6551501736703793 10e-01,
9.6523178196846670 66e-01, 9.6495307409990827 01e-01, 9.6467890603674200 10e-01,
9.6440929008762898 98e-01, 9.6414423859460240 96e-01, 9.6388376393315811 09e-01,
9.6362787851234554 81e-01, 9.6337659477485826 36e-01, 9.6312992519712536 94e-01,
9.6288788228940314 08e-01, 9.6265047859586660 99e-01, 9.6241772669470138 09e-01,
9.6218963919819600 06e-01, 9.6196622875283466 23e-01, 9.6174750803938911 18e-01,
9.6153348977301278 39e-01, 9.6132418670333286 14e-01, 9.6111961161454473 32e-01,
9.6091977732550482 03e-01, 9.6072469668982529 71e-01, 9.6053438259596790 60e-01,
9.6034884796733865 91e-01, 9.6016810576238220 69e-01, 9.5999216897467731 79e-01,
9.5982105063303202 46e-01, 9.5965476380157876 96e-01, 9.5949332157987066 16e-01,
9.5933673710297717 73e-01, 9.5918502354158075 02e-01, 9.5903819410207291 62e-01,
9.5889626202665145 80e-01, 9.5875924059341766 09e-01, 9.5862714311647290 18e-01,
9.5849998294601723 71e-01, 9.5837777346844632 56e-01, 9.5826052810645057 09e-01,
9.5814826031911237 70e-01, 9.5804098360200595 77e-01, 9.5793871148729525 80e-01,
9.5784145754383420 71e-01, 9.5774923537726508 46e-01, 9.5766205863011899 52e-01,
9.5757990408191601 13e-01, 9.5750289614926453 74e-01, 9.5743093788596311 81e-01,
9.5736407998310013 58e-01, 9.5730233626915561 82e-01, 9.5724572061010237 97e-01,
9.5719424690950771 77e-01, 9.5714792910863533 14e-01, 9.5710678118654757 27e-01,
9.5707081716020758 75e-01, 9.5704005108458278 79e-01, 9.5701449705274710 40e-01,
9.5699416919598501 16e-01, 9.5697908168389445 03e-01, 9.5696924872449118 38e-01,
9.5696468456431288 86e-01, 9.5696540348852332 51e-01, 9.5697141982101752 16e-01,
9.5698274792452631 13e-01, 9.5699940220072188 26e-01, 9.5702139709032352 23e-01,
9.5704874707320286 56e-01, 9.5708146666849092 11e-01, 9.5711957043468376 40e-01,
9.5716307296974967 31e-01, 9.5721198891123593 37e-01, 9.5726633293637619 64e-01,
9.5732611976219850 19e-01, 9.5739136414563241 75e-01, 9.5746208083617727 7e-01,
9.5753828481321279 22e-01, 9.5761999081170323 67e-01, 9.5770721379671142 07e-01,
9.5779996872630490 67e-01, 9.5789827059910737 09e-01, 9.5800213445440729 48e-01,
9.5811175372269208 6e-01, 9.5822660847364349 30e-01, 9.5834724892047795 65e-01,
9.5847351191582841 33e-01, 9.5860541270397037 21e-01, 9.5874296657051072 40e-01,
```

```
128 9.588861888424999869e-01, 9.590350948885443261e-01, 9.591897001189184646e-01,
129 9.593500199856788146e-01, 9.595160699827764983e-01, 9.596878656461707013e-01,
130 9.598654225539432483e-01, 9.600487563264122892e-01, 9.602378826262468747e-01,
131 9.604328171585819751e-01, 9.606335756711334994e-01, 9.608401739543135367e-01,
132 9.610526278413467072e-01, 9.612709532083855146e-01, 9.614951659746271417e-01,
133 9.617252821024303566e-01, 9.619613175974318642e-01, 9.622032885086644338e-01,
134 9.624512109286739170e-01, 9.627051009936374859e-01, 9.629649748834822054e-01,
135 9.632308488220031606e-01, 9.635027390769824729e-01, 9.637806619603088709e-01,
136 9.640646338280971506e-01, 9.643546710808080791e-01, 9.646507901633681881e-01,
137 9.649530075652912320e-01, 9.652613398207983142e-01, 9.655758035089392344e-01,
138 9.658964152537145020e-01, 9.662231917241966839e-01, 9.665561496346526393e-01,
139 9.668953057446663113e-01, 9.672406768592617388e-01, 9.675922798290256255e-01,
140 9.679501315502314629e-01, 9.683142489649629869e-01, 9.686846490612389671e-01,
141 9.690613488731369962e-01, 9.694443654809188349e-01, 9.698337160111555333e-01,
142 9.702294176368531087e-01, 9.706314875775782225e-01, 9.710399430995845238e-01,
143 9.714548015159391037e-01, 9.718760801866497268e-01, 9.723037965187919518e-01,
144 9.727379679666363632e-01, 9.731786120317773570e-01, 9.736257462632605941e-01,
145 9.740793882577122309e-01, 9.745395556594674824e-01, 9.750062661607005188e-01,
146 9.754795375015535841e-01, 9.759593874702675587e-01, 9.764458339033119660e-01,
147 9.769388946855159794e-01, 9.774385877501994280e-01, 9.779449310793042471e-01,
148 9.784579427035267063e-01, 9.789776407024486371e-01, 9.795040432046712153e-01,
149 9.800371683879468554e-01, 9.805770344793129922e-01, 9.811236597552254191e-01,
150 9.816770625416927354e-01, 9.822372612144102400e-01, 9.828042741988944897e-01,
151 9.833781199706193021e-01, 9.839588170551499813e-01, 9.845463840282800971e-01,
152 9.851408395161672660e-01, 9.857422021954695968e-01, 9.863504907934828037e-01,
153 9.869657240882776517e-01, 9.875879209088370692e-01, 9.882171001351949258e-01,
154 9.888532806985737000e-01, 9.894964815815237014e-01, 9.901467218180625141e-01,
155 9.908040204938135531e-01, 9.914683967461471736e-01, 9.921398697643202258e-01,
156 9.928184587896166091e-01, 9.935041831154891590e-01, 9.941970620877000897e-01,
157 9.948971151044636585e-01, 9.956043616165879406e-01, 9.963188211276171602e-01,
158 9.970405131939754639e-01, 9.977694574251096959e-01, 9.985056734836331715e-01,
159 9.992491810854701173e-01
160 };

162 static const double
163         K256ONLN2 = 369.3299304675746271,
164         KA2 = 3.665566716607838332261e-06,
165         KA1 = 2.707607828213929805 64e-03,
166         KA0 = 1.0;

168 static const float extreme[2] = { 1.0e30f, 1.0e-30f };

170 #define PROCESS(N)                                              \
171         x##N *= K256ONLN2;                                      \
172         k##N = (int) x##N;                                      \
173         x##N -= (double) k##N;                                  \
174         x##N = (KA2 * x##N + KA1) * x##N + KA0;                 \
175         lres##N = ((long long *)__TBL_exp2f)[k##N & 0xff];      \
176         lres##N += (long long)k##N << 44;                       \
177         *y = (float) (x##N * *(double *)&lres##N);              \
178         y += stridey

180 #ifdef __sparc

182 #define PREPROCESS(N , index, label)                            \
183         xi = *(int *)x;                                         \
184         ax = xi & ~0x80000000;                                  \
185         fx = *x;                                                \
186         x += stridex;                                           \
187         if ( ax >= 0x42aeac50 ) /* log(2^126) = 87.3365... */   \
188         {                                                       \
189                 sign = (unsigned)xi >> 31;                      \
190                 if ( ax >= 0x7f800000 ) /* |x| = inf or nan */  \
191                 {                                               \
192                         if ( ax > 0x7f800000 )  /* nan */       \
193                         {                                       \
```



```
194                                 y[index] = fx * fx;             \
195                                 goto label;                     \
196                         }                                       \
197                         y[index] = (sign) ? 0.0f : fx;          \
198                         goto label;                             \
199                 }                                               \
200                 if ( sign || ax > 0x42b17218 ) {                \
201                         fx = extreme[sign];                     \
202                         y[index] = fx * fx;                     \
203                         goto label;                             \
204                 }                                               \
205         }                                                       \
206         x##N = fx

208 #else

210 #define PREPROCESS(N , index, label)                            \
211         xi = *(int *)x;                                         \
212         ax = xi & ~0x80000000;                                  \
213         fx = *x;                                                \
214         x += stridex;                                           \
215         if ( ax > 0x42cff1b4 )  /* 103.972076f */               \
216         {                                                       \
217                 sign = (unsigned)xi >> 31;                      \
218                 if ( ax >= 0x7f800000 ) /* |x| = inf or nan */  \
219                 {                                               \
220                         if ( ax > 0x7f800000 )  /* nan */       \
221                         {                                       \
222                                 y[index] = fx * fx;             \
223                                 goto label;                     \
224                         }                                       \
225                         y[index] = (sign) ? 0.0f : fx;          \
226                         goto label;                             \
227                 }                                               \
228                 fx = extreme[sign];                             \
229                 y[index] = fx * fx;                             \
230                 goto label;                                     \
231         }                                                       \
232         x##N = fx

234 #endif

236 void
237 __vexpf( int n, float * restrict x, int stridex, float * restrict y,
238         int stridey )
239 {
240         double          x0, x1, x2, x3, x4;
241         double          res0, res1, res2, res3, res4;
242         float           fx;
243         long long       lres0, lres1, lres2, lres3, lres4;
244         int             k0, k1, k2, k3, k4;
245         int             xi, ax, sign;

247         y -= stridey;

249         for ( ; ; )
250         {
251 begin:
252                 if ( --n < 0 )
253                         break;
254                 y += stridey;

256                 PREPROCESS(0, 0, begin);

258                 if ( --n < 0 )
259                         goto process1;
```

```
261                 PREPROCESS(1, stridey, process1);

263                 if ( --n < 0 )
264                         goto process2;

266                 PREPROCESS(2, stridey << 1, process2);

268                 if ( --n < 0 )
269                         goto process3;

271                 PREPROCESS(3, (stridey << 1) + stridey, process3);

273                 if ( --n < 0 )
274                         goto process4;

276                 PREPROCESS(4, (stridey << 2), process4);

278                 x0 *= K256ONLN2;
279                 x1 *= K256ONLN2;
280                 x2 *= K256ONLN2;
281                 x3 *= K256ONLN2;
282                 x4 *= K256ONLN2;

284                 k0 = (int)x0;
285                 k1 = (int)x1;
286                 k2 = (int)x2;
287                 k3 = (int)x3;
288                 k4 = (int)x4;

290                 x0 -= (double)k0;
291                 x1 -= (double)k1;
292                 x2 -= (double)k2;
293                 x3 -= (double)k3;
294                 x4 -= (double)k4;

296                 x0 = (KA2 * x0 + KA1) * x0 + KA0;
297                 x1 = (KA2 * x1 + KA1) * x1 + KA0;
298                 x2 = (KA2 * x2 + KA1) * x2 + KA0;
299                 x3 = (KA2 * x3 + KA1) * x3 + KA0;
300                 x4 = (KA2 * x4 + KA1) * x4 + KA0;

302                 lres0 = ((long long *)__TBL_exp2f)[k0 & 255];
303                 lres1 = ((long long *)__TBL_exp2f)[k1 & 255];
304                 lres2 = ((long long *)__TBL_exp2f)[k2 & 255];
305                 lres3 = ((long long *)__TBL_exp2f)[k3 & 255];
306                 lres4 = ((long long *)__TBL_exp2f)[k4 & 255];

308                 lres0 += (long long)k0 << 44;
309                 res0 = *(double *)&lres0;
310                 lres1 += (long long)k1 << 44;
311                 res1 = *(double *)&lres1;
312                 lres2 += (long long)k2 << 44;
313                 res2 = *(double *)&lres2;
314                 lres3 += (long long)k3 << 44;
315                 res3 = *(double *)&lres3;
316                 lres4 += (long long)k4 << 44;
317                 res4 = *(double *)&lres4;

319                 *y = (float)(res0 * x0);
320                 y += stridey;
321                 *y = (float)(res1 * x1);
322                 y += stridey;
323                 *y = (float)(res2 * x2);
324                 y += stridey;
325                 *y = (float)(res3 * x3);
```



```
326                 y += stridey;
327                 *y = (float)(res4 * x4);
328                 continue;

330 process1:
331                 PROCESS(0);
332                 continue;

334 process2:
335                 PROCESS(0);
336                 PROCESS(1);
337                 continue;

339 process3:
340                 PROCESS(0);
341                 PROCESS(1);
342                 PROCESS(2);
343                 continue;

345 process4:
346                 PROCESS(0);
347                 PROCESS(1);
348                 PROCESS(2);
349                 PROCESS(3);
350         }
351 }
```

```
**********************************************************
    8613 Sat May 10 12:09:52 2014
new/usr/src/lib/libmvec/common/__vhypot.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include <sys/isa_defs.h>
#include "libm_synonyms.h"
#include "libm_inlines.h"

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/* double hypot(double x, double y)
 *
 * Method :
 *      1. Special cases:
 *              x or y is +Inf or -Inf                          => +Inf
 *              x or y is NaN                                   => QNaN
 *      2. Computes hypot(x,y):
 *              hypot(x,y) = m * sqrt(xnm * xnm + ynm * ynm)
 *      Where:
 *              m = max(|x|,|y|)
 *              xnm = x * (1/m)
 *              ynm = y * (1/m)
 *
 *      Compute xnm * xnm + ynm * ynm by simulating
```



```
 *      muti-precision arithmetic.
 *
 * Accuracy:
 *      Maximum error observed: less than 0.872 ulp after 16.777.216.000
 *      results.
 */

#define sqrt __sqrt

extern double sqrt( double );
extern double fabs( double );

static const unsigned long long LCONST[] = {
0x41b0000000000000ULL,  /* D2ON28 = 2 ** 28             */
0x0010000000000000ULL,  /* D2ONM1022 = 2 ** -1022       */
0x7fd0000000000000ULL   /* D2ONP1022 = 2 **  1022       */
};

static void
__vhypot_n( int n, double * restrict px, int stridex, double * restrict py,
        int stridey, double * restrict pz, int stridez );

#pragma no_inline(__vhypot_n)

#define RETURN(ret)                                             \
{                                                               \
        *pz = (ret);                                            \
        py += stridey;                                          \
        pz += stridez;                                          \
        if ( n_n == 0 )                                         \
        {                                                       \
                hx0 = HI(px);                                   \
                hy0 = HI(py);                                   \
                spx = px; spy = py; spz = pz;                   \
                continue;                                       \
        }                                                       \
        n--;                                                    \
        break;                                                  \
}

void
__vhypot( int n, double * restrict px, int stridex, double * restrict py,
        int stridey, double * restrict pz, int stridez )
{
        int             hx0, hx1, hy0, j0, diff;
        double          x_hi, x_lo, y_hi, y_lo;
        double          scl = 0;
        double          x, y, res;
        double          *spx, *spy, *spz;
        int             n_n;
        double          D2ON28 = ((double*)LCONST)[0];          /* 2 ** 28
        double          D2ONM1022 = ((double*)LCONST)[1];       /* 2 **-1022
        double          D2ONP1022 = ((double*)LCONST)[2];       /* 2 ** 1022

        while ( n > 1 )
        {
                n_n = 0;
                spx = px;
                spy = py;
                spz = pz;
                hx0 = HI(px);
                hy0 = HI(py);
                for ( ; n > 1 ; n-- )
                {
                        px += stridex;
                        hx0 &= 0x7fffffff;
```

```
128                         hy0 &= 0x7fffffff;
129
130                         if ( hx0 >= 0x7fe00000 )        /* |X| >= 2**1023 or Inf
131                         {
132                                 diff = hy0 - hx0;
133                                 j0 = diff >> 31;
134                                 j0 = hy0 - (diff & j0);
135                                 j0 &= 0x7ff00000;
136                                 x = *(px - stridex);
137                                 y = *py;
138                                 x = fabs(x);
139                                 y = fabs(y);
140                                 if ( j0 >= 0x7ff00000 ) /* |X| or |Y| = Inf or N
141                                 {
142                                         int lx = LO((px - stridex));
143                                         int ly = LO(py);
144                                         if ( hx0 == 0x7ff00000 && lx == 0 ) res
145                                         else if ( hy0 == 0x7ff00000 && ly == 0 )
146                                         else res = x + y;
147                                         RETURN ( res )
148                                 }
149                                 else
150                                 {
151                                         j0 = diff >> 31;
152                                         if ( ((diff ^ j0) - j0) < 0x03600000 )
153                                         {
154                                                 x *= D2ONM1022;
155                                                 y *= D2ONM1022;
156
157                                                 x_hi = ( x + D2ON28 ) - D2ON28;
158                                                 x_lo = x - x_hi;
159                                                 y_hi = ( y + D2ON28 ) - D2ON28;
160                                                 y_lo = y - y_hi;
161                                                 res = (x_hi * x_hi + y_hi * y_hi
162                                                 res += ((x + x_hi) * x_lo + (y +
163
164                                                 res = sqrt ( res );
165
166                                                 res = D2ONP1022 * res;
167                                                 RETURN ( res )
168                                         }
169                                         else RETURN ( x + y )
170                                 }
171                         }
172                         if ( hy0 >= 0x7fe00000 )        /* |Y| >= 2**1023 or Inf
173                         {
174                                 diff = hy0 - hx0;
175                                 j0 = diff >> 31;
176                                 j0 = hy0 - (diff & j0);
177                                 j0 &= 0x7ff00000;
178                                 x = *(px - stridex);
179                                 y = *py;
180                                 x = fabs(x);
181                                 y = fabs(y);
182                                 if ( j0 >= 0x7ff00000 ) /* |X| or |Y| = Inf or N
183                                 {
184                                         int lx = LO((px - stridex));
185                                         int ly = LO(py);
186                                         if ( hx0 == 0x7ff00000 && lx == 0 ) res
187                                         else if ( hy0 == 0x7ff00000 && ly == 0 )
188                                         else res = x + y;
189                                         RETURN ( res )
190                                 }
191                                 else
192                                 {
193                                         j0 = diff >> 31;
```



```
194                                         if ( ((diff ^ j0) - j0) < 0x03600000 )
195                                         {
196                                                 x *= D2ONM1022;
197                                                 y *= D2ONM1022;
198
199                                                 x_hi = ( x + D2ON28 ) - D2ON28;
200                                                 x_lo = x - x_hi;
201                                                 y_hi = ( y + D2ON28 ) - D2ON28;
202                                                 y_lo = y - y_hi;
203                                                 res = (x_hi * x_hi + y_hi * y_hi
204                                                 res += ((x + x_hi) * x_lo + (y +
205
206                                                 res = sqrt ( res );
207
208                                                 res = D2ONP1022 * res;
209                                                 RETURN ( res )
210                                         }
211                                         else RETURN ( x + y )
212                                 }
213                         }
214
215                         hx1 = HI(px);
216
217                         if ( hx0 < 0x00100000 && hy0 < 0x00100000 )     /* X and
218                         {
219                                 x = *(px - stridex);
220                                 y = *py;
221
222                                 x *= D2ONP1022;
223                                 y *= D2ONP1022;
224
225                                 x_hi = ( x + D2ON28 ) - D2ON28;
226                                 x_lo = x - x_hi;
227                                 y_hi = ( y + D2ON28 ) - D2ON28;
228                                 y_lo = y - y_hi;
229                                 res = (x_hi * x_hi + y_hi * y_hi);
230                                 res += ((x + x_hi) * x_lo + (y + y_hi) * y_lo);
231
232                                 res = sqrt(res);
233
234                                 res = D2ONM1022 * res;
235                                 RETURN ( res )
236                         }
237
238                         hx0 = hx1;
239                         py += stridey;
240                         pz += stridez;
241                         n_n++;
242                         hy0 = HI(py);
243                 }
244                 if ( n_n > 0 )
245                         __vhypot_n ( n_n, spx, stridex, spy, stridey, spz, strid
246         }
247
248         if ( n > 0 )
249         {
250                 x = *px;
251                 y = *py;
252                 hx0 = HI(px);
253                 hy0 = HI(py);
254
255                 hx0 &= 0x7fffffff;
256                 hy0 &= 0x7fffffff;
257
258                 diff = hy0 - hx0;
259                 j0 = diff >> 31;
```

```
260                 j0 = hy0 - (diff & j0);
261                 j0 &= 0x7ff00000;

263                 if ( j0 >= 0x7fe00000 ) /* max(|X|,|Y|) >= 2**1023 or X or Y = I
264                 {
265                         x = fabs(x);
266                         y = fabs(y);
267                         if ( j0 >= 0x7ff00000 ) /* |X| or |Y| = Inf or NaN */
268                         {
269                                 int lx = LO(px);
270                                 int ly = LO(py);
271                                 if ( hx0 == 0x7ff00000 && lx == 0 ) res = x == y
272                                 else if ( hy0 == 0x7ff00000 && ly == 0 ) res = x
273                                 else res = x + y;
274                                 *pz = res;
275                                 return;
276                         }
277                         else
278                         {
279                                 j0 = diff >> 31;
280                                 if ( ((diff ^ j0) - j0) < 0x03600000 )  /* max(|
281                                 {
282                                         x *= D2ONM1022;
283                                         y *= D2ONM1022;

285                                         x_hi = ( x + D2ON28 ) - D2ON28;
286                                         x_lo = x - x_hi;
287                                         y_hi = ( y + D2ON28 ) - D2ON28;
288                                         y_lo = y - y_hi;
289                                         res = (x_hi * x_hi + y_hi * y_hi);
290                                         res += ((x + x_hi) * x_lo + (y + y_hi) *

292                                         res = sqrt ( res );

294                                         res = D2ONP1022 * res;
295                                         *pz = res;
296                                         return;
297                                 }
298                                 else
299                                 {
300                                         *pz = x + y;
301                                         return;
302                                 }
303                         }
304                 }

306                 if ( j0 < 0x00100000 )  /* X and Y are subnormal */
307                 {
308                         x *= D2ONP1022;
309                         y *= D2ONP1022;

311                         x_hi = ( x + D2ON28 ) - D2ON28;
312                         x_lo = x - x_hi;
313                         y_hi = ( y + D2ON28 ) - D2ON28;
314                         y_lo = y - y_hi;
315                         res = (x_hi * x_hi + y_hi * y_hi);
316                         res += ((x + x_hi) * x_lo + (y + y_hi) * y_lo);

318                         res = sqrt(res);

320                         res = D2ONM1022 * res;
321                         *pz = res;
322                         return;
323                 }

325                 HI(&scl) = (0x7fe00000 - j0);
```



```
327                 x *= scl;
328                 y *= scl;

330                 x_hi = ( x + D2ON28 ) - D2ON28;
331                 y_hi = ( y + D2ON28 ) - D2ON28;
332                 x_lo = x - x_hi;
333                 y_lo = y - y_hi;

335                 res = (x_hi * x_hi + y_hi * y_hi);
336                 res += ((x + x_hi) * x_lo + (y + y_hi) * y_lo);

338                 res = sqrt(res);

340                 HI(&scl) = j0;

342                 res = scl * res;
343                 *pz = res;
344         }
345 }

347 static void
348 __vhypot_n( int n, double * restrict px, int stridex, double * restrict py,
349         int stridey, double * restrict pz, int stridez )
350 {
351         int             hx0, hy0, j0, diff0;
352         double          x_hi0, x_lo0, y_hi0, y_lo0, scl0 = 0;
353         double          x0, y0, res0;
354         double          D2ON28 = ((double*)LCONST)[0];          /* 2 ** 28

356         for( ; n > 0 ; n-- )
357         {
358                 x0 = *px;
359                 y0 = *py;
360                 hx0 = HI(px);
361                 hy0 = HI(py);

363                 hx0 &= 0x7fffffff;
364                 hy0 &= 0x7fffffff;

366                 diff0 = hy0 - hx0;
367                 j0 = diff0 >> 31;
368                 j0 = hy0 - (diff0 & j0);
369                 j0 &= 0x7ff00000;

371                 px += stridex;
372                 py += stridey;

374                 HI(&scl0) = ( 0x7fe00000 - j0 );

376                 x0 *= scl0;
377                 y0 *= scl0;

379                 x_hi0 = ( x0 + D2ON28 ) - D2ON28;
380                 y_hi0 = ( y0 + D2ON28 ) - D2ON28;
381                 x_lo0 = x0 - x_hi0;
382                 y_lo0 = y0 - y_hi0;

384                 res0 = (x_hi0 * x_hi0 + y_hi0 * y_hi0);
385                 res0 += ((x0 + x_hi0) * x_lo0 + (y0 + y_hi0) * y_lo0);

387                 res0 = sqrt(res0);

389                 HI(&scl0) = j0;

391                 res0 = scl0 * res0;
```

```
392                 *pz = res0;

394                 pz += stridez;
395         }
396 }
```

```
**********************************************************
    4271 Sat May 10 12:09:52 2014
new/usr/src/lib/libmvec/common/__vhypotf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

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 */
/*
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 */

#include "libm_synonyms.h"
#include "libm_inlines.h"

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

#define sqrt __sqrt

extern double sqrt( double );

void
__vhypotf( int n, float * restrict x, int stridex, float * restrict y,
        int stridey, float * restrict z, int stridez )
{
        float           x0, x1, x2, y0, y1, y2, z0, z1, z2, *pz0, *pz1, *pz2;
        unsigned        hx0, hx1, hx2, hy0, hy1, hy2;
        int                     i, j0, j1, j2;

        do
        {
LOOP0:
                hx0 = *(unsigned*)x & ~0x80000000;
                hy0 = *(unsigned*)y & ~0x80000000;
                *(unsigned*)&x0 = hx0;
                *(unsigned*)&y0 = hy0;
                if ( hy0 > hx0 )
                {
                        i = hy0 - hx0;
                        j0 = hy0 & 0x7f800000;
                        if ( hy0 == 0 )
                                i = 0x7f800000;
                        if ( hx0 == 0 )
                                i = 0x7f800000;
                }
                else
                {
                        i = hx0 - hy0;
                        j0 = hx0 & 0x7f800000;
                        if ( hy0 == 0 )
                                i = 0x7f800000;
                        else if ( hx0 == 0 )
                                i = 0x7f800000;
                }
                if ( i >= 0x0c800000 || j0 >= 0x7f800000 )
                {
                        z0 = x0 + y0;
                        if ( hx0 == 0x7f800000 )
                                z0 = x0;
                        else if ( hy0  == 0x7f800000 )
                                z0 = y0;
                        else if ( hx0 > 0x7f800000 || hy0 > 0x7f800000 )
                                z0 = *x + *y;
                        *z = z0;
                        x += stridex;
                        y += stridey;
                        z += stridez;
                        i = 0;
                        if ( --n <= 0 )
                                break;
                        goto LOOP0;
                }
                pz0 = z;
                x += stridex;
                y += stridey;
                z += stridez;
                i = 1;
                if ( --n <= 0 )
                        break;

LOOP1:
                hx1 = *(unsigned*)x & ~0x80000000;
                hy1 = *(unsigned*)y & ~0x80000000;
                *(unsigned*)&x1 = hx1;
                *(unsigned*)&y1 = hy1;
                if ( hy1 > hx1 )
                {
                        i = hy1 - hx1;
                        j1 = hy1 & 0x7f800000;
                        if ( hx1 == 0 )
                                i = 0x7f800000;
                }
                else
                {
                        i = hx1 - hy1;
                        j1 = hx1 & 0x7f800000;
                        if ( hy1 == 0 )
                                i = 0x7f800000;
                        else if ( hx1 == 0 )
                                i = 0x7f800000;
                }
                if ( i >= 0x0c800000 || j1 >= 0x7f800000 )
                {
                        z1 = x1 + y1;
                        if ( hx1 == 0x7f800000 )
                                z1 = x1;
                        else if ( hy1 == 0x7f800000 )
                                z1 = y1;
```

```
128                         else if ( hx1 > 0x7f800000 || hy1 > 0x7f800000 )
129                                 z1 = *x + *y;
130                         *z = z1;
131                         x += stridex;
132                         y += stridey;
133                         z += stridez;
134                         i = 1;
135                         if ( --n <= 0 )
136                                 break;
137                         goto LOOP1;
138                 }
139                 pz1 = z;
140                 x += stridex;
141                 y += stridey;
142                 z += stridez;
143                 i = 2;
144                 if ( --n <= 0 )
145                         break;

147 LOOP2:
148                 hx2 = *(unsigned*)x & ~0x80000000;
149                 hy2 = *(unsigned*)y & ~0x80000000;
150                 *(unsigned*)&x2 = hx2;
151                 *(unsigned*)&y2 = hy2;
152                 if ( hy2 > hx2 )
153                 {
154                         i = hy2 - hx2;
155                         j2 = hy2 & 0x7f800000;
156                         if ( hx2 == 0 )
157                                 i = 0x7f800000;
158                 }
159                 else
160                 {
161                         i = hx2 - hy2;
162                         j2 = hx2 & 0x7f800000;
163                         if ( hy2 == 0 )
164                                 i = 0x7f800000;
165                         else if ( hx2 == 0 )
166                                 i = 0x7f800000;
167                 }
168                 if ( i >= 0x0c800000 || j2 >= 0x7f800000 )
169                 {
170                         z2 = x2 + y2;
171                         if ( hx2 == 0x7f800000 )
172                                 z2 = x2;
173                         else if ( hy2 == 0x7f800000 )
174                                 z2 = y2;
175                         else if ( hx2 > 0x7f800000 || hy2 > 0x7f800000 )
176                                 z2 = *x + *y;
177                         *z = z2;
178                         x += stridex;
179                         y += stridey;
180                         z += stridez;
181                         i = 2;
182                         if ( --n <= 0 )
183                                 break;
184                         goto LOOP2;
185                 }
186                 pz2 = z;

188                 z0 = sqrt( x0 * (double)x0 + y0 * (double)y0 );
189                 z1 = sqrt( x1 * (double)x1 + y1 * (double)y1 );
190                 z2 = sqrt( x2 * (double)x2 + y2 * (double)y2 );
191                 *pz0 = z0;
192                 *pz1 = z1;
193                 *pz2 = z2;
```



```
195                 x += stridex;
196                 y += stridey;
197                 z += stridez;
198                 i = 0;
199         } while ( --n > 0 );

201         if ( i > 0 )
202         {
203                 if ( i > 1 )
204                 {
205                         z1 = sqrt( x1 * (double)x1 + y1 * (double)y1 );
206                         *pz1 = z1;
207                 }
208                 z0 = sqrt( x0 * (double)x0 + y0 * (double)y0 );
209                 *pz0 = z0;
210         }
211 }
```

```
**********************************************************
   36406 Sat May 10 12:09:52 2014
new/usr/src/lib/libmvec/common/__vlog.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
 * __vlog: double precision vector log
 *
 * Algorithm:
 *
 * Write x = 2^n z where 1 - 2^-10 <= z < 2 - 2^-9.  Let m = z
 * rounded to nine significant bits, so m = 1 + 2^-8 k, where
 * 0 <= k <= 255.  Let d = z - m.  Then
 *
 * log(x) = n log(2) + log(m) + log(1+(d/m))
 *
 * Let ln2hi = log(2) rounded to a multiple of 2^-42 and ln2lo
 * ~ log(2) - ln2hi.  From a table, obtain mh and ml such that
 * mh = log(m) rounded to a multiple of 2^-42 and ml ~ log(m) -
 * mh.  From the same table, obtain rh and rl such that rh = 1/m
 * rounded to a multiple of 2^-10 and rl ~ 1/m - rh.  For |y| <=
 * 2^-9, approximate log(1+y) by a polynomial y+p(y) where p(y)
 * := y*y*(-1/2+y*(P3+y*(P4+y*(P5+y*P6)))).  Now letting s =
 * d*rh + d*rl in double precision, we can compute the sum above
 * accurately as
 *
 * (n*ln2hi + mh) + (d*rh + (d*rl + (n*ln2lo + ml) + p(s)))
 *
 * When x is subnormal, we first scale it to the normal range,
 * adjusting n accordingly.
 *
 * Accuracy:
 *
 * The largest error observed is less than 0.8 ulps.
 */

#include <sys/isa_defs.h>
```



```
#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int *)&x)
#define LO(x)   *(unsigned *)&x
#define HIWORD  1
#define LOWORD  0
#else
#define HI(x)   *(int *)&x
#define LO(x)   *(1+(unsigned *)&x)
#define HIWORD  0
#define LOWORD  1
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

static const double TBL[] = {
        1.00000000000000000000e+00,  0.00000000000000000000e+00,
        0.00000000000000000000e+00,  0.00000000000000000000e+00,
        9.96093750000000000000e-01,  1.51994163424124515728e-05,
        3.89864041562759666704e-03,  2.97263469009289512726e-14,
        9.92187500000000000000e-01,  6.05620155038759681518e-05,
        7.78214044203195953742e-03,  2.29894100462035112076e-14,
        9.88281250000000000000e-01,  1.35738416988416988208e-04,
        1.16506172200843138853e-02, -1.09039749717359319029e-13,
        9.84375000000000000000e-01,  2.40384615384615397959e-04,
        1.55041865359635266941e-02,  1.72745674997061065553e-15,
        9.80468750000000000000e-01,  3.74161877394636028203e-04,
        1.93429628432113531744e-02, -8.04185385052258635682e-14,
        9.77539062500000000000e-01, -4.39825858778625927714e-04,
        2.31670592816044518258e-02, -7.00735970431003565857e-14,
        9.73632812500000000000e-01, -2.48782081749049442231e-04,
        2.69765876983001362532e-02, -9.80605051684317662887e-14,
        9.69726562500000000000e-01, -2.95928030303030311244e-05,
        3.07716586667083902285e-02,  4.52981425779092882775e-14,
        9.65820312500000000000e-01,  2.17423349056603779517e-04,
        3.45523815067281248048e-02, -6.83913974232877736961e-14,
        9.62890625000000000000e-01, -4.84609962406015010693e-04,
        3.83188643020275776507e-02,  1.09021543022033016421e-13,
        9.58984375000000000000e-01, -1.82876872659176042957e-04,
        4.20712139207353175152e-02, -4.82631400055112824008e-14,
        9.55078125000000000000e-01,  1.45755597014925360189e-04,
        4.58095360313564015087e-02, -6.21983419947579227529e-14,
        9.52148437500000000000e-01, -4.75575046468401500289e-04,
        4.95339351223265111912e-02, -4.98803091079814255646e-14,
        9.48242187500000000000e-01, -9.40393518518518520526e-05,
        5.32445145188376045553e-02, -2.53216894311744497863e-14,
        9.44335937500000000000e-01,  3.13508994464944631443e-04,
        5.69413764001183153596e-02,  2.01093994355649575698e-14,
        9.41406250000000000000e-01, -2.29779411764705879164e-04,
        6.06246218164869787870e-02, -5.21362063913650408235e-14,
        9.37500000000000000000e-01,  2.28937728937728937530e-04,
        6.42943507054951624013e-02, -9.79051851199021608925e-14,
        9.34570312500000000000e-01, -2.63743156934306572509e-04,
        6.79506619085259444546e-02, -1.81950600301688149235e-14,
        9.30664062500000000000e-01,  2.45028409090909096626e-04,
        7.15936531869374448434e-02,  7.13730822534317801406e-14,
        9.27734375000000000000e-01, -1.98143115942028998078e-04,
        7.52234212375242350390e-02,  6.32906595872454402199e-14,
        9.23828125000000000000e-01,  3.59600631768953083074e-04,
        7.88400617077513743425e-02,  2.46501890617661192316e-14,
        9.20898437500000000000e-01, -3.51281474820143869292e-05,
        8.24436692109884461388e-02,  8.61451293608781447223e-14,
        9.17968750000000000000e-01, -4.06025985663082419983e-04,
```

```
        8.603433734174359415l9e-02,  5.955922987625642636e-14,
        9.140625000000000000e-01,  2.232142857142857073e-04,
        8.961215868976069032l1e-02, -7.355770219435028678l6e-14,
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589         5.01953125000000000000e-01,  7.65931372549019597214e-06,
```



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591         5.00976562500000000000e-01,  1.91108121330724059841e-06,
592         6.91192145724244255689e-01, -1.02296829368141946888e-13,
593 };

595 static const double C[] = {
596         6.93147180559890330187e-01,
597         5.49792301870837115524e-14,
598         -0.5,
599         3.33333333332438282293284931714682042701467889609e-0001,
600         -2.49999999998669026809069285994497705748522309858e-0001,
601         2.00000758613044543658508591796951886624273250472e-0001,
602         -1.66667492411916229281646821123333564982955309481e-0001,
603         4503599627370496.0,
604         0.0
605 };

607 #define ln2hi   C[0]
608 #define ln2lo   C[1]
609 #define mhalf   C[2]
610 #define P3      C[3]
611 #define P4      C[4]
612 #define P5      C[5]
613 #define P6      C[6]
614 #define two52   C[7]
615 #define zero    C[8]

617 #define PROCESS(N)                                                      \
618         i##N = (i##N + 0x800) & ~0xfff;                                 \
619         e = (i##N & 0x7ff00000) - 0x3ff00000;                           \
620         z##N.i[HIWORD] -= e;                                            \
621         w##N.i[HIWORD] = i##N - e;                                      \
622         w##N.i[LOWORD] = 0;                                             \
623         n##N += (e >> 20);                                              \
624         i##N = (i##N >> 10) & 0x3fc;                                    \
625         d##N = z##N.d - w##N.d;                                   \
626         h##N = d##N * TBL[i##N];                                        \
627         l##N = d##N * TBL[i##N+1];                                      \
628         s##N = h##N + l##N;                                             \
629         b##N = (s##N * s##N) * (mhalf + s##N * (P3 + s##N * (P4 +       \
630             s##N * (P5 + s##N * P6))));                                 \
631         *y = (n##N * ln2hi + TBL[i##N+2]) + (h##N + (l##N +             \
632             (n##N * ln2lo + TBL[i##N+3]) + b##N));                      \
633         y += stridey

635 #define PREPROCESS(N, index, label)                                     \
636         i##N = HI(*x);                                                  \
637         z##N.d = *x;                                                    \
638         x += stridex;                                                   \
639         n##N = 0;                                                       \
640         if ((i##N & 0x7ff00000) == 0x7ff00000) { /* inf or NaN */       \
641                 y[index] = z##N.d * ((i##N < 0)? zero : z##N.d);        \
642                 goto label;                                             \
643         } else if (i##N < 0x00100000) { /* subnormal, negative, zero */ \
644                 if (((i##N << 1) | z##N.i[LOWORD]) == 0) {              \
645                         y[index] = mhalf / zero;                        \
646                         goto label;                                     \
647                 } else if (i##N < 0) {                                  \
648                         y[index] = zero / zero;                         \
649                         goto label;                                     \
650                 }                                                       \
651                 z##N.d *= two52;                                        \
652                 n##N = -52;                                             \
653                 i##N = z##N.i[HIWORD];                            \
654         }
```

```
656 void
657 __vlog(int n, double *restrict x, int stridex, double *restrict y,
658         int stridey)
659 {
660         union {
661                 unsigned        i[2];
662                 double          d;
663         } z0, z1, z2, z3, w0, w1, w2, w3;
664         double  b0, b1, b2, b3;
665         double  d0, d1, d2, d3;
666         double  h0, h1, h2, h3;
667         double  l0, l1, l2, l3;
668         double  s0, s1, s2, s3;
669         int     i0, i1, i2, i3, e;
670         int     n0, n1, n2, n3;

672         w0.i[LOWORD] = 0;
673         w1.i[LOWORD] = 0;
674         w2.i[LOWORD] = 0;
675         w3.i[LOWORD] = 0;

677         y -= stridey;

679         for (;;) {
680 begin:
681                 y += stridey;

683                 if (--n < 0)
684                         break;

686                 PREPROCESS(0, 0, begin);

688                 if (--n < 0)
689                         goto process1;

691                 PREPROCESS(1, stridey, process1);

693                 if (--n < 0)
694                         goto process2;

696                 PREPROCESS(2, (stridey << 1), process2);

698                 if (--n < 0)
699                         goto process3;

701                 PREPROCESS(3, (stridey << 1) + stridey, process3);

703                 i0 = (i0 + 0x800) & ~0xfff;
704                 e = (i0 & 0x7ff00000) - 0x3ff00000;
705                 z0.i[HIWORD] -= e;
706                 w0.i[HIWORD] = i0 - e;
707                 n0 += (e >> 20);
708                 i0 = (i0 >> 10) & 0x3fc;

710                 i1 = (i1 + 0x800) & ~0xfff;
711                 e = (i1 & 0x7ff00000) - 0x3ff00000;
712                 z1.i[HIWORD] -= e;
713                 w1.i[HIWORD] = i1 - e;
714                 n1 += (e >> 20);
715                 i1 = (i1 >> 10) & 0x3fc;

717                 i2 = (i2 + 0x800) & ~0xfff;
718                 e = (i2 & 0x7ff00000) - 0x3ff00000;
719                 z2.i[HIWORD] -= e;
720                 w2.i[HIWORD] = i2 - e;
721                 n2 += (e >> 20);
```



```
722                 i2 = (i2 >> 10) & 0x3fc;

724                 i3 = (i3 + 0x800) & ~0xfff;
725                 e = (i3 & 0x7ff00000) - 0x3ff00000;
726                 z3.i[HIWORD] -= e;
727                 w3.i[HIWORD] = i3 - e;
728                 n3 += (e >> 20);
729                 i3 = (i3 >> 10) & 0x3fc;

731                 d0 = z0.d - w0.d;
732                 d1 = z1.d - w1.d;
733                 d2 = z2.d - w2.d;
734                 d3 = z3.d - w3.d;

736                 h0 = d0 * TBL[i0];
737                 h1 = d1 * TBL[i1];
738                 h2 = d2 * TBL[i2];
739                 h3 = d3 * TBL[i3];

741                 l0 = d0 * TBL[i0+1];
742                 l1 = d1 * TBL[i1+1];
743                 l2 = d2 * TBL[i2+1];
744                 l3 = d3 * TBL[i3+1];

746                 s0 = h0 + l0;
747                 s1 = h1 + l1;
748                 s2 = h2 + l2;
749                 s3 = h3 + l3;

751                 b0 = (s0 * s0) * (mhalf + s0 * (P3 + s0 * (P4 +
752                     s0 * (P5 + s0 * P6))));
753                 b1 = (s1 * s1) * (mhalf + s1 * (P3 + s1 * (P4 +
754                     s1 * (P5 + s1 * P6))));
755                 b2 = (s2 * s2) * (mhalf + s2 * (P3 + s2 * (P4 +
756                     s2 * (P5 + s2 * P6))));
757                 b3 = (s3 * s3) * (mhalf + s3 * (P3 + s3 * (P4 +
758                     s3 * (P5 + s3 * P6))));

760                 *y = (n0 * ln2hi + TBL[i0+2]) + (h0 + (l0 +
761                     (n0 * ln2lo + TBL[i0+3]) + b0));
762                 y += stridey;
763                 *y = (n1 * ln2hi + TBL[i1+2]) + (h1 + (l1 +
764                     (n1 * ln2lo + TBL[i1+3]) + b1));
765                 y += stridey;
766                 *y = (n2 * ln2hi + TBL[i2+2]) + (h2 + (l2 +
767                     (n2 * ln2lo + TBL[i2+3]) + b2));
768                 y += stridey;
769                 *y = (n3 * ln2hi + TBL[i3+2]) + (h3 + (l3 +
770                     (n3 * ln2lo + TBL[i3+3]) + b3));
771                 continue;

773 process1:
774                 PROCESS(0);
775                 continue;

777 process2:
778                 PROCESS(0);
779                 PROCESS(1);
780                 continue;

782 process3:
783                 PROCESS(0);
784                 PROCESS(1);
785                 PROCESS(2);
786         }
787 }
```

```
**********************************************************
    7748 Sat May 10 12:09:52 2014
new/usr/src/lib/libmvec/common/__vlogf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/* float logf(float x)
 *
 * Method :
 *      1. Special cases:
 *              for x is negative, -Inf => QNaN + invalid;
 *              for x = 0               => -Inf + divide-by-zero;
 *              for x = +Inf            => Inf;
 *              for x = NaN             => QNaN.
 *      2. Computes logarithm from:
 *              x = m * 2**n => log(x) = n * log(2) + log(m),
 *              m = [1, 2).
 *      Let m = m0 + dm, where m0 = 1 + k / 32,
 *              k = [0, 32],
 *              dm = [-1/64, 1/64].
 *      Then log(m) = log(m0 + dm) = log(m0) + log(1+y),
 *              where y = dm*(1/m0), y = [-1/66, 1/64].
 *      Then
 *              1/m0 is looked up in a table of 1, 1/(1+1/32), ..., 1/(1+32/32);
 *              log(m0) is looked up in a table of log(1), log(1+1/32),
 *              ..., log(1+32/32).
 *              log(1+y) is computed using approximation:
 *              log(1+y) = ((a3*y + a2)*y + a1)*y*y + y.
 * Accuracy:
 *      The maximum relative error for the approximating
 *      polynomial is 2**(-28.41).  All calculations are of
 *      double precision.
```



```
 *      Maximum error observed: less than 0.545 ulp for the
 *      whole float type range.
 */

static const double __TBL_logf[] = {
        /* __TBL_logf[2*i] = log(1+i/32), i = [0, 32] */
        /* __TBL_logf[2*i+1] = 2**(-23)/(1+i/32), i = [0, 32] */
0.0000000000000000e+00, 1.1920928955078125e-07, 3.0771658666753687e-02,
1.5596886837121215e-07, 6.0624621816434839e-02, 1.1219697840073529e-07,
8.9612158689687138e-02, 1.0899135044642856e-07, 1.1778303565638345e-01,
1.0596381293402777e-07, 1.4518200984449788e-01, 1.0309992609797297e-07,
1.7185025692665922e-01, 1.0038677014802631e-07, 1.9782574332991986e-01,
9.7812750400641022e-08, 2.2314355131420976e-01, 9.5367431640625005e-08,
2.4783616390458126e-01, 9.3041396722560978e-08, 2.7193371548364176e-01,
9.0826125372023804e-08, 2.9546421289383589e-01, 8.8713889898255812e-08,
3.1845373111853458e-01, 8.6697665127840911e-08, 3.4092658697059319e-01,
8.4771050347222225e-08, 3.6290549368936847e-01, 8.2928201426630432e-08,
3.8441169891033205e-01, 8.1163771609042551e-08, 4.0546510810816438e-01,
7.9472859700520828e-08, 4.2608439531090008e-01, 7.7850964604591830e-08,
4.4628710262841952e-01, 7.6293945312500015e-08, 4.6608972992459924e-01,
7.4797985600490195e-08, 4.8550781578170082e-01, 7.3359562800480773e-08,
5.0455601075239531e-01, 7.1975420106132072e-08, 5.2324814376454786e-01,
7.0642541956018514e-08, 5.4159728243274440e-01, 6.9358132102272724e-08,
5.5961578793542265e-01, 6.8119594029017853e-08, 5.7731536503482361e-01,
6.6924513432017540e-08, 5.9470710774669277e-01, 6.5770642510775861e-08,
6.1180154110599294e-01, 6.4655885858050847e-08, 6.2860859422374094e-01,
6.3578287760416665e-08, 6.4513796137358470e-01, 6.2536020747950823e-08,
6.6139848224536501e-01, 6.1527375252016127e-08, 6.7739882359180614e-01,
6.0550750248015869e-08, 6.9314718055994528e-01, 5.9604644775390625e-08
};

static const double
        K3 = -2.49887584306188944706e-01,
        K2 =  3.33368009981254554946e-01,
        K1 = -5.00000084024749765650e-01;

static const union {
        int     i;
        float   f;
} inf = { 0x7f800000 };

#define INF     inf.f

#define PROCESS(N)
        iy##N = ival##N & 0x007fffff;
        ival##N = (iy##N + 0x20000) & 0xfffc0000;
        i##N  = ival##N >> 17;
        iy##N = iy##N - ival##N;
        ty##N = LN2 * (double) exp##N + __TBL_logf[i##N];
        yy##N = (double) iy##N * __TBL_logf[i##N + 1];
        yy##N = ((K3 * yy##N + K2) * yy##N + K1) * yy##N * yy##N + yy##N;
        y[0] = (float)(yy##N + ty##N);
        y += stridey;

#define PREPROCESS(N, index, label)
        ival##N = *(int*)x;
        value = x[0];
        x += stridex;
        exp##N = (ival##N >> 23) - 127;
        if ( (ival##N & 0x7fffffff) >= 0x7f800000 ) /* X = NaN or Inf */
        {
                y[index] = value + INF;
                goto label;
        }
        if ( ival##N < 0x00800000 )
        {
```

```
128                 if ( ival##N > 0 )      /* X = denormal */
129                 {
130                         value = (float) ival##N;
131                         ival##N = *(int*) &value;
132                         exp##N = (ival##N >> 23) - (127 + 149);
133                 }
134                 else
135                 {
136                         value = 0.0f;
137                         y[index] = ((ival##N & 0x7fffffff) == 0) ?
138                                 -1.0f / value : value / value;
139                         goto label;
140                 }
141         }

143 void
144 __vlogf( int n, float * restrict x, int stridex, float * restrict y,
145         int stridey )
146 {
147         double  LN2 = __TBL_logf[64];           /* log(2) = 0.693147180559945309
148         double  yy0, yy1, yy2, yy3, yy4;
149         double  ty0, ty1, ty2, ty3, ty4;
150         float   value;
151         int     i0, i1, i2, i3, i4;
152         int     ival0, ival1, ival2, ival3, ival4;
153         int     exp0, exp1, exp2, exp3, exp4;
154         int     iy0, iy1, iy2, iy3, iy4;

156         y -= stridey;

158         for ( ; ; )
159         {
160 begin:
161                 y += stridey;

163                 if ( --n < 0 )
164                         break;

166                 PREPROCESS(0, 0, begin)

168                 if ( --n < 0 )
169                         goto process1;

171                 PREPROCESS(1, stridey, process1)

173                 if ( --n < 0 )
174                         goto process2;

176                 PREPROCESS(2, (stridey << 1), process2)

178                 if ( --n < 0 )
179                         goto process3;

181                 PREPROCESS(3, (stridey << 1) + stridey, process3)

183                 if ( --n < 0 )
184                         goto process4;

186                 PREPROCESS(4, (stridey << 2), process4)

188                 iy0 = ival0 & 0x007fffff;
189                 iy1 = ival1 & 0x007fffff;
190                 iy2 = ival2 & 0x007fffff;
191                 iy3 = ival3 & 0x007fffff;
192                 iy4 = ival4 & 0x007fffff;
```



```
194                 ival0 = (iy0 + 0x20000) & 0xfffc0000;
195                 ival1 = (iy1 + 0x20000) & 0xfffc0000;
196                 ival2 = (iy2 + 0x20000) & 0xfffc0000;
197                 ival3 = (iy3 + 0x20000) & 0xfffc0000;
198                 ival4 = (iy4 + 0x20000) & 0xfffc0000;

200                 i0 = ival0 >> 17;
201                 i1 = ival1 >> 17;
202                 i2 = ival2 >> 17;
203                 i3 = ival3 >> 17;
204                 i4 = ival4 >> 17;

206                 iy0 = iy0 - ival0;
207                 iy1 = iy1 - ival1;
208                 iy2 = iy2 - ival2;
209                 iy3 = iy3 - ival3;
210                 iy4 = iy4 - ival4;

212                 ty0 = LN2 * (double) exp0 + __TBL_logf[i0];
213                 ty1 = LN2 * (double) exp1 + __TBL_logf[i1];
214                 ty2 = LN2 * (double) exp2 + __TBL_logf[i2];
215                 ty3 = LN2 * (double) exp3 + __TBL_logf[i3];
216                 ty4 = LN2 * (double) exp4 + __TBL_logf[i4];

218                 yy0 = (double) iy0 * __TBL_logf[i0 + 1];
219                 yy1 = (double) iy1 * __TBL_logf[i1 + 1];
220                 yy2 = (double) iy2 * __TBL_logf[i2 + 1];
221                 yy3 = (double) iy3 * __TBL_logf[i3 + 1];
222                 yy4 = (double) iy4 * __TBL_logf[i4 + 1];

224                 yy0 = ((K3 * yy0 + K2) * yy0 + K1) * yy0 * yy0 + yy0;
225                 yy1 = ((K3 * yy1 + K2) * yy1 + K1) * yy1 * yy1 + yy1;
226                 yy2 = ((K3 * yy2 + K2) * yy2 + K1) * yy2 * yy2 + yy2;
227                 yy3 = ((K3 * yy3 + K2) * yy3 + K1) * yy3 * yy3 + yy3;
228                 yy4 = ((K3 * yy4 + K2) * yy4 + K1) * yy4 * yy4 + yy4;

230                 y[0] = (float)(yy0 + ty0);
231                 y += stridey;
232                 y[0] = (float)(yy1 + ty1);
233                 y += stridey;
234                 y[0] = (float)(yy2 + ty2);
235                 y += stridey;
236                 y[0] = (float)(yy3 + ty3);
237                 y += stridey;
238                 y[0] = (float)(yy4 + ty4);
239                 continue;

241 process1:
242                 PROCESS(0)
243                 continue;

245 process2:
246                 PROCESS(0)
247                 PROCESS(1)
248                 continue;

250 process3:
251                 PROCESS(0)
252                 PROCESS(1)
253                 PROCESS(2)
254                 continue;

256 process4:
257                 PROCESS(0)
258                 PROCESS(1)
259                 PROCESS(2)
```

```
260                     PROCESS(3)
261             }
262     }
```

```
**********************************************************
   56146 Sat May 10 12:09:52 2014
new/usr/src/lib/libmvec/common/__vpow.c
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/* double pow(double x, double y)
 *
 * Method :
 *      1. Special cases:
 *              for (anything) ** 0                             => 1
 *              for (anything) ** NaN                           => QNaN + invali
 *              for NaN ** (anything)                           => QNaN + invali
 *              for +-1 ** +-Inf                                => QNaN + invali
 *              for +-(|x| < 1) ** +Inf                         => +0
 *              for +-(|x| < 1) ** -Inf                         => +Inf
 *              for +-(|x| > 1) ** +Inf                         => +Inf
 *              for +-(|x| > 1) ** -Inf                         => +0
 *              for +Inf ** (negative)                          => +0
 *              for +Inf ** (positive)                          => +Inf
 *              for -Inf ** (negative except odd integer)       => +0
```



```
 *              for -Inf ** (negative odd integer)              => -0
 *              for -Inf ** (positive except odd integer)       => +Inf
 *              for -Inf ** (positive odd integer)              => -Inf
 *              for (negative) ** (non-integer)                 => QNaN + invali
 *              for +0 ** (negative)                            => +Inf + overfl
 *              for +0 ** (positive)                            => +0
 *              for -0 ** (negative except odd integer)         => +Inf + overfl
 *              for -0 ** (negative odd integer)                => -Inf + overfl
 *              for -0 ** (positive except odd integer)         => +0
 *              for -0 ** (positive odd integer)                => -0
 *      2. Computes x**y from:
 *              x**y = 2**(y*log2(x)) = 2**(w/256), where w = 256*log2(|x|)*y.
 *      3. Computes w = 256*log2(|x|)*y from
 *              |x| = m * 2**n => log2(|x|) = n + log2(m).
 *      Let m = m0 + dm, where m0 = 1 + k / 256,
 *              k = [0, 255],
 *              dm = [-1/512, 1/512].
 *      Then 256*log2(m) = 256*log2(m0 + dm) = 256*log2(m0) + 256*log2((1+z)/(1-
 *              where z = (m-m0)/(m+m0), z = [-1/1025, 1/1025].
 *      Then
 *              256*log2(m0) is looked up in a table of 256*log2(1), 256*log2(1+
 *                      ..., 256*log2(1+128/128).
 *              256*log2((1+z)/(1-z)) is computed using
 *                      approximation: 256*log2((1+z)/(1-z)) = a0 * z + a1 * z**
 *      Perform w = 256*log2(|x|)*y = w1 + w2 by simulating muti-precision arith
 *      3. For w >= 262144
 *              then for (negative) ** (odd integer)    => -Inf + overflow
 *              else                                    => +Inf + overflow
 *      For w <= -275200
 *              then for (negative) ** (odd integer)    => -0 + underflow
 *              else                                    => +0 + underflow
 *      4. Computes 2 ** (w/256) from:
 *              2 ** (w/256) = 2**a  *  2**(k/256)  *  2**(r/256)
 *      Where:
 *              a    =    int  ( w ) >> 8;
 *              k    =    int  ( w ) & 0xFF;
 *              r    =    frac ( w ).
 *      Note that:
 *              k = 0, 1, ..., 255;
 *              r = (-1, 1).
 *      Then:
 *              2**(k/256) is looked up in a table of 2**0, 2**1/256, ...
 *              2**(r/256) is computed using approximation:
 *                      2**(r/256) =  ((((b5 * r + b4) * r + b3) * r + b2) * r +
 *              Multiplication by 2**a is done by adding "a" to
 *              the biased exponent.
 *      Perform 2 ** (w/256) by simulating muti-precision arithmetic.
 *      5. For (negative) ** (odd integer)              => -(2**(w/256))
 *      otherwise                                       =>   2**(w/256)
 *
 * Accuracy:
 *      Max. relative aproximation error < 2**(-67.94) for 256*log2((1+z)/(1-z))
 *      Max. relative aproximation error < 2**(-63.15) for 2**(r/256).
 *      Maximum error observed: less than 0.761 ulp after 1.300.000.000
 *      results.
 */

static void
__vpowx( int n, double * restrict px, double * restrict py,
        int stridey, double * restrict pz, int stridez );

static const double __TBL_exp2[] = {
        /* __TBL_exp2[2*i] = high order bits 2^(i/256), i = [0, 255] */
        /* __TBL_exp2[2*i+1] = least bits 2^(i/256), i = [0, 255]     */
 1.0000000000000000e+00, 0.0000000000000000e+00, 1.0027112750502025 22e+00,
-3.636615928692263944e-17, 1.0054299011128027 26e+00, 9.499186535455031757e-17,
```

```
 1.008155898118417548e+00,-3.252058756084308061e-17, 1.010889286051700475e+00,
-1.523477860336857718e-17, 1.013630084951489430e+00, 9.2835997681835675 87e-18,
 1.016378314910953096e+00,-5.772170731996600 28e-17, 1.019133996077737914e+00,
 3.601904982259661106e-17, 1.021897148654116627e+00, 5.109225028973443894e-17,
 1.024667792897135721e+00,-7.561607868487779440e-17, 1.027445949118763746e+00,
-4.956074174645370440e-17, 1.030231637686040980e+00, 3.319830041080812944e-17,
 1.033024879021228415e+00, 7.600838874027088489e-18, 1.035825693601957198e+00,
-7.806782391337636167e-17, 1.038634101961378731e+00, 5.996273788852510618e-17,
 1.041450124688316103e+00, 3.784830480287576210e-17, 1.044273782427413755e+00,
 8.551889705537964892e-17, 1.047105095879289793e+00, 7.277077243104314749e-17,
 1.049944085800687210e+00, 5.592937848127002586e-17, 1.052790773004626423e+00,
-9.629482899026935739e-17, 1.055645178360557157e+00, 1.759325738772091599e-18,
 1.058507322794512762e+00,-7.152651856637780738e-17, 1.061377227289262093e+00,
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};

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        /* __TBL_log2[2*i+1] = low order least bits log2(1+i/256)*256, i = [0, 2
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 2.55277954101562500e+02,-6.98153143764966706 4e-06
};

static const unsigned long long LCONST[] = {
0x3c90000000000000ULL,  /* 2**(-54) = 5.551115123125782702e-17          */
0x3ff0000000000000ULL,  /* DONE = 1.0                                   */
0x4330000000000000ULL,  /* DVAIN52 = 2**52 = 4.503599627370496e15       */
0xffffffff00000000ULL,  /* 0xffffffff00000000                           */
0x000fffffffffffffULL,  /* 0x000fffffffffffff                           */
0x0000080000000000ULL,  /* 0x0000080000000000                           */
0xfffff00000000000ULL,  /* 0xfffff00000000000                           */
0x0000000000000000ULL,  /* DZERO   = 0.0                                */
0x4062776d8ce329bdULL,  /* KA5     = 5.770786048608937379 86e-01*256    */
0x406ec709dc39fc99ULL,  /* KA3     = 9.617966939257655494 23e-01*256    */
0x3f6d94ae0bf85de6ULL,  /* KA1_LO  = 1.410521542681473095 68e-05*256    */
0x4087154000000000ULL,  /* KA1_HI  = 2.8853759765625e+00*256            */
0x40871547652b82feULL,  /* KA1     = 2.885390081777926774 e+00*256      */
0x4110000000000000ULL,  /* HTHRESH = 262144.0                           */
0xc110cc0000000000ULL,  /* LTHRESH = -275200.0                          */
0x3cd5d52893bc7fecULL,  /* KB5     = 1.211955558540688609 23e-15        */
0x3d83b2abc07c93d0ULL,  /* KB4     = 2.239395738118551043 11e-12        */
0x3e2c6b08d71f5d1eULL,  /* KB3     = 3.308302681266046774 36e-09        */
0x3ecebfbdff82c4edULL,  /* KB2     = 3.665565596910037678 77e-06        */
0x3f662e42fefa39efULL,  /* KB1     = 2.707606174062286365 78e-03        */
0x01a56e1fc2f8f359ULL,  /* _TINY   = 1.0e-300                           */
0x7e37e43c8800759cULL   /* _HUGE   = 1.0e+300                           */
};

#define SCALE_ARR       ((double*)LCONST + 1)
#define _TINY           ((double*)LCONST)[20]   /* 1.0e-300     */
#define _HUGE           ((double*)LCONST)[21]   /* 1.0e+300     */

#define RET_SC(I)
        px += stridex;
        py += stridey;
        pz += stridez;
        if ( --n <= 0 )
                break;
        goto start##I;

#define RETURN(I, ret)
{
        pz[0] = (ret);
        RET_SC(I)
}

#define PREP(I)
hx = HI(px);
lx = LO(px);
hy = HI(py);
ly = LO(py);
sx = hx >> 31;
```

```
sy = hy >> 31;
hx &= 0x7fffffff;
hy &= 0x7fffffff;
ull_y0 = *(unsigned long long*)px;

if ( hy < 0x3bf00000 )          /* |Y| < 2^(-64) */
{
        y0 = *px;
        if ( (hy | ly) == 0 )   /* pow(X,0) */
                RETURN (I, DONE)
        if ( hx > 0x7ff00000 || (hx == 0x7ff00000 && lx != 0) )         /* |X| =
                *pz = y0 + y0;
        else if ( (hx | lx) == 0 || (hx == 0x7ff00000 && lx == 0) )     /* X = 0
        {
                HI(pz) = hx;
                LO(pz) = lx;
                if ( sy )
                        *pz = DONE / *pz;
        }
        else
                *pz = (sx) ? DZERO / DZERO : DONE;
        RET_SC(I)
}
yisint##I = 0;  /* Y - non-integer */
exp = hy >> 20; /* Y exponent */
ull_y0 &= LMMANT;
ull_x##I = (ull_y0 | LDONE);
x##I = *(double*)&ull_x##I;
ull_ax##I = ((ull_x##I + LMROUND) & LMHI20);
ax##I = *(double*)&ull_ax##I;
if ( hx >= 0x7ff00000 || exp >= 0x43e )         /* X=Inf,Nan or |Y|>2^63,Inf,Nan
{
        y0 = *px;
        if ( hx > 0x7ff00000 || (hx == 0x7ff00000 && lx != 0) ||
        hy > 0x7ff00000 || (hy == 0x7ff00000 && ly != 0) )      /* |X| or |Y| =
                RETURN (I, y0 + *py)
        if ( hy == 0x7ff00000 && (ly == 0) )                    /* |Y| = Inf */
        {
                if ( hx == 0x3ff00000 && (lx == 0) )            /* +-1 ** +-Inf
                        *pz = *py - *py;
                else if ( (hx < 0x3ff00000) != sy )
                        *pz = DZERO;
                else
                {
                        HI(pz) = hy;
                        LO(pz) = ly;
                }
                RET_SC(I)
        }
        if ( exp < 0x43e )      /* |Y| < 2^63   */
        {
                if ( sx )       /* X = -Inf     */
                {
                        if ( exp >= 0x434 )     /* |Y| >= 2^53  */
                                yisint##I = 2;  /* Y - even     */
                        else
                        {
                                if ( exp >= 0x3ff )     /* |Y| >= 1     */
                                {
                                        if ( exp > (20 + 0x3ff) )
                                        {
                                                i0 = ly >> (52 - (exp - 0x3ff));
                                                if ( (i0 << (52 - (exp - 0x3ff))
                                                        yisint##I = 2 - (i0 & 1)
                                        }
                                        else if ( ly == 0 )
```



```
                                        {
                                                i0 = hy >> (20 - (exp - 0x3ff));
                                                if ( (i0 << (20 - (exp - 0x3ff))
                                                        yisint##I = 2 - (i0 & 1)
                                        }
                                }
                        }
                        if ( sy )
                                hx = lx = 0;
                        hx += yisint##I << 31;
                        HI(pz) = hx;
                        LO(pz) = lx;
                        RET_SC(I)
                }
                else    /* |Y| >= 2^63   */
                {
                        /* |X| = 0, 1, Inf */
                        if ( lx == 0 && (hx == 0 || hx == 0x3ff00000 || hx == 0x7ff00000
                        {
                                HI(pz) = hx;
                                LO(pz) = lx;
                                if ( sy )
                                        *pz = DONE / *pz;
                        }
                        else
                        {
                                y0 = ( (hx < 0x3ff00000) != sy ) ? _TINY : _HUGE;
                                *pz = y0 * y0;
                        }
                        RET_SC(I)
                }
        }
        if ( (sx || (hx | lx)) == 0 )   /* X <= 0      */
        {
                if ( exp >= 0x434 )     /* |Y| >= 2^53 */
                        yisint##I = 2;  /* Y - even    */
                else
                {
                        if ( exp >= 0x3ff )     /* |Y| >= 1    */
                        {
                                if ( exp > (20 + 0x3ff) )
                                {
                                        i0 = ly >> (52 - (exp - 0x3ff));
                                        if ( (i0 << (52 - (exp - 0x3ff))) == ly )
                                                yisint##I = 2 - (i0 & 1);
                                }
                                else if ( ly == 0 )
                                {
                                        i0 = hy >> (20 - (exp - 0x3ff));
                                        if ( (i0 << (20 - (exp - 0x3ff))) == hy )
                                                yisint##I = 2 - (i0 & 1);
                                }
                        }
                }
                if ( (hx | lx) == 0 )           /* X == 0  */
                {
                        y0 = DZERO;
                        if ( sy )
                                y0 = DONE / y0;
                        if ( sx & yisint##I )
                                y0 = -y0;
                        RETURN (I, y0)
                }
                if ( yisint##I == 0 )                   /* pow(neg,non-integer) */
                        RETURN (I, DZERO / DZERO)       /* NaN */
```

```
655 }
656 exp = (hx >> 20);
657 exp##I = exp - 2046;
658 py##I = py;
659 pz##I = pz;
660 ux##I = x##I + ax##I;
661 if ( !exp )
662 {
663         ax##I = (double) ull_y0;
664         ull_ax##I = *(unsigned long long*)&ax##I;
665         ull_x##I = ((ull_ax##I & LMMANT) | LDONE);
666         x##I = *(double*)&ull_x##I;
667         exp##I = ((unsigned int*) & ull_ax##I)[0];
668         exp##I = (exp##I >> 20) - (2046 + 1023 + 51);
669         ull_ax##I = (ull_x##I + (LMROUND & LMHI20));
670         ax##I = *(double*)&ull_ax##I;
671         ux##I = x##I + ax##I;
672 }
673 ull_x##I = *(unsigned long long *)&ux##I;
674 hx##I = HI(&ull_ax##I);
675 yd##I = DONE / ux##I;

677 void
678 __vpow( int n, double * restrict px, int stridex, double * restrict py,
679         int stridey, double * restrict pz, int stridez )
680 {
681         double                  *py0 = 0, *py1 = 0, *py2;
682         double                  *pz0 = 0, *pz1 = 0, *pz2;
683         double                  y0, yd0 = 0.0L, u0, s0, s_l0, m_h0;
684         double                  y1, yd1 = 0.0L, u1, s1, s_l1, m_h1;
685         double                  y2, yd2, u2, s2, s_l2, m_h2;
686         double                  ax0 = 0.0L, x0 = 0.0L, s_h0, ux0;
687         double                  ax1 = 0.0L, x1 = 0.0L, s_h1, ux1;
688         double                  ax2, x2, s_h2, ux2;
689         int                     eflag0, gflag0, ind0, i0;
690         int                     eflag1, gflag1, ind1, i1;
691         int                     eflag2, gflag2, ind2, i2;
692         int                     hx0 = 0, yisint0 = 0, exp0 = 0;
693         int                     hx1 = 0, yisint1 = 0, exp1 = 0;
694         int                     hx2, yisint2, exp2;
695         int                     exp, i = 0;
696         unsigned                hx, lx, sx, hy, ly, sy;
697         unsigned long long      ull_y0, ull_x0, ull_x1, ull_x2, ull_ax0, ull_ax1
698         unsigned long long      LDONE = ((unsigned long long*)LCONST)[1];
699         unsigned long long      LMMANT = ((unsigned long long*)LCONST)[4];
700         unsigned long long      LMROUND = ((unsigned long long*)LCONST)[5];
701         unsigned long long      LMHI20 = ((unsigned long long*)LCONST)[6];
702         double                  DONE = ((double*)LCONST)[1];
703         double                  DZERO = ((double*)LCONST)[7];
704         double                  KA5 = ((double*)LCONST)[8];
705         double                  KA3 = ((double*)LCONST)[9];
706         double                  KA1_LO = ((double*)LCONST)[10];
707         double                  KA1_HI = ((double*)LCONST)[11];
708         double                  KA1 = ((double*)LCONST)[12];
709         double                  HTHRESH = ((double*)LCONST)[13];
710         double                  LTHRESH = ((double*)LCONST)[14];
711         double                  KB5 = ((double*)LCONST)[15];
712         double                  KB4 = ((double*)LCONST)[16];
713         double                  KB3 = ((double*)LCONST)[17];
714         double                  KB2 = ((double*)LCONST)[18];
715         double                  KB1 = ((double*)LCONST)[19];

717         if (stridex == 0)
718         {
719                 unsigned        hx = HI(px);
720                 unsigned        lx = LO(px);
```



```
722                 /* if x is a positive normal number not equal to one,
723                    call __vpowx */
724                 if (hx >= 0x00100000 && hx < 0x7ff00000 &&
725                         (hx != 0x3ff00000 || lx != 0))
726                 {
727                         __vpowx( n, px, py, stridey, pz, stridez );
728                         return;
729                 }
730         }

732         do
733         {
734                 /* perform si + ydi = 256*log2(xi)*yi */
735 start0:
736                 PREP(0)
737                 px += stridex;
738                 py += stridey;
739                 pz += stridez;
740                 i = 1;
741                 if ( --n <= 0 )
742                         break;

744 start1:
745                 PREP(1)
746                 px += stridex;
747                 py += stridey;
748                 pz += stridez;
749                 i = 2;
750                 if ( --n <= 0 )
751                         break;

753 start2:
754                 PREP(2)

756                 u0 = x0 - ax0;
757                 u1 = x1 - ax1;
758                 u2 = x2 - ax2;

760                 s0 = u0 * yd0;
761                 LO(&ux0) = 0;
762                 s1 = u1 * yd1;
763                 LO(&ux1) = 0;
764                 s2 = u2 * yd2;
765                 LO(&ux2) = 0;

767                 y0 = s0 * s0;
768                 s_h0 = s0;
769                 LO(&s_h0) = 0;
770                 y1 = s1 * s1;
771                 s_h1 = s1;
772                 LO(&s_h1) = 0;
773                 y2 = s2 * s2;
774                 s_h2 = s2;
775                 LO(&s_h2) = 0;

777                 s0 = (KA5 * y0 + KA3) * y0 * s0;
778                 s1 = (KA5 * y1 + KA3) * y1 * s1;
779                 s2 = (KA5 * y2 + KA3) * y2 * s2;

781                 s_l0 = (x0 - (ux0 - ax0));
782                 s_l1 = (x1 - (ux1 - ax1));
783                 s_l2 = (x2 - (ux2 - ax2));

785                 s_l0 = u0 - s_h0 * ux0 - s_h0 * s_l0;
786                 s_l1 = u1 - s_h1 * ux1 - s_h1 * s_l1;
```

```
787                 s_l2 = u2 - s_h2 * ux2 - s_h2 * s_l2;

789                 s_l0 = KA1 * yd0 * s_l0;
790                 i0 = (hx0 >> 8) & 0xff0;
791                 exp0 += (hx0 >> 20);

793                 s_l1 = KA1 * yd1 * s_l1;
794                 i1 = (hx1 >> 8) & 0xff0;
795                 exp1 += (hx1 >> 20);

797                 s_l2 = KA1 * yd2 * s_l2;
798                 i2 = (hx2 >> 8) & 0xff0;
799                 exp2 += (hx2 >> 20);

801                 yd0 = KA1_HI * s_h0;
802                 yd1 = KA1_HI * s_h1;
803                 yd2 = KA1_HI * s_h2;

805                 y0 = *(double *)((char*)__TBL_log2 + i0);
806                 y1 = *(double *)((char*)__TBL_log2 + i1);
807                 y2 = *(double *)((char*)__TBL_log2 + i2);

809                 y0 += (double)(exp0 << 8);
810                 y1 += (double)(exp1 << 8);
811                 y2 += (double)(exp2 << 8);

813                 m_h0 = y0 + yd0;
814                 m_h1 = y1 + yd1;
815                 m_h2 = y2 + yd2;

817                 y0 = s0 - ((m_h0 - y0 - yd0) - s_l0);
818                 y1 = s1 - ((m_h1 - y1 - yd1) - s_l1);
819                 y2 = s2 - ((m_h2 - y2 - yd2) - s_l2);

821                 y0 += *(double *)((char*)__TBL_log2 + i0 + 8) + KA1_LO * s_h0;
822                 y1 += *(double *)((char*)__TBL_log2 + i1 + 8) + KA1_LO * s_h1;
823                 y2 += *(double *)((char*)__TBL_log2 + i2 + 8) + KA1_LO * s_h2;

825                 s_h0 = y0 + m_h0;
826                 s_h1 = y1 + m_h1;
827                 s_h2 = y2 + m_h2;

829                 LO(&s_h0) = 0;
830                 LO(&s_h1) = 0;
831                 LO(&s_h2) = 0;

833                 yd0 = *py0;
834                 yd1 = *py1;
835                 yd2 = *py2;
836                 s0 = yd0;
837                 s1 = yd1;
838                 s2 = yd2;
839                 LO(&s0) = 0;
840                 LO(&s1) = 0;
841                 LO(&s2) = 0;

843                 y0 = y0 - (s_h0 - m_h0);
844                 y1 = y1 - (s_h1 - m_h1);
845                 y2 = y2 - (s_h2 - m_h2);

847                 yd0 = (yd0 - s0) * s_h0 + yd0 * y0;
848                 yd1 = (yd1 - s1) * s_h1 + yd1 * y1;
849                 yd2 = (yd2 - s2) * s_h2 + yd2 * y2;

851                 s0 = s_h0 * s0;
852                 s1 = s_h1 * s1;
```



```
853                 s2 = s_h2 * s2;

855                 /* perform 2 ** ((si+ydi)/256) */
856                 if ( s0 > HTHRESH )
857                 {
858                         s0 = HTHRESH;
859                         yd0 = DZERO;
860                 }
861                 if ( s1 > HTHRESH )
862                 {
863                         s1 = HTHRESH;
864                         yd1 = DZERO;
865                 }
866                 if ( s2 > HTHRESH )
867                 {
868                         s2 = HTHRESH;
869                         yd2 = DZERO;
870                 }

872                 if ( s0 < LTHRESH )
873                 {
874                         s0 = LTHRESH;
875                         yd0 = DZERO;
876                 }
877                 ind0 = (int) (s0 + yd0);
878                 if ( s1 < LTHRESH )
879                 {
880                         s1 = LTHRESH;
881                         yd1 = DZERO;
882                 }
883                 ind1 = (int) (s1 + yd1);
884                 if ( s2 < LTHRESH )
885                 {
886                         s2 = LTHRESH;
887                         yd2 = DZERO;
888                 }
889                 ind2 = (int) (s2 + yd2);

891                 i0 = (ind0 & 0xff) << 4;
892                 u0 = (double) ind0;
893                 ind0 >>= 8;

895                 i1 = (ind1 & 0xff) << 4;
896                 u1 = (double)ind1;
897                 ind1 >>= 8;

899                 i2 = (ind2 & 0xff) << 4;
900                 u2 = (double) ind2;
901                 ind2 >>= 8;

903                 y0 = s0 - u0 + yd0;
904                 y1 = s1 - u1 + yd1;
905                 y2 = s2 - u2 + yd2;

907                 u0 = *(double*)((char*)__TBL_exp2 + i0);
908                 y0 = ((((KB5 * y0 + KB4) * y0 + KB3) * y0 + KB2) * y0 + KB1) * y
909                 u1 = *(double*)((char*)__TBL_exp2 + i1);
910                 y1 = ((((KB5 * y1 + KB4) * y1 + KB3) * y1 + KB2) * y1 + KB1) * y
911                 u2 = *(double*)((char*)__TBL_exp2 + i2);
912                 y2 = ((((KB5 * y2 + KB4) * y2 + KB3) * y2 + KB2) * y2 + KB1) * y

914                 eflag0 = (ind0 + 1021) >> 31;
915                 gflag0 = (1022 - ind0) >> 31;
916                 eflag1 = (ind1 + 1021) >> 31;
917                 gflag1 = (1022 - ind1) >> 31;
918                 eflag2 = (ind2 + 1021) >> 31;
```

```
                gflag2 = (1022 - ind2) >> 31;

                ind0 = (yisint0 << 11) + ind0 + (54 & eflag0) - (52 & gflag0);
                ind0 <<= 20;
                ind1 = (yisint1 << 11) + ind1 + (54 & eflag1) - (52 & gflag1);
                ind1 <<= 20;
                ind2 = (yisint2 << 11) + ind2 + (54 & eflag2) - (52 & gflag2);
                ind2 <<= 20;

                u0 = *(double*)((char*)__TBL_exp2 + i0 + 8) + u0 * y0 + u0;
                u1 = *(double*)((char*)__TBL_exp2 + i1 + 8) + u1 * y1 + u1;
                u2 = *(double*)((char*)__TBL_exp2 + i2 + 8) + u2 * y2 + u2;

                ull_x0 = *(unsigned long long*)&u0;
                HI(&ull_x0) += ind0;
                u0 = *(double*)&ull_x0;

                ull_x1 = *(unsigned long long*)&u1;
                HI(&ull_x1) += ind1;
                u1 = *(double*)&ull_x1;

                ull_x2 = *(unsigned long long*)&u2;
                HI(&ull_x2) += ind2;
                u2 = *(double*)&ull_x2;

                *pz0 = u0 * SCALE_ARR[eflag0 - gflag0];
                *pz1 = u1 * SCALE_ARR[eflag1 - gflag1];
                *pz2 = u2 * SCALE_ARR[eflag2 - gflag2];

                px += stridex;
                py += stridey;
                pz += stridez;
                i = 0;

        } while ( --n > 0 );

        if ( i > 0 )
        {
                /* perform si + ydi = 256*log2(xi)*yi */
                u0 = x0 - ax0;
                s0 = u0 * yd0;
                LO(&ux0) = 0;
                y0 = s0 * s0;
                s_h0 = s0;
                LO(&s_h0) = 0;
                s0 = (KA5 * y0 + KA3) * y0 * s0;
                s_l0 = (x0 - (ux0 - ax0));
                s_l0 = u0 - s_h0 * ux0 - s_h0 * s_l0;
                s_l0 = KA1 * yd0 * s_l0;
                i0 = (hx0 >> 8) & 0xff0;
                exp0 += (hx0 >> 20);
                yd0 = KA1_HI * s_h0;
                y0 = *(double *)((char*)__TBL_log2 + i0);
                y0 += (double)(exp0 << 8);
                m_h0 = y0 + yd0;
                y0 = s0 - ((m_h0 - y0 - yd0) - s_l0);
                y0 += *(double *)((char*)__TBL_log2 + i0 + 8) + KA1_LO * s_h0;
                s_h0 = y0 + m_h0;
                LO(&s_h0) = 0;
                y0 = y0 - (s_h0 - m_h0);
                s0 = yd0 = *py0;
                LO(&s0) = 0;
                yd0 = (yd0 - s0) * s_h0 + yd0 * y0;
                s0 = s_h0 * s0;

                /* perform 2 ** ((si+ydi)/256) */
```



```
                if ( s0 > HTHRESH )
                {
                        s0 = HTHRESH;
                        yd0 = DZERO;
                }
                if ( s0 < LTHRESH )
                {
                        s0 = LTHRESH;
                        yd0 = DZERO;
                }
                ind0 = (int) (s0 + yd0);
                i0 = (ind0 & 0xff) << 4;
                u0 = (double) ind0;
                ind0 >>= 8;
                y0 = s0 - u0 + yd0;
                u0 = *(double*)((char*)__TBL_exp2 + i0);
                y0 = ((((KB5 * y0 + KB4) * y0 + KB3) * y0 + KB2) * y0 + KB1) * y
                eflag0 = (ind0 + 1021) >> 31;
                gflag0 = (1022 - ind0) >> 31;
                u0 = *(double*)((char*)__TBL_exp2 + i0 + 8) + u0 * y0 + u0;
                ind0 = (yisint0 << 11) + ind0 + (54 & eflag0) - (52 & gflag0);
                ind0 <<= 20;
                ull_x0 = *(unsigned long long*)&u0;
                HI(&ull_x0) += ind0;
                u0 = *(double*)&ull_x0;

                *pz0 = u0 * SCALE_ARR[eflag0 - gflag0];

                if ( i > 1 )
                {
                        /* perform si + ydi = 256*log2(xi)*yi */
                        u0 = x1 - ax1;
                        s0 = u0 * yd1;
                        LO(&ux1) = 0;
                        y0 = s0 * s0;
                        s_h0 = s0;
                        LO(&s_h0) = 0;
                        s0 = (KA5 * y0 + KA3) * y0 * s0;
                        s_l0 = (x1 - (ux1 - ax1));
                        s_l0 = u0 - s_h0 * ux1 - s_h0 * s_l0;
                        s_l0 = KA1 * yd1 * s_l0;
                        i0 = (hx1 >> 8) & 0xff0;
                        exp1 += (hx1 >> 20);
                        yd0 = KA1_HI * s_h0;
                        y0 = *(double *)((char*)__TBL_log2 + i0);
                        y0 += (double)(exp1 << 8);
                        m_h0 = y0 + yd0;
                        y0 = s0 - ((m_h0 - y0 - yd0) - s_l0);
                        y0 += *(double *)((char*)__TBL_log2 + i0 + 8) + KA1_LO *
                        s_h0 = y0 + m_h0;
                        LO(&s_h0) = 0;
                        y0 = y0 - (s_h0 - m_h0);
                        s0 = yd0 = *py1;
                        LO(&s0) = 0;
                        yd0 = (yd0 - s0) * s_h0 + yd0 * y0;
                        s0 = s_h0 * s0;
                        /* perform 2 ** ((si+ydi)/256) */
                        if ( s0 > HTHRESH )
                        {
                                s0 = HTHRESH;
                                yd0 = DZERO;
                        }
                        if ( s0 < LTHRESH )
                        {
                                s0 = LTHRESH;
                                yd0 = DZERO;
```

```
                        }
                        ind0 = (int) (s0 + yd0);
                        i0 = (ind0 & 0xff) << 4;
                        u0 = (double) ind0;
                        ind0 >>= 8;
                        y0 = s0 - u0 + yd0;
                        u0 = *(double*)((char*)__TBL_exp2 + i0);
                        y0 = ((((KB5 * y0 + KB4) * y0 + KB3) * y0 + KB2) * y0 +
                        eflag0 = (ind0 + 1021) >> 31;
                        gflag0 = (1022 - ind0) >> 31;
                        u0 = *(double*)((char*)__TBL_exp2 + i0 + 8) + u0 * y0 +
                        ind0 = (yisint1 << 11) + ind0 + (54 & eflag0) - (52 & gf
                        ind0 <<= 20;
                        ull_x0 = *(unsigned long long*)&u0;
                        HI(&ull_x0) += ind0;
                        u0 = *(double*)&ull_x0;
                        *pz1 = u0 * SCALE_ARR[eflag0 - gflag0];
                }
        }
}

#undef RET_SC
#define RET_SC(I)                                                       \
        py += stridey;                                                  \
        pz += stridez;                                                  \
        if ( --n <= 0 )                                                 \
                break;                                                  \
        goto start##I;

#define PREP_X(I)                                                       \
hy = HI(py);                                            \
ly = LO(py);                                            \
sy = hy >> 31;                                                  \
hy &= 0x7fffffff;                                               \
py##I = py;                                                     \
                                                                \
if ( hy < 0x3bf00000 )          /* |Y| < 2^(-64) */             \
        RETURN (I, DONE)                                        \
pz##I = pz;                                                     \
if ( hy >= 0x43e00000 )         /* |Y|>2^63,Inf,Nan */          \
{                                                               \
        if ( hy >= 0x7ff00000 )         /* |Y|=Inf,Nan */       \
        {                                                       \
                if ( hy == 0x7ff00000 && ly == 0 )      /* |Y|=Inf */   \
                {                                               \
                        if ( (hx < 0x3ff00000) != sy )          \
                                *pz = DZERO;                    \
                        else                                    \
                        {                                       \
                                HI(pz) = hy;                    \
                                LO(pz) = ly;                    \
                        }                                       \
                }                                               \
                else                                            \
                        *pz = *px + *py;        /* |Y|=Nan */  \
        }                                                       \
        else    /* |Y|>2^63 */                                  \
        {                                                       \
                y0 = ( (hx < 0x3ff00000) != sy ) ? _TINY : _HUGE;        \
                *pz = y0 * y0;                                  \
        }                                                       \
        RET_SC(I)                                               \
}                                                               \

#define LMMANT  ((unsigned long long*)LCONST)[4]        /* 0x000fffffffffffff
#define LMROUND ((unsigned long long*)LCONST)[5]        /* 0x0000080000000000
```



```
#define LMHI20  ((unsigned long long*)LCONST)[6]        /* 0xfffff00000000000
#define MMANT   ((double*)LCONST)[4]                    /* 0x000fffffffffffff
#define MROUND  ((double*)LCONST)[5]                    /* 0x0000080000000000
#define MHI20   ((double*)LCONST)[6]                    /* 0xfffff00000000000
#define KA5     ((double*)LCONST)[8]                    /* 5.7707860486089373798
#define KA3     ((double*)LCONST)[9]                    /* 9.6179669392576554942
#define KA1_LO  ((double*)LCONST)[10]                   /* 1.4105215426814730956
#define KA1_HI  ((double*)LCONST)[11]                   /* 2.8853759765625e+00*2
#define KA1     ((double*)LCONST)[12]                   /* 2.885390081777926774e


static void
__vpowx( int n, double * restrict px, double * restrict py,
        int stridey, double * restrict pz, int stridez )
{
        double                  *py0, *py1 = 0, *py2;
        double                  *pz0, *pz1 = 0, *pz2;
        double                  ux0, y0, yd0, u0, s0;
        double                  y1, yd1, u1, s1;
        double                  y2, yd2, u2, s2;
        double                  yr, s_h0, s_l0, m_h0, x0, ax0;
        unsigned long long      ull_y0, ull_x0, ull_x1, ull_x2, ull_ax0;
        int                     eflag0, gflag0, ind0, i0, exp0;
        int                     eflag1, gflag1, ind1, i1;
        int                     eflag2, gflag2, ind2, i2;
        int                     i = 0;
        unsigned                hx, hx0, hy, ly, sy;
        double                  DONE = ((double*)LCONST)[1];
        unsigned long long      LDONE = ((unsigned long long*)LCONST)[1];
        double                  DZERO = ((double*)LCONST)[7];
        double                  HTHRESH = ((double*)LCONST)[13];
        double                  LTHRESH = ((double*)LCONST)[14];
        double                  KB5 = ((double*)LCONST)[15];
        double                  KB4 = ((double*)LCONST)[16];
        double                  KB3 = ((double*)LCONST)[17];
        double                  KB2 = ((double*)LCONST)[18];
        double                  KB1 = ((double*)LCONST)[19];

        /* perform s_h + yr = 256*log2(x) */
        ull_y0 = *(unsigned long long*)px;
        hx = HI(px);
        ull_x0 = (ull_y0 & LMMANT) | LDONE;
        x0 = *(double*)&ull_x0;
        exp0 = (hx >> 20) - 2046;
        ull_ax0 = ull_x0 + (LMROUND & LMHI20);
        ax0 = *(double*)&ull_ax0;
        hx0 = HI(&ax0);
        ux0 = x0 + ax0;
        yd0 = DONE / ux0;
        u0 = x0 - ax0;
        s0 = u0 * yd0;
        LO(&ux0) = 0;
        y0 = s0 * s0;
        s_h0 = s0;
        LO(&s_h0) = 0;
        s0 = (KA5 * y0 + KA3) * y0 * s0;
        s_l0 = (x0 - (ux0 - ax0));
        s_l0 = u0 - s_h0 * ux0 - s_h0 * s_l0;
        s_l0 = KA1 * yd0 * s_l0;
        i0 = (hx0 >> 8) & 0xff0;
        exp0 += (hx0 >> 20);
        yd0 = KA1_HI * s_h0;
        y0 = *(double *)((char*)__TBL_log2 + i0);
        y0 += (double)(exp0 << 8);
        m_h0 = y0 + yd0;
        y0 = s0 - ((m_h0 - y0 - yd0) - s_l0);
```

```
1183         y0 += *(double *)((char*)__TBL_log2 + i0 + 8) + KA1_LO * s_h0;
1184         s_h0 = y0 + m_h0;
1185         LO(&s_h0) = 0;
1186         yr = y0 - (s_h0 - m_h0);

1188         do
1189         {
1190         /* perform 2 ** ((s_h0+yr)*yi/256) */
1191 start0:
1192                 PREP_X(0)
1193                 py += stridey;
1194                 pz += stridez;
1195                 i = 1;
1196                 if ( --n <= 0 )
1197                         break;

1199 start1:
1200                 PREP_X(1)
1201                 py += stridey;
1202                 pz += stridez;
1203                 i = 2;
1204                 if ( --n <= 0 )
1205                         break;

1207 start2:
1208                 PREP_X(2)

1210                 s0 = yd0 = *py0;
1211                 s1 = yd1 = *py1;
1212                 s2 = yd2 = *py2;

1214                 LO(&s0) = 0;
1215                 LO(&s1) = 0;
1216                 LO(&s2) = 0;

1218                 yd0 = (yd0 - s0) * s_h0 + yd0 * yr;
1219                 yd1 = (yd1 - s1) * s_h0 + yd1 * yr;
1220                 yd2 = (yd2 - s2) * s_h0 + yd2 * yr;

1222                 s0 = s_h0 * s0;
1223                 s1 = s_h0 * s1;
1224                 s2 = s_h0 * s2;

1226                 if ( s0 > HTHRESH )
1227                 {
1228                         s0 = HTHRESH;
1229                         yd0 = DZERO;
1230                 }
1231                 if ( s1 > HTHRESH )
1232                 {
1233                         s1 = HTHRESH;
1234                         yd1 = DZERO;
1235                 }
1236                 if ( s2 > HTHRESH )
1237                 {
1238                         s2 = HTHRESH;
1239                         yd2 = DZERO;
1240                 }

1242                 if ( s0 < LTHRESH )
1243                 {
1244                         s0 = LTHRESH;
1245                         yd0 = DZERO;
1246                 }
1247                 ind0 = (int) (s0 + yd0);
1248                 if ( s1 < LTHRESH )
```



```
1249                 {
1250                         s1 = LTHRESH;
1251                         yd1 = DZERO;
1252                 }
1253                 ind1 = (int) (s1 + yd1);
1254                 if ( s2 < LTHRESH )
1255                 {
1256                         s2 = LTHRESH;
1257                         yd2 = DZERO;
1258                 }
1259                 ind2 = (int) (s2 + yd2);

1261                 i0 = (ind0 & 0xff) << 4;
1262                 u0 = (double) ind0;
1263                 ind0 >>= 8;

1265                 i1 = (ind1 & 0xff) << 4;
1266                 u1 = (double) ind1;
1267                 ind1 >>= 8;

1269                 i2 = (ind2 & 0xff) << 4;
1270                 u2 = (double) ind2;
1271                 ind2 >>= 8;

1273                 y0 = s0 - u0 + yd0;
1274                 y1 = s1 - u1 + yd1;
1275                 y2 = s2 - u2 + yd2;

1277                 u0 = *(double*)((char*)__TBL_exp2 + i0);
1278                 y0 = ((((KB5 * y0 + KB4) * y0 + KB3) * y0 + KB2) * y0 + KB1) * y
1279                 u1 = *(double*)((char*)__TBL_exp2 + i1);
1280                 y1 = ((((KB5 * y1 + KB4) * y1 + KB3) * y1 + KB2) * y1 + KB1) * y
1281                 u2 = *(double*)((char*)__TBL_exp2 + i2);
1282                 y2 = ((((KB5 * y2 + KB4) * y2 + KB3) * y2 + KB2) * y2 + KB1) * y

1284                 eflag0 = (ind0 + 1021) >> 31;
1285                 gflag0 = (1022 - ind0) >> 31;
1286                 eflag1 = (ind1 + 1021) >> 31;
1287                 gflag1 = (1022 - ind1) >> 31;
1288                 eflag2 = (ind2 + 1021) >> 31;
1289                 gflag2 = (1022 - ind2) >> 31;

1291                 u0 = *(double*)((char*)__TBL_exp2 + i0 + 8) + u0 * y0 + u0;
1292                 ind0 = ind0 + (54 & eflag0) - (52 & gflag0);
1293                 ind0 <<= 20;
1294                 ull_x0 = *(unsigned long long*)&u0;
1295                 HI(&ull_x0) += ind0;
1296                 u0 = *(double*)&ull_x0;

1298                 u1 = *(double*)((char*)__TBL_exp2 + i1 + 8) + u1 * y1 + u1;
1299                 ind1 = ind1 + (54 & eflag1) - (52 & gflag1);
1300                 ind1 <<= 20;
1301                 ull_x1 = *(unsigned long long*)&u1;
1302                 HI(&ull_x1) += ind1;
1303                 u1 = *(double*)&ull_x1;

1305                 u2 = *(double*)((char*)__TBL_exp2 + i2 + 8) + u2 * y2 + u2;
1306                 ind2 = ind2 + (54 & eflag2) - (52 & gflag2);
1307                 ind2 <<= 20;
1308                 ull_x2 = *(unsigned long long*)&u2;
1309                 HI(&ull_x2) += ind2;
1310                 u2 = *(double*)&ull_x2;

1312                 *pz0 = u0 * SCALE_ARR[eflag0 - gflag0];
1313                 *pz1 = u1 * SCALE_ARR[eflag1 - gflag1];
1314                 *pz2 = u2 * SCALE_ARR[eflag2 - gflag2];
```

```
1316                py += stridey;
1317                pz += stridez;
1318                i = 0;

1320        } while ( --n > 0 );

1322        if ( i > 0 )
1323        {
1324                /* perform 2 ** ((s_h0+yr)*yi/256) */
1325                s0 = y0 = *py0;
1326                LO(&s0) = 0;
1327                yd0 = (y0 - s0) * s_h0 + y0 * yr;
1328                s0 = s_h0 * s0;
1329                if ( s0 > HTHRESH )
1330                {
1331                        s0 = HTHRESH;
1332                        yd0 = DZERO;
1333                }
1334                if ( s0 < LTHRESH )
1335                {
1336                        s0 = LTHRESH;
1337                        yd0 = DZERO;
1338                }
1339                ind0 = (int) (s0 + yd0);
1340                i0 = (ind0 & 0xff) << 4;
1341                u0 = (double) ind0;
1342                ind0 >>= 8;
1343                y0 = s0 - u0 + yd0;
1344                u0 = *(double*)((char*)__TBL_exp2 + i0);
1345                y0 = ((((KB5 * y0 + KB4) * y0 + KB3) * y0 + KB2) * y0 + KB1) * y
1346                eflag0 = (ind0 + 1021) >> 31;
1347                gflag0 = (1022 - ind0) >> 31;
1348                u0 = *(double*)((char*)__TBL_exp2 + i0 + 8) + u0 * y0 + u0;
1349                ind0 = ind0 + (54 & eflag0) - (52 & gflag0);
1350                ind0 <<= 20;
1351                ull_x0 = *(unsigned long long*)&u0;
1352                HI(&ull_x0) += ind0;
1353                u0 = *(double*)&ull_x0;
1354                *pz0 = u0 * SCALE_ARR[eflag0 - gflag0];

1356                if ( i > 1 )
1357                {
1358                        /* perform 2 ** ((s_h0+yr)*yi/256) */
1359                        s0 = y0 = *py1;
1360                        LO(&s0) = 0;
1361                        yd0 = (y0 - s0) * s_h0 + y0 * yr;
1362                        s0 = s_h0 * s0;
1363                        if ( s0 > HTHRESH )
1364                        {
1365                                s0 = HTHRESH;
1366                                yd0 = DZERO;
1367                        }
1368                        if ( s0 < LTHRESH )
1369                        {
1370                                s0 = LTHRESH;
1371                                yd0 = DZERO;
1372                        }
1373                        ind0 = (int) (s0 + yd0);
1374                        i0 = (ind0 & 0xff) << 4;
1375                        u0 = (double) ind0;
1376                        ind0 >>= 8;
1377                        y0 = s0 - u0 + yd0;
1378                        u0 = *(double*)((char*)__TBL_exp2 + i0);
1379                        y0 = ((((KB5 * y0 + KB4) * y0 + KB3) * y0 + KB2) * y0 +
1380                        eflag0 = (ind0 + 1021) >> 31;
```



```
1381                        gflag0 = (1022 - ind0) >> 31;
1382                        u0 = *(double*)((char*)__TBL_exp2 + i0 + 8) + u0 * y0 +
1383                        ind0 = ind0 + (54 & eflag0) - (52 & gflag0);
1384                        ind0 <<= 20;
1385                        ull_x0 = *(unsigned long long*)&u0;
1386                        HI(&ull_x0) += ind0;
1387                        u0 = *(double*)&ull_x0;
1388                        *pz1 = u0 * SCALE_ARR[eflag0 - gflag0];
1389                }
1390        }
1391 }
```

```
**********************************************************
   35340 Sat May 10 12:09:52 2014
new/usr/src/lib/libmvec/common/__vpowf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/* float powf(float x, float y)
 *
 * Method :
 *      1. Special cases:
 *      for (anything) ** 0                                     => 1
 *              for (anything) ** NaN                           => QNaN + invali
 *              for NaN ** (anything)                           => QNaN + invali
 *              for +-1 ** +-Inf                                => QNaN + invali
 *              for +-(|x| < 1) ** +Inf                         => +0
 *              for +-(|x| < 1) ** -Inf                         => +Inf
 *              for +-(|x| > 1) ** +Inf                         => +Inf
 *              for +-(|x| > 1) ** -Inf                         => +0
 *              for +Inf ** (negative)                          => +0
 *              for +Inf ** (positive)                          => +Inf
 *              for -Inf ** (negative except odd integer)       => +0
 *              for -Inf ** (negative odd integer)              => -0
 *              for -Inf ** (positive except odd integer)       => +Inf
 *              for -Inf ** (positive odd integer)              => -Inf
 *              for (negative) ** (non-integer)                 => QNaN + invali
 *              for +0 ** (negative)                            => +Inf + overfl
 *              for +0 ** (positive)                            => +0
 *              for -0 ** (negative except odd integer)         => +Inf + overfl
 *              for -0 ** (negative odd integer)                => -Inf + overfl
 *              for -0 ** (positive except odd integer)         => +0
 *              for -0 ** (positive odd integer)                => -0
 *      2. Computes x**y from:
```



```
 *              x**y = 2**(y*log2(x)) = 2**(w/256), where w = 256*log2(|x|)*y.
 *      3. Computes w = 256 * log2(|x|) * y from
 *              |x| = m * 2**n => log2(|x|) = n + log2(m).
 *      Let m = m0 + dm, where m0 = 1 + k / 128,
 *              k = [0, 128],
 *              dm = [-1/256, 1/256].
 *      Then 256*log2(m) = 256*log2(m0 + dm) = 256*log2(m0) + 256*log2(1+z),
 *              where z = dm*(1/m0), z = [-1/258, 1/256].
 *      Then
 *              1/m0 is looked up in a table of 1, 1/(1+1/128), ..., 1/(1+128/12
 *              256*log2(m0) is looked up in a table of 256*log2(1), 256*log2(1+
 *                      ..., 256*log2(1+128/128).
 *              256*log2(1+z) is computed using approximation:
 *                      256*log2(1+z) = (((a3*z + a2)*z + a1)*z + a0)*z.
 *      3. For w >= 32768
 *              then for (negative) ** (odd integer)            => -Inf + overfl
 *              else                                            => +Inf + overfl
 *      For w <= -38400
 *              then for (negative) ** (odd integer)            => -0 + underflo
 *              else                                            => +0 + underflo
 *      4. Computes 2 ** (w/256) from:
 *              2 ** (w/256) = 2**a  *  2**(k/256)  *  2**(r/256)
 *      Where:
 *              a    =    int  ( w ) >> 8;
 *              k    =    int  ( w ) & 0xFF;
 *              r    =    frac ( w ).
 *      Note that:
 *              k = 0, 1, ..., 255;
 *              r = (-1, 1).
 *      Then:
 *              2**(k/256) is looked up in a table of 2**0, 2**1/256, ...
 *              2**(r/256) is computed using approximation:
 *                      2**(r/256) =  a0 + a1 * r + a2 * r**2
 *              Multiplication by 2**a is done by adding "a" to
 *              the biased exponent.
 *      5. For (negative) ** (odd integer)      => -(2**(w/256))
 *      otherwise                               =>   2**(w/256)
 *
 * Accuracy:
 *      Max. relative aproximation error < 2**(-37.35) for 256*log2(1+z).
 *      Max. relative aproximation error < 2**(-29.18) for 2**(r/256).
 *      All calculations are done in double precision.
 *      Maximum error observed: less than 0.528 ulp after 700.000.000
 *      results.
 */

static void __vpowfx( int n, float * restrict px, float * restrict py,
        int stridey, float * restrict pz, int stridez );

static void __vpowf_n( int n, float * restrict px, int stridex, float * restrict
        int stridey, float * restrict pz, int stridez );

static void __vpowfx_n( int n, double yy, float * restrict py,
        int stridey, float * restrict pz, int stridez );

#pragma no_inline(__vpowfx)
#pragma no_inline(__vpowf_n)
#pragma no_inline(__vpowfx_n)

static const double __TBL_exp2f[] = {
        /* 2^(i/256), i = [0, 255] */
1.0000000000000000e+00, 1.0027112750502025 22e+00, 1.0054299011128027 26e+00,
1.0081558981184175 48e+00, 1.0108892860517004 75e+00, 1.0136300849514894 30e+00,
1.0163783149109530 96e+00, 1.0191339960777379 14e+00, 1.0218971486541166 27e+00,
1.0246677928971357 21e+00, 1.0274459491187637 46e+00, 1.0302316376860409 80e+00,
1.0330248790212284 15e+00, 1.0358256936019571 98e+00, 1.0386341019613787 31e+00,
```

```
1.041450124688316103e+00, 1.044273782427413755e+00, 1.047105095879289793e+00,
1.049944085800687210e+00, 1.052790773004626423e+00, 1.055645178360557157e+00,
1.058507322794512762e+00, 1.061377227289262093e+00, 1.064254912884464499e+00,
1.067140400676823697e+00, 1.070033711820241873e+00, 1.072934867525975555e+00,
1.075843889062791048e+00, 1.078760797757119860e+00, 1.081685614993215250e+00,
1.084618362213309206e+00, 1.087559060917769660e+00, 1.090507732665257690e+00,
1.093464399072885840e+00, 1.096429081816376883e+00, 1.099401802630221914e+00,
1.102382583307840891e+00, 1.105371445701741173e+00, 1.108368411723678726e+00,
1.111373503344817548e+00, 1.114386742595892432e+00, 1.117408151567369279e+00,
1.120437752409606746e+00, 1.123475567333019898e+00, 1.126521618608241848e+00,
1.129575928566288079e+00, 1.132638519598719196e+00, 1.135709414157805464e+00,
1.138788634756691565e+00, 1.141876203969561576e+00, 1.144972144431804173e+00,
1.148076478840178938e+00, 1.151189229952982673e+00, 1.154310420590215935e+00,
1.157440073633751121e+00, 1.160578212027498779e+00, 1.163724858777577476e+00,
1.166880036952481658e+00, 1.170043769683250190e+00, 1.173216080163637320e+00,
1.176396991650281221e+00, 1.179586527462875845e+00, 1.182784710984341014e+00,
1.185991565660993841e+00, 1.189207115002721027e+00, 1.192431382583151178e+00,
1.195664392039827328e+00, 1.198906167074380580e+00, 1.202156731452703076e+00,
1.205416109005123859e+00, 1.208684323626581625e+00, 1.211961399276801243e+00,
1.215247359980468955e+00, 1.218542229827408452e+00, 1.221846032972757623e+00,
1.225158793637145527e+00, 1.228480536106870025e+00, 1.231811284734075862e+00,
1.235151063936933413e+00, 1.238499898199816540e+00, 1.241857812073484002e+00,
1.245224830175257980e+00, 1.248600977189204819e+00, 1.251986277866316222e+00,
1.255380757024691096e+00, 1.258784439549716527e+00, 1.262197350394250739e+00,
1.265619514578806282e+00, 1.269050957191733220e+00, 1.272491703389402762e+00,
1.275941778396392001e+00, 1.279401207505669325e+00, 1.282870016078778264e+00,
1.286348229546025568e+00, 1.289835873406665723e+00, 1.293332973229089466e+00,
1.296839554651009641e+00, 1.300355643379650594e+00, 1.303881265191935812e+00,
1.307416445934677318e+00, 1.310961211524764414e+00, 1.314515587949354636e+00,
1.318079601266064049e+00, 1.321653277603157539e+00, 1.325236643159741323e+00,
1.328829724205954355e+00, 1.332432547083161500e+00, 1.336045138204145832e+00,
1.339667524053302916e+00, 1.343299731186835322e+00, 1.346941786232945804e+00,
1.350593715892034474e+00, 1.354255546936892651e+00, 1.357927306212901142e+00,
1.361609020638224754e+00, 1.365300717204011915e+00, 1.369002422974590516e+00,
1.372714165087668414e+00, 1.376435970754530169e+00, 1.380167867260237990e+00,
1.383909881963832023e+00, 1.387662042298529075e+00, 1.391424375771926236e+00,
1.395196909966200272e+00, 1.398979672538311236e+00, 1.402772691220204759e+00,
1.406575993819015435e+00, 1.410389608217270663e+00, 1.414213562373095145e+00,
1.418047884320415175e+00, 1.421892602169165576e+00, 1.425747744105494208e+00,
1.429613338391970023e+00, 1.433489413367788901e+00, 1.437375997448982368e+00,
1.441273119128625657e+00, 1.445180806977046650e+00, 1.449099089642035043e+00,
1.453027995849052623e+00, 1.456967554401443765e+00, 1.460917794180647045e+00,
1.464878744146405731e+00, 1.468850433336981842e+00, 1.472832890869367528e+00,
1.476826145939499346e+00, 1.480830227822471867e+00, 1.484845165872752393e+00,
1.488870989524397004e+00, 1.492907728291264835e+00, 1.496955411767235455e+00,
1.501014069626425584e+00, 1.505083731623406473e+00, 1.509164427593422841e+00,
1.513256187452609813e+00, 1.517359041198214742e+00, 1.521473018908814590e+00,
1.525598150744538417e+00, 1.529734466947286986e+00, 1.533881997840955913e+00,
1.538040773831656827e+00, 1.542210825407940744e+00, 1.546392183141021448e+00,
1.550584877684999974e+00, 1.554788939777088652e+00, 1.559004400237836929e+00,
1.563231289971357629e+00, 1.567469639965552997e+00, 1.571719481292341403e+00,
1.575980845107886497e+00, 1.580253762652824578e+00, 1.584538265252493749e+00,
1.588834384317163950e+00, 1.593142151342266999e+00, 1.597461597908627073e+00,
1.601792755682693414e+00, 1.606135656416771029e+00, 1.610490331949254283e+00,
1.614856814204860713e+00, 1.619235135194863728e+00, 1.623625327017328868e+00,
1.628027421857347834e+00, 1.632441451987274972e+00, 1.636867449766964411e+00,
1.641305447644006321e+00, 1.645755478153964946e+00, 1.650217573920617742e+00,
1.654691767656194301e+00, 1.659178092161616158e+00, 1.663676580326736376e+00,
1.668187265130582464e+00, 1.672710179641596628e+00, 1.677245357017878469e+00,
1.681792830507429004e+00, 1.686352633448393368e+00, 1.690924799269305279e+00,
1.695509361489332623e+00, 1.700106353718523478e+00, 1.704715809658051251e+00,
1.709337763100462926e+00, 1.713972247929925974e+00, 1.718619298122477934e+00,
1.723278947746273992e+00, 1.727951230961837670e+00, 1.732636182022311067e+00,
1.737333835273706217e+00, 1.742044225155156445e+00, 1.746767386199169048e+00,
1.751503353031878207e+00, 1.756252160373299454e+00, 1.761013843037583904e+00,
1.765788435933272726e+00, 1.770575974063554714e+00, 1.775376492526521188e+00,
```



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1.780190026515424462e+00, 1.785016611318934965e+00, 1.789856282321401038e+00,
1.794709075003107168e+00, 1.799575024940535117e+00, 1.804454167806623932e+00,
1.809346539371031959e+00, 1.814252175500398856e+00, 1.819171112158608494e+00,
1.824103385407053413e+00, 1.829049031404897274e+00, 1.834008086409342431e+00,
1.838980586775893711e+00, 1.843966568958625984e+00, 1.848966069510450838e+00,
1.853979125083385471e+00, 1.859005772428820480e+00, 1.864046048397788979e+00,
1.869099989941238604e+00, 1.874167634110299963e+00, 1.879249018056560194e+00,
1.884344179032334532e+00, 1.889453154390939194e+00, 1.894575981586965607e+00,
1.899712698176555303e+00, 1.904863341817674138e+00, 1.910027950270389852e+00,
1.915206561397147400e+00, 1.920399213163047403e+00, 1.925605943636125028e+00,
1.930826790987627106e+00, 1.936061793492294347e+00, 1.941310989528640452e+00,
1.946574417579233218e+00, 1.951852116230978318e+00, 1.957144124175400179e+00,
1.962450480208927317e+00, 1.967771223233175881e+00, 1.973106392255234320e+00,
1.978456026387950928e+00, 1.983820164850219392e+00, 1.989198846967266343e+00,
1.994592112170940235e+00
};

static const double __TBL_log2f[] = {
        /* __TBL_log2f[2*i] = 256*log2(1+i/128), i = [0, 128] */
        /* __TBL_log2f[2*i+1] = 2**(-23)/(1+i/128), i = [0, 128] */
0.000000000000000000e+00, 1.192092895507812500e-07, 2.814772388353054585e+00,
1.182851865310077503e-07, 5.726160135284354524e+00, 1.173753004807692373e-07,
8.556288393587271557e+00, 1.164793058206106825e-07, 1.136489455576407970e+01,
1.155968868371212153e-07, 1.415230348830453799e+01, 1.147277373120300688e-07,
1.691883275718974389e+01, 1.138715601679104456e-07, 1.966479284501270897e+01,
1.130280671296296339e-07, 2.239048736008688678e+01, 1.121969784007352926e-07,
2.509621323789484038e+01, 1.113780223540145949e-07, 2.778226093521127638e+01,
1.105709352355072477e-07, 3.044891461721790193e+01, 1.097754608812949697e-07,
3.309645233791141550e+01, 1.089913504464285680e-07, 3.572514621409114710e+01,
1.082183621453900683e-07, 3.833526259319860685e+01, 1.074562610035211292e-07,
4.092706221526768928e+01, 1.067048186188111188e-07, 4.350080036923196758e+01,
1.059638129340277719e-07, 4.605672704382322280e+01, 1.052330280172413778e-07,
4.859508707328441091e+01, 1.045122538527397202e-07, 5.111612027810928538e+01,
1.038012861394557784e-07, 5.362006160101114460e+01, 1.030999260979729787e-07,
5.610714123831336053e+01, 1.024079802852348971e-07, 5.857758476694550609e+01,
1.017252604166666732e-07, 6.103161326722020164e+01, 1.010515831953642383e-07,
6.346944344155788542e+01, 1.003867701480263102e-07, 6.589128772931884725e+01,
9.973064746732026447e-08, 6.829735441789475203e+01, 9.908304586038961692e-08,
7.068784775020480993e+01, 9.844380040322580637e-08, 7.306296802873558249e+01,
9.781275040064102225e-08, 7.542291716256507484e+01, 9.718973925159236158e-08,
7.776787153333835079e+01, 9.657461431962025166e-08, 8.009803655279496581e+01,
9.596722680817610579e-08, 8.241359229116476115e+01, 9.536743164062500529e-08,
8.471472079734193983e+01, 9.477508734720490448e-08, 8.700160073846393516e+01,
9.419005594135801946e-08, 8.927440748315585495e+01, 9.361220283742331508e-08,
9.153331318222942059e+01, 9.304139672256097884e-08, 9.377848684692884262e+01,
9.247750946969696962e-08, 9.601009442481273481e+01, 9.192041603915663129e-08,
9.822829887335737453e+01, 9.136999438622755046e-08, 1.004332602313626381e+02,
9.082612537202380448e-08, 1.026251356882391832e+02, 9.028869267751479078e-08,
1.048407965125165550e+02, 8.975758272058823405e-08, 1.069702438107898530e+02,
8.923268457602338686e-08, 1.091237772037370775e+02, 8.871388989825581272e-08,
1.112648262750015107e+02, 8.820109284682080489e-08, 1.133935349372744383e+02,
8.769419001436718487e-08, 1.155100446290761766e+02, 8.719308035714285707e-08,
1.176144943711480977e+02, 8.669766512784091150e-08, 1.197070208212473403e+02,
8.620784781073446298e-08, 1.217877583273978246e+02, 8.572353405898876167e-08,
1.238568389796496376e+02, 8.524463163407821503e-08, 1.259143926603967287e+02,
8.477105034722222546e-08, 1.279605470933005762e+02, 8.430270200276242743e-08,
1.299954278908662388e+02, 8.383950034340659995e-08, 1.320191586007148601e+02,
8.338136099726775949e-08, 1.340318607505952855e+02, 8.292820142663043248e-08,
1.360336538921758915e+02, 8.247994087837838296e-08, 1.380246556436560468e+02,
8.203650033602151192e-08, 1.400049817312349774e+02, 8.159780247326202734e-08,
1.419774602947751704e+02, 8.116377160904255122e-08, 1.439340606005945915e+02,
8.073433366402115954e-08, 1.458830357327226466e+02, 8.030946118421050082e-08,
1.478217799771516638e+02, 7.988894797120419333e-08, 1.497504001846159838e+02,
7.947285970052082892e-08, 1.516690015406285852e+02, 7.906108322538860398e-08,
1.535776875999046922e+02, 7.865355186855669953e-08, 1.554765603199003294e+02,
7.825020032051282044e-08, 1.573657200934933087e+02, 7.785096460459183052e-08,
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1.5924526578083231 24e+02, 7.745578204314720208e-08, 1.6111529474038005 11e+02,
7.7064591224747481 30e-08, 1.6297590285917411 28e+02, 7.6677331972361810 18e-08,
1.6482718458232955 23e+02, 7.6293945312500001 59e-08, 1.6666923294180571 70e+02,
7.5914373445273630 39e-08, 1.6850213958445945 65e+02, 7.5538559715346535 57e-08,
1.7032599479940512 31e+02, 7.516644858374384 321e-08, 1.7214088754470287 77e+02,
7.4797985600490195 04e-08, 1.7394690547339419 60e+02, 7.4433117378048780 42e-08,
1.7574413495890391 35e+02, 7.4071791565533974 16e-08, 1.7753266111982725 31e+02,
7.3713956823671494 07e-08, 1.7931256784411959 87e+02, 7.3359562800480773 30e-08,
1.8108393781270598 31e+02, 7.300856010765549 54e-08, 1.8284685252252739 93e+02,
7.2660900297619054 17e-08, 1.8460139230903939 73e+02, 7.2316535841232233 01e-08,
1.8634763636817899 62e+02, 7.197542010613207 272e-08, 1.8808566277781457 64e+02,
7.1637507335680752 79e-08, 1.8981554851869361 76e+02, 7.1302752628504667 58e-08,
1.9153736949490183 86e+02, 7.097111191860465 018e-08, 1.9325120055384795 14e+02,
7.0642541956018514 60e-08, 1.9495711550578670 31e+02, 7.0317000288018433 12e-08,
1.9665518714289314 06e+02, 6.9994445240825691 96e-08, 1.9834548725790040 18e+02,
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2.0170305520420649 26e+02, 6.9044294400452494 86e-08, 2.0337046178562712 84e+02,
6.8733284065315314 72e-08, 2.0503037437959801 54e+02, 6.8425063060538115 58e-08,
2.0668286004674664 01e+02, 6.8119594029017853 36e-08, 2.0832798495156148 99e+02,
6.7816840277777777 2e-08, 2.0996581437828805 86e+02, 6.7516765763274335 35e-08,
2.1159641274674742 32e+02, 6.7219335077092517 25e-08, 2.1321984362617385 50e+02,
6.6924513432017540 14e-08, 2.1483616975281765 35e+02, 6.6632666484716122 5e-08,
2.1644545304176006 08e+02, 6.6342565114130434 863e-08, 2.1804775460251073 58e+02,
6.6055363906926406 87e-08, 2.1964313475265845 45e+02, 6.5770642510775861 16e-08,
2.2123165303149573 90e+02, 6.5488365075107295 91e-08, 2.2281336821335663 e+02,
6.5208500267094023 65e-08, 2.2438833832063991 74e+02, 6.4931017287234043 62e-08,
2.2595662063663135 65e+02, 6.4655885858050847 23e-08, 2.2751827171795432 04e+02,
6.4383076213080163 36e-08, 2.2907334740683353 40e+02, 6.4112559086134451 00e-08,
2.3062190284307163 78e+02, 6.3844305700836814 60e-08, 2.3216399247578073 07e+02,
6.3578287760416665 78e-08, 2.3369967007487016 99e+02, 6.3314477437759336 15e-08,
2.3522898874229619 54e+02, 6.3052847365702481 09e-08, 2.3675200092307991 89e+02,
6.2793370627572021 80e-08, 2.3826875841609887 63e+02, 6.2536207479508229 3e-08,
2.3977931238465805 56e+02, 6.2280771683673475 01e-08, 2.4128371336684544 04e+02,
6.2027597815040656 97e-08, 2.4278201128567746 99e+02, 6.1776473937246964 21e-08,
2.4427425545904006 30e+02, 6.1527375252016127 32e-08, 2.4576049460942871 86e+02,
6.1280277359437745 37e-08, 2.4724077687349426 92e+02, 6.1035156250000001 27e-08,
2.4871514981139762 31e+02, 6.0791988296812747 95e-08, 2.5018366041597860 77e+02,
6.0550750248015869 65e-08, 2.5164635512174339 74e+02, 6.0311419219367584 85e-08,
2.5310327981367447 75e+02, 6.0073972687007873 18e-08, 2.5455447983586762 46e+02,
5.9838388480392156 03e-08, 2.5600000000000000 00e+02, 5.9604644775390625 00e-08
};

static const double __TBL_expfb[] = {
7.0064923216240853 55e-46, 1.401298464324817071e-45, 2.802596928649634142e-45,
5.6051938572992682 84e-45, 1.121038771459853657e-44, 2.242077542919707313e-44,
4.4841550858394146 27e-44, 8.968310717678829254e-44, 1.793662034335765851e-43,
3.5873240686715317 02e-43, 7.174648137343063403e-43, 1.434929627468612681e-42,
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1.8367099231598242 31e-40, 3.673419846319648462e-40, 7.346839692639296925e-40,
1.4693679385278593 85e-39, 2.938735877055718770e-39, 5.877471754111437540e-39,
1.1754943508222875 08e-38, 2.350988701644575016e-38, 4.701977403289150032e-38,
9.4039548065783000 64e-38, 1.880709961315660013e-37, 3.761581922631320025e-37,
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6.0185310762101120 41e-36, 1.203706215242022408e-35, 2.407412430484044816e-35,
4.8148248609680896 33e-35, 9.629649721936179265e-35, 1.925929944387235853e-34,
3.8518598887744717 06e-34, 7.703719777548943412e-34, 1.540743955509788682e-33,
3.0814879110195773 65e-33, 6.162975822039154730e-33, 1.232595164407830946e-32,
2.4651903288156618 92e-32, 4.930380657631323784e-32, 9.860761315262647568e-32,
1.9721522630525295 14e-31, 3.944304526105059027e-31, 7.888609052210118054e-31,
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4.1359030627651383 74e-25, 8.271806125530276749e-25, 1.654361225106055350e-24,
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1.0000000000000000 00e+00, 2.000000000000000000e+00, 4.000000000000000000e+00,
8.0000000000000000 00e+00, 1.600000000000000000e+01, 3.200000000000000000e+01,
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2.6214400000000000 00e+05, 5.242880000000000000e+05, 1.048576000000000000e+06,
2.0971520000000000 00e+06, 4.194304000000000000e+06, 8.388608000000000000e+06,
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3.5184372088832000 00e+13, 7.036874417766400000e+13, 1.407374883553280000e+14,
2.8147497671065600 00e+14, 5.629499534213120000e+14, 1.125899906842624000e+15,
2.2517998136852480 00e+15, 4.503599627370496000e+15, 9.007199254740992000e+15,
1.8014398509481984 00e+16, 3.602879701896396800e+16, 7.205759403792793600e+16,
1.4411518807585587 20e+17, 2.882303761517117440e+17, 5.764607523034234880e+17,
1.1529215046068469 76e+18, 2.305843009213693952e+18, 4.611686018427387904e+18,
9.2233720368547758 08e+18, 1.844674407370955162e+19, 3.689348814741910323e+19,
7.3786976294838206 46e+19, 1.475739525896764129e+20, 2.951479051793528259e+20,
5.9029581035870565 17e+20, 1.180591620717411303e+21, 2.361183241434822607e+21,
4.7223664828696452 14e+21, 9.444732965739290427e+21, 1.888946593147858085e+22,
3.7778931862957161 71e+22, 7.555786372591432342e+22, 1.511157274518286468e+23,
3.0223145490365729 37e+23, 6.044629098073145874e+23, 1.208925819614629175e+24,
2.4178516392292583 49e+24, 4.835703278458516699e+24, 9.671406556917033398e+24,
1.9342813113834066 80e+25, 3.868562622766813359e+25, 7.737125245533626718e+25,
1.5474250491067253 44e+26, 3.094850098213450687e+26, 6.189700196426901374e+26,
1.2379400392858302 75e+27, 2.475880078570760550e+27, 4.951760157141521100e+27,
9.9035203142830421 99e+27, 1.980704062856608440e+28, 3.961408125713216880e+28,
7.9228162514264337 59e+28, 1.584563250285286752e+29, 3.169126500570573504e+29,
6.3382530011411470 07e+29, 1.267650600228229401e+30, 2.535301200456458803e+30,
5.0706024009129176 06e+30, 1.014120480182583521e+31, 2.028240960365167042e+31,
4.0564819207303340 85e+31, 8.112963841460668170e+31, 1.622592768292133634e+32,
3.2451855365842676 28e+32, 6.490371073168534536e+32, 1.298074214637069073e+33,
2.5961484292674138 14e+33, 5.192296858534827629e+33, 1.038459371706965526e+34,
2.0769187434139310 51e+34, 4.153837486827862103e+34, 8.307674973655724206e+34,
```

```
392 1.6615349947311448 41e+35, 3.32306998946228 9682e+35, 6.64613997892457 9365e+35,
393 1.32922799578491 5873e+36, 2.65845599156983 1746e+36, 5.31691198313966 3492e+36,
394 1.06338239662793 2698e+37, 2.12676479325586 5397e+37, 4.25352958651173 0793e+37,
395 8.50705917302346 1587e+37, 1.70141183460469 2317e+38, 3.40282366920938 4635e+38
396 };

398 static const double
399         KA3 = -3.60659926599003171364e-01*256.0,
400         KA2 =  4.80902715189356683026e-01*256.0,
401         KA1 = -7.21347520569871841065e-01*256.0,
402         KA0 =  1.44269504088069658645e+00*256.0,
403         KB2 =  3.66556671660783833261e-06,
404         KB1 =  2.70760782821392980564e-03,
405         DONE = 1.0,
406         HTHRESH = 32768.0,
407         LTHRESH = -38400.0;

409 #define RETURN(ret)                                             \
410 {                                                               \
411         *pz = (ret);                                          \
412         px += stridex;                                        \
413         py += stridey;                                        \
414         pz += stridez;                                        \
415         if ( n_n == 0 )                                       \
416         {                                                     \
417                 spx = px; spy = py; spz = pz;                 \
418                 continue;                                     \
419         }                                                     \
420         n--;                                                  \
421         break;                                                \
422 }

424 void
425 __vpowf( int n, float * restrict px, int stridex, float * restrict py,
426         int stridey, float * restrict pz, int stridez )
427 {
428         float           *spx, *spy, *spz;
429         double          y0, yy0;
430         long long       di0;
431         unsigned        ux, sx, uy, ay, ax0;
432         int             exp, i0, ind0, exp0, yisint0, n_n;

434 #ifndef NOPOWFIX
435         if ( stridex == 0 )
436         {
437                 unsigned        hx = *(unsigned*)px;

439                 if ( (hx >= 0x00800000) &&      /* x not zero or subnormal
440                 (hx < 0x7f800000) &&            /* x not inf, nan or negative si
441                 (hx != 0x3f800000) )            /* x not 1
442                 {
443                         __vpowfx( n, px, py, stridey, pz, stridez );
444                         return;
445                 }
446         }
447 #endif

449         while ( n > 0 )
450         {
451                 n_n = 0;
452                 spx = px;
453                 spy = py;
454                 spz = pz;
455                 for ( ; n > 0 ; n-- )
456                 {
457                         uy = *(unsigned int*)py;
```



```
458                         ux = *(unsigned int*)px;
459                         ay = uy & 0x7fffffff;
460                         ax0 = ux & 0x7fffffff;
461                         sx = ux >> 31;
462                         yisint0 = 0;    /* Y - non-integer */

464                         /* |X| or |Y| = Inf,Nan */
465                         if ( ax0 >= 0x7f800000 || ay >= 0x7f800000 )
466                         {
467                                 if ( ay == 0 )
468                                         RETURN( 1.0f )  /* pow(X,0) */
469                                 /* |X| or |Y| = Nan */
470                                 if ( ax0 > 0x7f800000 || ay > 0x7f800000 )
471                                         RETURN ( *px + *py )
472                                 if ( ay == 0x7f800000 )         /* |Y| = Inf */
473                                 {
474                                         float fy;
475                                         if ( ax0 == 0x3f800000 )
476                                                 fy = *py - *py;         /* +-1 *
477                                         else
478                                                 fy = ( (ax0 < 0x3f800000) != (uy
479                                         RETURN( fy )
480                                 }
481                                 if ( sx )       /* X = -Inf */
482                                 {
483                                         exp = ay >> 23;
484                                         if ( exp >= 0x97 )      /* |Y| >= 2^24 *
485                                                 yisint0 = 2;    /* Y - even */
486                                         else if ( exp >= 0x7f ) /* |Y| >= 1 */
487                                         {
488                                                 i0 = ay >> ((0x7f + 23) - exp);
489                                                 if ( (i0 << ((0x7f + 23) - exp))
490                                                         yisint0 = 2 - (i0 & 1);
491                                         }
492                                 }
493                                 if ( uy >> 31 )
494                                         ax0 = 0;
495                                 ax0 += yisint0 << 31;
496                                 RETURN( *(float*)&ax0 )
497                         }

499                         if ( (int)ux < 0x00800000 )     /* X = denormal or negat
500                         {
501                                 if ( ay == 0 )
502                                         RETURN( 1.0f )  /* pow(X,0) */
503                                 exp0 = (ax0 >> 23) - 127;

505                                 if ( (int)ax0 < 0x00800000 )    /* X = denormal
506                                 {
507                                         *((float*) &ax0) = (float) (int)ax0;
508                                         exp0 = (ax0 >> 23) - (127 + 149);
509                                 }

511                                 if ( (int)ux <= 0 )     /* X <= 0 */
512                                 {
513                                         exp = ay >> 23;
514                                         if ( exp >= 0x97 )      /* |Y| >= 2^24 *
515                                                 yisint0 = 2;    /* Y - even */
516                                         else if ( exp >= 0x7f ) /* |Y| >= 1 */
517                                         {
518                                                 i0 = ay >> ((0x7f + 23) - exp);
519                                                 if ( (i0 << ((0x7f + 23) - exp))
520                                                         yisint0 = 2 - (i0 & 1);
521                                         }

523                                         if ( ax0 == 0 )         /* pow(0,Y) */
```

```
524                                     {
525                                             float fy;
526                                             fy = (uy >> 31) ? 1.0f / 0.0f :
527                                             if ( sx & yisint0 )
528                                                     fy = -fy;
529                                             RETURN( fy )
530                                     }
531
532                                     if ( yisint0 == 0 )     /* pow(neg,non-i
533                                             RETURN( 0.0f / 0.0f )   /* NaN *
534                                 }
535
536                                 /* perform yy0 = 256*log2(xi)*yi */
537                                 ax0 &= 0x007fffff;
538                                 i0 = (ax0 + 0x8000) & 0xffff0000;
539                                 ind0 = i0 >> 15;
540                                 i0 = ax0 - i0;
541                                 y0 = (double) i0 * __TBL_log2f[ind0 + 1];
542                                 yy0 = __TBL_log2f[ind0] + (double) (exp0 << 8);
543                                 yy0 += (((KA3 * y0 + KA2) * y0 + KA1) * y0 + KA0
544                                 yy0 = (double)py[0] * yy0;
545
546                                 /* perform 2 ** (yy0/256) */
547                                 if ( yy0 >= HTHRESH )
548                                         yy0 = HTHRESH;
549                                 if ( yy0 <= LTHRESH )
550                                         yy0 = LTHRESH;
551                                 ind0 = (int) yy0;
552                                 y0 = yy0 - (double)ind0;
553                                 yy0 = (KB2 * y0 + KB1) * y0 + DONE;
554                                 di0 = ((long long)((ind0 >> 8) + (yisint0 << 11)
555                                 di0 += ((long long*)__TBL_exp2f)[ind0 & 255];
556                                 RETURN( (float) (yy0 * *(double*)&di0) )
557                         }
558                         px += stridex;
559                         py += stridey;
560                         pz += stridez;
561                         n_n++;
562                 }
563                 if ( n_n > 0 )
564                         __vpowf_n( n_n, spx, stridex, spy, stridey, spz, stridez
565         }
566 }
567
568
569 static void
570 __vpowf_n( int n, float * restrict px, int stridex, float * restrict py,
571         int stridey, float * restrict pz, int stridez )
572 {
573         double          y0, yy0;
574         double          di0;
575         int             ind0, i0, exp0;
576         unsigned        ax0;
577         double          y1, yy1;
578         double          di1;
579         int             ind1, i1, exp1;
580         unsigned        ax1;
581         double          y2, yy2;
582         double          di2;
583         int             ind2, i2, exp2;
584         unsigned        ax2;
585
586         for ( ; n > 2 ; n -= 3 )
587         {
588                 /* perform yy0 = 256*log2(xi)*yi */
589                 ax0 = ((int*)px)[0];
```



```
590                 px += stridex;
591                 ax1 = ((int*)px)[0];
592                 px += stridex;
593                 ax2 = ((int*)px)[0];
594                 px += stridex;
595                 exp0 = ((ax0 & 0x7fffffff) >> 23) - 127;
596                 exp1 = ((ax1 & 0x7fffffff) >> 23) - 127;
597                 exp2 = ((ax2 & 0x7fffffff) >> 23) - 127;
598                 ax0 &= 0x007fffff;
599                 ax1 &= 0x007fffff;
600                 ax2 &= 0x007fffff;
601                 i0 = (ax0 + 0x8000) & 0xffff0000;
602                 i1 = (ax1 + 0x8000) & 0xffff0000;
603                 i2 = (ax2 + 0x8000) & 0xffff0000;
604                 ind0 = i0 >> 15;
605                 ind1 = i1 >> 15;
606                 ind2 = i2 >> 15;
607                 i0 = ax0 - i0;
608                 i1 = ax1 - i1;
609                 i2 = ax2 - i2;
610                 y0 = (double) i0 * __TBL_log2f[ind0 + 1];
611                 y1 = (double) i1 * __TBL_log2f[ind1 + 1];
612                 y2 = (double) i2 * __TBL_log2f[ind2 + 1];
613                 yy0 = __TBL_log2f[ind0] + (double) (exp0 << 8);
614                 yy1 = __TBL_log2f[ind1] + (double) (exp1 << 8);
615                 yy2 = __TBL_log2f[ind2] + (double) (exp2 << 8);
616                 yy0 += (((KA3 * y0 + KA2) * y0 + KA1) * y0 + KA0) * y0;
617                 yy1 += (((KA3 * y1 + KA2) * y1 + KA1) * y1 + KA0) * y1;
618                 yy2 += (((KA3 * y2 + KA2) * y2 + KA1) * y2 + KA0) * y2;
619                 yy0 = (double)py[0] * yy0;
620                 py += stridey;
621                 yy1 = (double)py[0] * yy1;
622                 py += stridey;
623                 yy2 = (double)py[0] * yy2;
624                 py += stridey;
625
626                 /* perform 2 ** (yy0/256) */
627                 if ( yy0 >= HTHRESH )
628                         yy0 = HTHRESH;
629                 if ( yy0 <= LTHRESH )
630                         yy0 = LTHRESH;
631                 if ( yy1 >= HTHRESH )
632                         yy1 = HTHRESH;
633                 if ( yy1 <= LTHRESH )
634                         yy1 = LTHRESH;
635                 if ( yy2 >= HTHRESH )
636                         yy2 = HTHRESH;
637                 if ( yy2 <= LTHRESH )
638                         yy2 = LTHRESH;
639
640                 ind0 = (int) yy0;
641                 ind1 = (int) yy1;
642                 ind2 = (int) yy2;
643                 y0 = yy0 - (double)ind0;
644                 y1 = yy1 - (double)ind1;
645                 y2 = yy2 - (double)ind2;
646                 yy0 = (KB2 * y0 + KB1) * y0 + DONE;
647                 yy1 = (KB2 * y1 + KB1) * y1 + DONE;
648                 yy2 = (KB2 * y2 + KB1) * y2 + DONE;
649                 di0 = (__TBL_expfb + 150)[ind0 >> 8];
650                 di1 = (__TBL_expfb + 150)[ind1 >> 8];
651                 di2 = (__TBL_expfb + 150)[ind2 >> 8];
652                 di0 *= __TBL_exp2f[ind0 & 255];
653                 di1 *= __TBL_exp2f[ind1 & 255];
654                 di2 *= __TBL_exp2f[ind2 & 255];
655                 pz[0] = (float) (yy0 * di0);
```

```
656                 pz += stridez;
657                 pz[0] = (float) (yy1 * di1);
658                 pz += stridez;
659                 pz[0] = (float) (yy2 * di2);
660                 pz += stridez;
661         }

663         for ( ; n > 0 ; n-- )
664         {
665                 /* perform yy0 = 256*log2(xi)*yi */
666                 ax0 = ((int*)px)[0];
667                 exp0 = ((ax0 & 0x7fffffff) >> 23) - 127;
668                 ax0 &= 0x007fffff;
669                 i0 = (ax0 + 0x8000) & 0xffff0000;
670                 ind0 = i0 >> 15;
671                 i0 = ax0 - i0;
672                 y0 = (double) i0 * __TBL_log2f[ind0 + 1];
673                 yy0 = __TBL_log2f[ind0] + (double) (exp0 << 8);
674                 yy0 += (((KA3 * y0 + KA2) * y0 + KA1) * y0 + KA0) * y0;
675                 yy0 = (double)py[0] * yy0;

677                 /* perform 2 ** (yy0/256) */
678                 if ( yy0 >= HTHRESH )
679                         yy0 = HTHRESH;
680                 if ( yy0 <= LTHRESH )
681                         yy0 = LTHRESH;
682                 ind0 = (int) yy0;
683                 y0 = yy0 - (double)ind0;
684                 yy0 = (KB2 * y0 + KB1) * y0 + DONE;
685                 di0 = (__TBL_expfb + 150)[ind0 >> 8];
686                 di0 *= __TBL_exp2f[ind0 & 255];
687                 pz[0] = (float) (yy0 * di0);
688                 px += stridex;
689                 py += stridey;
690                 pz += stridez;
691         }
692 }


695 static void
696 __vpowfx( int n, float * restrict px, float * restrict py,
697         int stridey, float * restrict pz, int stridez )
698 {
699         float           *spy, *spz;
700         double          yy, y0;
701         int             ind0, exp0, i0, n_n;
702         unsigned        ux, ax, ax0, uy, ay;

704         /* perform yy = 256*log2(xi)*yi */
705         ux = *(unsigned int*)px;
706         ax = ux & 0x7fffffff;
707         exp0 = (ax >> 23) - 127;
708         ax0 = ux & 0x007fffff;
709         i0 = (ax0 + 0x8000) & 0xffff0000;
710         ind0 = i0 >> 15;
711         i0 = ax0 - i0;
712         y0 = (double) i0 * __TBL_log2f[ind0 + 1];
713         yy = __TBL_log2f[ind0] + (double) (exp0 << 8);
714         yy += (((KA3 * y0 + KA2) * y0 + KA1) * y0 + KA0) * y0;

716         while ( n > 0 )
717         {
718                 n_n = 0;
719                 spy = py;
720                 spz = pz;
721                 for ( ; n > 0 ; n-- )
```



```
722                 {
723                         uy = *(unsigned int*)py;
724                         ay = uy & 0x7fffffff;

726                         if ( ay >= 0x7f800000 )         /* |Y| = Inf or Nan */
727                         {
728                                 float fy;
729                                 if ( ay > 0x7f800000 )
730                                         fy = *py + *py; /* |Y| = Nan */
731                                 else
732                                         fy = ( (ax < 0x3f800000) != (uy >> 31) )
733                                 *pz = fy;
734                                 py += stridey;
735                                 pz += stridez;
736                                 if ( n_n == 0 )
737                                 {
738                                         spy = py;
739                                         spz = pz;
740                                         continue;
741                                 }
742                                 n--;
743                                 break;
744                         }
745                         py += stridey;
746                         pz += stridez;
747                         n_n++;
748                 }
749                 if ( n_n > 0 )
750                         __vpowfx_n( n_n, yy, spy, stridey, spz, stridez );
751         }
752 }


755 static void
756 __vpowfx_n( int n, double yy, float * restrict py,
757         int stridey, float * restrict pz, int stridez )
758 {
759         double          y0, yy0, di0;
760         double          y1, yy1, di1;
761         double          y2, yy2, di2;
762         int             ind0, ind1, ind2;

764         for ( ; n > 2 ; n-= 3 )
765         {
766                 /* perform 2 ** (yy/256) */
767                 yy0 = (double)py[0] * yy;
768                 py += stridey;
769                 yy1 = (double)py[0] * yy;
770                 py += stridey;
771                 yy2 = (double)py[0] * yy;
772                 py += stridey;
773                 if ( yy0 >= HTHRESH )
774                         yy0 = HTHRESH;
775                 if ( yy0 <= LTHRESH )
776                         yy0 = LTHRESH;
777                 if ( yy1 >= HTHRESH )
778                         yy1 = HTHRESH;
779                 if ( yy1 <= LTHRESH )
780                         yy1 = LTHRESH;
781                 if ( yy2 >= HTHRESH )
782                         yy2 = HTHRESH;
783                 if ( yy2 <= LTHRESH )
784                         yy2 = LTHRESH;
785                 ind0 = (int) yy0;
786                 ind1 = (int) yy1;
787                 ind2 = (int) yy2;
```

```
788                 y0 = yy0 - (double)ind0;
789                 y1 = yy1 - (double)ind1;
790                 y2 = yy2 - (double)ind2;
791                 yy0 = (KB2 * y0 + KB1) * y0 + DONE;
792                 yy1 = (KB2 * y1 + KB1) * y1 + DONE;
793                 yy2 = (KB2 * y2 + KB1) * y2 + DONE;
794                 di0 = (__TBL_expfb + 150)[ind0 >> 8];
795                 di1 = (__TBL_expfb + 150)[ind1 >> 8];
796                 di2 = (__TBL_expfb + 150)[ind2 >> 8];
797                 di0 *= __TBL_exp2f[ind0 & 255];
798                 di1 *= __TBL_exp2f[ind1 & 255];
799                 di2 *= __TBL_exp2f[ind2 & 255];
800                 pz[0] = (float) (yy0 * di0);
801                 pz += stridez;
802                 pz[0] = (float) (yy1 * di1);
803                 pz += stridez;
804                 pz[0] = (float) (yy2 * di2);
805                 pz += stridez;
806         }
807         for ( ; n > 0 ; n-- )
808         {
809                 /* perform 2 ** (yy/256) */
810                 yy0 = (double)py[0] * yy;
811                 if ( yy0 >= HTHRESH )
812                         yy0 = HTHRESH;
813                 if ( yy0 <= LTHRESH )
814                         yy0 = LTHRESH;
815                 ind0 = (int) yy0;
816                 y0 = yy0 - (double)ind0;
817                 yy0 = (KB2 * y0 + KB1) * y0 + DONE;
818                 di0 = (__TBL_expfb + 150)[ind0 >> 8];
819                 di0 *= __TBL_exp2f[ind0 & 255];
820                 pz[0] = (float) (yy0 * di0);
821                 py += stridey;
822                 pz += stridez;
823         }
824 }
```

```
**********************************************************
   10409 Sat May 10 12:09:52 2014
new/usr/src/lib/libmvec/common/__vrem_pio2m.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
 * Given X, __vlibm_rem_pio2m finds Y and an integer n such that
 * Y = X - n*pi/2 and |Y| < pi/2.
 *
 * On entry, X is represented by x, an array of nx 24-bit integers
 * stored in double precision format, and e:
 *
 *   X = sum (x[i] * 2^(e - 24*i))
 *
 * nx must be 1, 2, or 3, and e must be >= -24.  For example, a
 * suitable representation for the double precision number z can
 * be computed as follows:
 *
 *      e  = ilogb(z)-23
 *      z  = scalbn(z,-e)
 *      for i = 0,1,2
 *              x[i] = floor(z)
 *              z    = (z-x[i])*2**24
 *
 * On exit, Y is approximated by y[0] if prec is 0 and by the un-
 * evaluated sum y[0] + y[1] if prec != 0.  The approximation is
 * accurate to 53 bits in the former case and to at least 72 bits
 * in the latter.
 *
 * __vlibm_rem_pio2m returns n mod 8.
 *
 * Notes:
 *
 * As n is the integer nearest X * 2/pi, we approximate the latter
 * product to a precision that is determined dynamically so as to
 * ensure that the final value Y is approximated accurately enough.
 * We don't bother to compute terms in the product that are multiples
```



```
 * of 8, so the cost of this multiplication is independent of the
 * magnitude of X.  The variable ip determines the offset into the
 * array ipio2 of the first term we need to use.  The variable eq0
 * is the corresponding exponent of the first partial product.
 *
 * The partial products are scaled, summed, and split into an array
 * of non-overlapping 24-bit terms (not necessarily having the same
 * signs).  Each partial product overlaps three elements of the
 * resulting array:
 *
 *      q[i]   xxxxxxxxxxxxxx
 *      q[i+1]       xxxxxxxxxxxxxx
 *      q[i+2]             xxxxxxxxxxxxxx
 *      ...                      ...
 *
 *
 *      r[i]     xxxxxx
 *      r[i+1]         xxxxxx
 *      r[i+2]               xxxxxx
 *      ...                        ...
 *
 * In order that the last element of the r array have some correct
 * bits, we compute an extra term in the q array, but we don't bother
 * to split this last term into 24-bit chunks; thus, the final term
 * of the r array could have more than 24 bits, but this doesn't
 * matter.
 *
 * After we subtract the nearest integer to the product, we multiply
 * the remaining part of r by pi/2 to obtain Y.  Before we compute
 * this last product, however, we make sure that the remaining part
 * of r has at least five nonzero terms, computing more if need be.
 * This ensures that even if the first nonzero term is only a single
 * bit and the last term is wrong in several trailing bits, we still
 * have enough accuracy to obtain 72 bits of Y.
 *
 * IMPORTANT: This code assumes that the rounding mode is round-to-
 * nearest in several key places.  First, after we compute X * 2/pi,
 * we round to the nearest integer by adding and subtracting a power
 * of two.  This step must be done in round-to-nearest mode to ensure
 * that the remainder is less than 1/2 in absolute value.  (Because
 * we only take two adjacent terms of r into account when we perform
 * this rounding, in very rare cases the remainder could be just
 * barely greater than 1/2, but this shouldn't matter in practice.)
 *
 * Second, we also split the partial products of X * 2/pi into 24-bit
 * pieces by adding and subtracting a power of two.  In this step,
 * round-to-nearest mode is important in order to guarantee that
 * the index of the first nonzero term in the remainder gives an
 * accurate indication of the number of significant terms.  For
 * example, suppose eq0 = -1, so that r[1] is a multiple of 1/2 and
 * |r[2]| < 1/2.  After we subtract the nearest integer, r[1] could
 * be -1/2, and r[2] could be very nearly 1/2, so that r[1] != 0,
 * yet the remainder is much smaller than the least significant bit
 * corresponding to r[1].  As long as we use round-to-nearest mode,
 * this can't happen; instead, the absolute value of each r[j] will
 * be less than 1/2 the least significant bit corresponding to r[j-1],
 * so that the entire remainder must be at least half as large as
 * the first nonzero term (or perhaps just barely smaller than this).
 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HIWORD  1
#define LOWORD  0
#else
```

```
#define HIWORD  0
#define LOWORD  1
#endif

/* 396 hex digits of 2/pi, with two leading zeroes to make life easier */
static const double ipio2[] = {
        0, 0,
        0xA2F983, 0x6E4E44, 0x1529FC, 0x2757D1, 0xF534DD, 0xC0DB62,
        0x95993C, 0x439041, 0xFE5163, 0xABDEBB, 0xC561B7, 0x246E3A,
        0x424DD2, 0xE00649, 0x2EEA09, 0xD1921C, 0xFE1DEB, 0x1CB129,
        0xA73EE8, 0x8235F5, 0x2EBB44, 0x84E99C, 0x7026B4, 0x5F7E41,
        0x3991D6, 0x398353, 0x39F49C, 0x845F8B, 0xBDF928, 0x3B1FF8,
        0x97FFDE, 0x05980F, 0xEF2F11, 0x8B5A0A, 0x6D1F6D, 0x367ECF,
        0x27CB09, 0xB74F46, 0x3F669E, 0x5FEA2D, 0x7527BA, 0xC7EBE5,
        0xF17B3D, 0x0739F7, 0x8A5292, 0xEA6BFB, 0x5FB11F, 0x8D5D08,
        0x560330, 0x46FC7B, 0x6BABF0, 0xCFBC20, 0x9AF436, 0x1DA9E3,
        0x91615E, 0xE61B08, 0x659985, 0x5F14A0, 0x68408D, 0xFFD880,
        0x4D7327, 0x310606, 0x1556CA, 0x73A8C9, 0x60E27B, 0xC08C6B,
};

/* pi/2 in 24-bit pieces */
static const double pio2[] = {
        1.57079625129699707031e+00,
        7.54978941586159635335e-08,
        5.39030252995776476554e-15,
        3.28200341580791294123e-22,
        1.27065575308067607349e-29,
};

/* miscellaneous constants */
static const double
        zero    = 0.0,
        two24   = 16777216.0,
        round1  = 6755399441055744.0,   /* 3 * 2^51 */
        round24 = 113336795588871485128704.0, /* 3 * 2^75 */
        twon24  = 5.960464477539062500E-8;

int
__vlibm_rem_pio2m(double *x, double *y, int e, int nx, int prec)
{
        union {
                double  d;
                int     i[2];
        } s;
        double  z, t, p, q[20], r[21], *pr;
        int     nq, ip, n, i, j, k, eq0, eqnqm1;

        /* determine ip and eq0; note that -48 <= eq0 <= 2 */
        ip = (e - 3) / 24;
        if (ip < 0)
                ip = 0;
        eq0 = e - 24 * (ip + 1);

        /* compute q[0,...,5] = x * ipio2 and initialize nq and eqnqm1 */
        if (nx == 3) {
                q[0] = x[0] * ipio2[ip+2] + x[1] * ipio2[ip+1] + x[2] * ipio2[ip
                q[1] = x[0] * ipio2[ip+3] + x[1] * ipio2[ip+2] + x[2] * ipio2[ip
                q[2] = x[0] * ipio2[ip+4] + x[1] * ipio2[ip+3] + x[2] * ipio2[ip
                q[3] = x[0] * ipio2[ip+5] + x[1] * ipio2[ip+4] + x[2] * ipio2[ip
                q[4] = x[0] * ipio2[ip+6] + x[1] * ipio2[ip+5] + x[2] * ipio2[ip
                q[5] = x[0] * ipio2[ip+7] + x[1] * ipio2[ip+6] + x[2] * ipio2[ip
        } else if (nx == 2) {
                q[0] = x[0] * ipio2[ip+2] + x[1] * ipio2[ip+1];
                q[1] = x[0] * ipio2[ip+3] + x[1] * ipio2[ip+2];
                q[2] = x[0] * ipio2[ip+4] + x[1] * ipio2[ip+3];
                q[3] = x[0] * ipio2[ip+5] + x[1] * ipio2[ip+4];
```



```
                q[4] = x[0] * ipio2[ip+6] + x[1] * ipio2[ip+5];
                q[5] = x[0] * ipio2[ip+7] + x[1] * ipio2[ip+6];
        } else {
                q[0] = x[0] * ipio2[ip+2];
                q[1] = x[0] * ipio2[ip+3];
                q[2] = x[0] * ipio2[ip+4];
                q[3] = x[0] * ipio2[ip+5];
                q[4] = x[0] * ipio2[ip+6];
                q[5] = x[0] * ipio2[ip+7];
        }
        nq = 5;
        eqnqm1 = eq0 - 96;

recompute:
        /* propagate carries and incorporate powers of two */
        s.i[HIWORD] = (0x3ff + eqnqm1) << 20;
        s.i[LOWORD] = 0;
        p = s.d;
        z = q[nq] * twon24;
        for (j = nq-1; j >= 1; j--) {
                z += q[j];
                t = (z + round24) - round24; /* must be rounded to nearest */
                r[j+1] = (z - t) * p;
                z = t * twon24;
                p *= two24;
        }
        z += q[0];
        t = (z + round24) - round24; /* must be rounded to nearest */
        r[1] = (z - t) * p;
        r[0] = t * p;

        /* form n = [r] mod 8 and leave the fractional part of r */
        if (eq0 > 0) {
                /* binary point lies within r[2] */
                z = r[2] + r[3];
                t = (z + round1) - round1; /* must be rounded to nearest */
                r[2] -= t;
                n = (int)(r[1] + t);
                r[0] = r[1] = zero;
        } else if (eq0 > -24) {
                /* binary point lies within or just to the right of r[1] */
                z = r[1] + r[2];
                t = (z + round1) - round1; /* must be rounded to nearest */
                r[1] -= t;
                z = r[0] + t;
                /* cut off high part of z so conversion to int doesn't
                   overflow */
                t = (z + round24) - round24;
                n = (int)(z - t);
                r[0] = zero;
        } else {
                /* binary point lies within or just to the right of r[0] */
                z = r[0] + r[1];
                t = (z + round1) - round1; /* must be rounded to nearest */
                r[0] -= t;
                n = (int)t;
        }

        /* count the number of leading zeroes in r */
        for (j = 0; j <= nq; j++) {
                if (r[j] != zero)
                        break;
        }

        /* if fewer than 5 terms remain, add more */
        if (nq - j < 4) {
```

```
260                 k = 4 - (nq - j);
261                 /*
262                  * compute q[nq+1] to q[nq+k]
263                  *
264                  * For some reason, writing out the nx loop explicitly
265                  * for each of the three possible values (as above) seems
266                  * to run a little slower, so we'll leave this code as is.
267                  */
268                 for (i = nq + 1; i <= nq + k; i++) {
269                         t = x[0] * ipio2[ip+2+i];
270                         for (j = 1; j < nx; j++)
271                                 t += x[j] * ipio2[ip+2+i-j];
272                         q[i] = t;
273                         eqnqm1 -= 24;
274                 }
275                 nq += k;
276                 goto recompute;
277         }

279         /* set pr and nq so that pr[0,...,nq] is the part of r remaining */
280         pr = &r[j];
281         nq = nq - j;

283         /* compute pio2 * pr[0,...,nq]; note that nq >= 4 here */
284         q[0] = pio2[0] * pr[0];
285         q[1] = pio2[0] * pr[1] + pio2[1] * pr[0];
286         q[2] = pio2[0] * pr[2] + pio2[1] * pr[1] + pio2[2] * pr[0];
287         q[3] = pio2[0] * pr[3] + pio2[1] * pr[2] + pio2[2] * pr[1]
288             + pio2[3] * pr[0];
289         for (i = 4; i <= nq; i++) {
290                 q[i] = pio2[0] * pr[i] + pio2[1] * pr[i-1] + pio2[2] * pr[i-2]
291                     + pio2[3] * pr[i-3] + pio2[4] * pr[i-4];
292         }

294         /* sum q in increasing order to obtain the first term of y */
295         t = q[nq];
296         for (i = nq - 1; i >= 0; i--)
297                 t += q[i];
298         y[0] = t;
299         if (prec) {
300                 /* subtract and sum again in decreasing order
301                    to obtain the second term */
302                 t = q[0] - t;
303                 for (i = 1; i <= nq; i++)
304                         t += q[i];
305                 y[1] = t;
306         }

308         return (n & 7);
309 }
```

```
**********************************************************
   11672 Sat May 10 12:09:53 2014
new/usr/src/lib/libmvec/common/__vrhypot.c
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

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 */
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 */

#include <sys/isa_defs.h>
#include "libm_synonyms.h"
#include "libm_inlines.h"

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/* double rhypot(double x, double y)
 *
 * Method :
 *      1. Special cases:
 *              x or  y = Inf                                   => 0
 *              x or  y = NaN                                   => QNaN
 *              x and y = 0                                     => Inf + divide-
 *      2. Computes rhypot(x,y):
 *              rhypot(x,y) = m * sqrt(1/(xnm * xnm + ynm * ynm))
 *      Where:
 *              m = 1/max(|x|,|y|)
 *              xnm = x * m
 *              ynm = y * m
```



```
 *
 *      Compute 1/(xnm * xnm + ynm * ynm) by simulating
 *      muti-precision arithmetic.
 *
 * Accuracy:
 *      Maximum error observed: less than 0.869 ulp after 1.000.000.000
 *      results.
 */

#define sqrt __sqrt

extern double sqrt( double );

extern double fabs( double );

static const int __vlibm_TBL_rhypot[] = {
/* i = [0,127]
 * TBL[i] = 0x3ff00000 + *(int*)&(1.0 / *(double*)&(0x3ff0000000000000ULL + (i <
 0x7fe00000,  0x7fdfc07f, 0x7fdf81f8,  0x7fdf4465,
 0x7fdf07c1,  0x7fdecc07, 0x7fde9131,  0x7fde573a,
 0x7fde1e1e,  0x7fdde5d6, 0x7fddae60,  0x7fdd77b6,
 0x7fdd41d4,  0x7fdd0cb5, 0x7fdcd856,  0x7fdca4b3,
 0x7fdc71c7,  0x7fdc3f8f, 0x7fdc0e07,  0x7fdbdd2b,
 0x7fdbacf9,  0x7fdb7d6c, 0x7fdb4e81,  0x7fdb2036,
 0x7fdaf286,  0x7fdac570, 0x7fda98ef,  0x7fda6d01,
 0x7fda41a4,  0x7fda16d3, 0x7fd9ec8e,  0x7fd9c2d1,
 0x7fd99999,  0x7fd970e4, 0x7fd948b0,  0x7fd920fb,
 0x7fd8f9c1,  0x7fd8d301, 0x7fd8acb9,  0x7fd886e5,
 0x7fd86186,  0x7fd83c97, 0x7fd81818,  0x7fd7f405,
 0x7fd7d05f,  0x7fd7ad22, 0x7fd78a4c,  0x7fd767dc,
 0x7fd745d1,  0x7fd72428, 0x7fd702e0,  0x7fd6e1f7,
 0x7fd6c16c,  0x7fd6a13c, 0x7fd68168,  0x7fd661ec,
 0x7fd642c8,  0x7fd623fa, 0x7fd60581,  0x7fd5e75b,
 0x7fd5c988,  0x7fd5ac05, 0x7fd58ed2,  0x7fd571ed,
 0x7fd55555,  0x7fd53909, 0x7fd51d07,  0x7fd50150,
 0x7fd4e5e0,  0x7fd4cab8, 0x7fd4afd6,  0x7fd49539,
 0x7fd47ae1,  0x7fd460cb, 0x7fd446f8,  0x7fd42d66,
 0x7fd41414,  0x7fd3fb01, 0x7fd3e22c,  0x7fd3c995,
 0x7fd3b13b,  0x7fd3991c, 0x7fd38138,  0x7fd3698d,
 0x7fd3521c,  0x7fd33ae4, 0x7fd323e3,  0x7fd30d19,
 0x7fd2f684,  0x7fd2e025, 0x7fd2c9fb,  0x7fd2b404,
 0x7fd29e41,  0x7fd288b0, 0x7fd27350,  0x7fd25e22,
 0x7fd24924,  0x7fd23456, 0x7fd21fb7,  0x7fd20b47,
 0x7fd1f704,  0x7fd1e2ef, 0x7fd1cf06,  0x7fd1bb4a,
 0x7fd1a7b9,  0x7fd19453, 0x7fd18118,  0x7fd16e06,
 0x7fd15b1e,  0x7fd1485f, 0x7fd135c8,  0x7fd12358,
 0x7fd11111,  0x7fd0fef0, 0x7fd0ecf5,  0x7fd0db20,
 0x7fd0c971,  0x7fd0b7e6, 0x7fd0a681,  0x7fd0953f,
 0x7fd08421,  0x7fd07326, 0x7fd0624d,  0x7fd05197,
 0x7fd04104,  0x7fd03091, 0x7fd02040,  0x7fd01010,
};

static const unsigned long long LCONST[] = {
0x3ff0000000000000ULL,  /* DONE = 1.0           */
0x4000000000000000ULL,  /* DTWO = 2.0           */
0x4230000000000000ULL,  /* D2ON36 = 2**36       */
0x7fd0000000000000ULL,  /* D2ON1022 = 2**1022   */
0x3cb0000000000000ULL,  /* D2ONM52 = 2**-52     */
};

#define RET_SC(I)
        px += stridex;
        py += stridey;
        pz += stridez;
        if ( --n <= 0 )
                break;
```

```
127         goto start##I;

129 #define RETURN(I, ret)
130 {
131         pz[0] = (ret);
132         RET_SC(I)
133 }

135 #define PREP(I)
136 hx##I = HI(px);
137 hy##I = HI(py);
138 hx##I &= 0x7fffffff;
139 hy##I &= 0x7fffffff;
140 pz##I = pz;
141 if ( hx##I >= 0x7ff00000 || hy##I >= 0x7ff00000 )       /* |X| or |Y| = Inf,NaN
142 {
143         lx = LO(px);
144         ly = LO(py);
145         x = *px;
146         y = *py;
147         if ( hx##I == 0x7ff00000 && lx == 0 ) res0 = 0.0;               /* |X| =
148         else if ( hy##I == 0x7ff00000 && ly == 0 ) res0 = 0.0;  /* |Y| = Inf */
149         else res0 = fabs(x) + fabs(y);
150
151         RETURN (I, res0)
152 }
153 x##I = *px;
154 y##I = *py;
155 diff0 = hy##I - hx##I;
156 j0 = diff0 >> 31;
157 if ( hx##I < 0x00100000 && hy##I < 0x00100000 ) /* |X| and |Y| = subnormal or ze
158 {
159         lx = LO(px);
160         ly = LO(py);
161         x = x##I;
162         y = y##I;
163
164         if ( (hx##I | hy##I | lx | ly) == 0 )   /* |X| and |Y| = 0 */
165                 RETURN (I, DONE / 0.0)
166
167         x = fabs(x);
168         y = fabs(y);
169
170         x = *(long long*)&x;
171         y = *(long long*)&y;
172
173         x *= D2ONM52;
174         y *= D2ONM52;
175
176         x_hi0 = ( x + D2ON36 ) - D2ON36;
177         y_hi0 = ( y + D2ON36 ) - D2ON36;
178         x_lo0 = x - x_hi0;
179         y_lo0 = y - y_hi0;
180         res0_hi = (x_hi0 * x_hi0 + y_hi0 * y_hi0);
181         res0_lo = ((x + x_hi0) * x_lo0 + (y + y_hi0) * y_lo0);
182
183         dres0 = res0_hi + res0_lo;
184
185         iarr0 = HI(&dres0);
186         iexp0 = iarr0 & 0xfff00000;
187
188         iarr0 = (iarr0 >> 11) & 0x1fc;
189         itbl0 = ((int*)((char*)__vlibm_TBL_rhypot + iarr0))[0];
190         itbl0 -= iexp0;
191         HI(&dd0) = itbl0;                                               \
192         LO(&dd0) = 0;
```



```
193
194         dd0 = dd0 * (DTWO - dd0 * dres0);
195         dd0 = dd0 * (DTWO - dd0 * dres0);
196         dres0 = dd0 * (DTWO - dd0 * dres0);
197
198         HI(&res0) = HI(&dres0) & 0xffffff00;
199         LO(&res0) = 0;
200         res0 += (DONE - res0_hi * res0 - res0_lo * res0) * dres0;
201         res0 = sqrt ( res0 );
202
203         res0 = D2ON1022 * res0;
204         RETURN (I, res0)
205 }
206 j0 = hy##I - (diff0 & j0);
207 j0 &= 0x7ff00000;
208 HI(&scl##I) = 0x7ff00000 - j0;

210 void
211 __vrhypot( int n, double * restrict px, int stridex, double * restrict py,
212         int stridey, double * restrict pz, int stridez )
213 {
214         int             i = 0;
215         double          x, y;
216         double          x_hi0, x_lo0, y_hi0, y_lo0, scl0 = 0;
217         double          x0, y0, res0, dd0;
218         double          res0_hi,res0_lo, dres0;
219         double          x_hi1, x_lo1, y_hi1, y_lo1, scl1 = 0;
220         double          x1 = 0.0L, y1 = 0.0L, res1, dd1;
221         double          res1_hi,res1_lo, dres1;
222         double          x_hi2, x_lo2, y_hi2, y_lo2, scl2 = 0;
223         double          x2, y2, res2, dd2;
224         double          res2_hi,res2_lo, dres2;

226         int             hx0, hy0, j0, diff0;
227         int             iarr0, iexp0, itbl0;
228         int             hx1, hy1;
229         int             iarr1, iexp1, itbl1;
230         int             hx2, hy2;
231         int             iarr2, iexp2, itbl2;

233         int             lx, ly;

235         double          DONE = ((double*)LCONST)[0];
236         double          DTWO = ((double*)LCONST)[1];
237         double          D2ON36 = ((double*)LCONST)[2];
238         double          D2ON1022 = ((double*)LCONST)[3];
239         double          D2ONM52 = ((double*)LCONST)[4];

241         double          *pz0, *pz1 = 0, *pz2;

243         do
244         {
245 start0:
246                 PREP(0)
247                 px += stridex;
248                 py += stridey;
249                 pz += stridez;
250                 i = 1;
251                 if ( --n <= 0 )
252                         break;

254 start1:
255                 PREP(1)
256                 px += stridex;
257                 py += stridey;
258                 pz += stridez;
```

```
259                 i = 2;
260                 if ( --n <= 0 )
261                         break;

263 start2:
264                 PREP(2)

266                 x0 *= scl0;
267                 y0 *= scl0;
268                 x1 *= scl1;
269                 y1 *= scl1;
270                 x2 *= scl2;
271                 y2 *= scl2;

273                 x_hi0 = ( x0 + D2ON36 ) - D2ON36;
274                 y_hi0 = ( y0 + D2ON36 ) - D2ON36;
275                 x_hi1 = ( x1 + D2ON36 ) - D2ON36;
276                 y_hi1 = ( y1 + D2ON36 ) - D2ON36;
277                 x_hi2 = ( x2 + D2ON36 ) - D2ON36;
278                 y_hi2 = ( y2 + D2ON36 ) - D2ON36;
279                 x_lo0 = x0 - x_hi0;
280                 y_lo0 = y0 - y_hi0;
281                 x_lo1 = x1 - x_hi1;
282                 y_lo1 = y1 - y_hi1;
283                 x_lo2 = x2 - x_hi2;
284                 y_lo2 = y2 - y_hi2;
285                 res0_hi = (x_hi0 * x_hi0 + y_hi0 * y_hi0);
286                 res1_hi = (x_hi1 * x_hi1 + y_hi1 * y_hi1);
287                 res2_hi = (x_hi2 * x_hi2 + y_hi2 * y_hi2);
288                 res0_lo = ((x0 + x_hi0) * x_lo0 + (y0 + y_hi0) * y_lo0);
289                 res1_lo = ((x1 + x_hi1) * x_lo1 + (y1 + y_hi1) * y_lo1);
290                 res2_lo = ((x2 + x_hi2) * x_lo2 + (y2 + y_hi2) * y_lo2);

292                 dres0 = res0_hi + res0_lo;
293                 dres1 = res1_hi + res1_lo;
294                 dres2 = res2_hi + res2_lo;

296                 iarr0 = HI(&dres0);
297                 iarr1 = HI(&dres1);
298                 iarr2 = HI(&dres2);
299                 iexp0 = iarr0 & 0xfff00000;
300                 iexp1 = iarr1 & 0xfff00000;
301                 iexp2 = iarr2 & 0xfff00000;

303                 iarr0 = (iarr0 >> 11) & 0x1fc;
304                 iarr1 = (iarr1 >> 11) & 0x1fc;
305                 iarr2 = (iarr2 >> 11) & 0x1fc;
306                 itbl0 = ((int*)((char*)__vlibm_TBL_rhypot + iarr0))[0];
307                 itbl1 = ((int*)((char*)__vlibm_TBL_rhypot + iarr1))[0];
308                 itbl2 = ((int*)((char*)__vlibm_TBL_rhypot + iarr2))[0];
309                 itbl0 -= iexp0;
310                 itbl1 -= iexp1;
311                 itbl2 -= iexp2;
312                 HI(&dd0) = itbl0;
313                 HI(&dd1) = itbl1;
314                 HI(&dd2) = itbl2;
315                 LO(&dd0) = 0;
316                 LO(&dd1) = 0;
317                 LO(&dd2) = 0;

319                 dd0 = dd0 * (DTWO - dd0 * dres0);
320                 dd1 = dd1 * (DTWO - dd1 * dres1);
321                 dd2 = dd2 * (DTWO - dd2 * dres2);
322                 dd0 = dd0 * (DTWO - dd0 * dres0);
323                 dd1 = dd1 * (DTWO - dd1 * dres1);
324                 dd2 = dd2 * (DTWO - dd2 * dres2);
```



```
325                 dres0 = dd0 * (DTWO - dd0 * dres0);
326                 dres1 = dd1 * (DTWO - dd1 * dres1);
327                 dres2 = dd2 * (DTWO - dd2 * dres2);

329                 HI(&res0) = HI(&dres0) & 0xffffff00;
330                 HI(&res1) = HI(&dres1) & 0xffffff00;
331                 HI(&res2) = HI(&dres2) & 0xffffff00;
332                 LO(&res0) = 0;
333                 LO(&res1) = 0;
334                 LO(&res2) = 0;
335                 res0 += (DONE - res0_hi * res0 - res0_lo * res0) * dres0;
336                 res1 += (DONE - res1_hi * res1 - res1_lo * res1) * dres1;
337                 res2 += (DONE - res2_hi * res2 - res2_lo * res2) * dres2;
338                 res0 = sqrt ( res0 );
339                 res1 = sqrt ( res1 );
340                 res2 = sqrt ( res2 );

342                 res0 = scl0 * res0;
343                 res1 = scl1 * res1;
344                 res2 = scl2 * res2;

346                 *pz0 = res0;
347                 *pz1 = res1;
348                 *pz2 = res2;

350                 px += stridex;
351                 py += stridey;
352                 pz += stridez;
353                 i = 0;

355         } while ( --n > 0 );

357         if ( i > 0 )
358         {
359                 x0 *= scl0;
360                 y0 *= scl0;

362                 x_hi0 = ( x0 + D2ON36 ) - D2ON36;
363                 y_hi0 = ( y0 + D2ON36 ) - D2ON36;
364                 x_lo0 = x0 - x_hi0;
365                 y_lo0 = y0 - y_hi0;
366                 res0_hi = (x_hi0 * x_hi0 + y_hi0 * y_hi0);
367                 res0_lo = ((x0 + x_hi0) * x_lo0 + (y0 + y_hi0) * y_lo0);

369                 dres0 = res0_hi + res0_lo;

371                 iarr0 = HI(&dres0);
372                 iexp0 = iarr0 & 0xfff00000;

374                 iarr0 = (iarr0 >> 11) & 0x1fc;
375                 itbl0 = ((int*)((char*)__vlibm_TBL_rhypot + iarr0))[0];
376                 itbl0 -= iexp0;
377                 HI(&dd0) = itbl0;
378                 LO(&dd0) = 0;

380                 dd0 = dd0 * (DTWO - dd0 * dres0);
381                 dd0 = dd0 * (DTWO - dd0 * dres0);
382                 dres0 = dd0 * (DTWO - dd0 * dres0);

384                 HI(&res0) = HI(&dres0) & 0xffffff00;
385                 LO(&res0) = 0;
386                 res0 += (DONE - res0_hi * res0 - res0_lo * res0) * dres0;
387                 res0 = sqrt ( res0 );

389                 res0 = scl0 * res0;
```

```
391                 *pz0 = res0;
393                 if ( i > 1 )
394                 {
395                         x1 *= scl1;
396                         y1 *= scl1;
398                         x_hi1 = ( x1 + D2ON36 ) - D2ON36;
399                         y_hi1 = ( y1 + D2ON36 ) - D2ON36;
400                         x_lo1 = x1 - x_hi1;
401                         y_lo1 = y1 - y_hi1;
402                         res1_hi = (x_hi1 * x_hi1 + y_hi1 * y_hi1);
403                         res1_lo = ((x1 + x_hi1) * x_lo1 + (y1 + y_hi1) * y_lo1);
405                         dres1 = res1_hi + res1_lo;
407                         iarr1 = HI(&dres1);
408                         iexp1 = iarr1 & 0xfff00000;
410                         iarr1 = (iarr1 >> 11) & 0x1fc;
411                         itbl1 = ((int*)((char*)__vlibm_TBL_rhypot + iarr1))[0];
412                         itbl1 -= iexp1;
413                         HI(&dd1) = itbl1;
414                         LO(&dd1) = 0;
416                         dd1 = dd1 * (DTWO - dd1 * dres1);
417                         dd1 = dd1 * (DTWO - dd1 * dres1);
418                         dres1 = dd1 * (DTWO - dd1 * dres1);
420                         HI(&res1) = HI(&dres1) & 0xffffff00;
421                         LO(&res1) = 0;
422                         res1 += (DONE - res1_hi * res1 - res1_lo * res1) * dres1
423                         res1 = sqrt ( res1 );
425                         res1 = scl1 * res1;
427                         *pz1 = res1;
428                 }
429         }
430 }
```

```
**********************************************************
   15324 Sat May 10 12:09:53 2014
new/usr/src/lib/libmvec/common/__vrhypotf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
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 */

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 */
/*
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 */

#include <sys/isa_defs.h>
#include "libm_synonyms.h"
#include "libm_inlines.h"

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/* float rhypotf(float x, float y)
 *
 * Method :
 *      1. Special cases:
 *              for x or y = Inf                        => 0;
 *              for x or y = NaN                        => QNaN;
 *              for x and y = 0                         => +Inf + divide-by-zero
 *      2. Computes d = x * x + y * y;
 *      3. Computes reciprocal square root from:
 *              d = m * 2**n
 *      Where:
 *              m = [0.5, 2),
 *              n = ((exponent + 1) & ~1).
 *      Then:
```



```
 *              rsqrtf(d) = 1/sqrt( m * 2**n ) = (2 ** (-n/2)) * (1/sqrt(m))
 *      4. Computes 1/sqrt(m) from:
 *              1/sqrt(m) = (1/sqrt(m0)) * (1/sqrt(1 + (1/m0)*dm))
 *      Where:
 *              m = m0 + dm,
 *              m0 = 0.5 * (1 + k/64) for m = [0.5,         0.5+127/256), k = [0
 *              m0 = 1.0 * (0 + k/64) for m = [0.5+127/256, 1.0+127/128), k = [6
 *      Then:
 *              1/sqrt(m0), 1/m0 are looked up in a table,
 *              1/sqrt(1 + (1/m0)*dm) is computed using approximation:
 *                      1/sqrt(1 + z) = ((a3 * z + a2) * z + a1) * z + a0
 *                      where z = [-1/64, 1/64].
 *
 * Accuracy:
 *      The maximum relative error for the approximating
 *      polynomial is 2**(-27.87).
 *      Maximum error observed: less than 0.535 ulp after 3.000.000.000
 *      results.
 */

#pragma align 32 (__vlibm_TBL_rhypotf)

static const double __vlibm_TBL_rhypotf[] = {
/*
 i = [0,63]
 TBL[2*i+0] = 1.0 / (*(double*)&(0x3ff0000000000000LL + (i << 46)));
 TBL[2*i+1] = (double)(0.5/sqrtl(2) / sqrtl(*(double*)&(0x3ff0000000000000LL + (
 TBL[128+2*i+0] = 1.0 / (*(double*)&(0x3ff0000000000000LL + (i << 46)));
 TBL[128+2*i+1] = (double)(0.25 / sqrtl(*(double*)&(0x3ff0000000000000LL + (i <<
*/
 1.0000000000000000000e+00, 3.5355339059327378637e-01,
 9.8461538461538467004e-01, 3.5082320772281166965e-01,
 9.6969696969696972388e-01, 3.4815531191139570399e-01,
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 9.2753623188405798228e-01, 3.4050261230349943009e-01,
 9.1428571428571425717e-01, 3.3806170189140660742e-01,
 9.0140845070422537244e-01, 3.3567254331867563133e-01,
 8.8888888888888883955e-01, 3.3333333333333331483e-01,
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 7.0329670329670335160e-01, 2.9649972666444046610e-01,
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 6.1538461538461541878e-01, 1.9611613513818404453e-01,
 6.0952380952380957879e-01, 1.9518001458970662965e-01,
 6.0377358490566035432e-01, 1.9425717247145282696e-01,
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 5.0793650793650790831e-01, 1.7817416127494958844e-01,
 5.0393700787401574104e-01, 1.7747130188322274291e-01,
};

#define fabsf   __fabsf

extern float fabsf( float );

static const double
        A0 = 9.99999997962321453275e-01,
        A1 =-4.99999981660775806600e-01,
        A2 = 3.75066768969515586277e-01,
        A3 =-3.12560092408808548438e-01;

static void
__vrhypotf_n( int n, float * restrict px, int stridex, float * restrict py,
        int stridey, float * restrict pz, int stridez );

#pragma no_inline(__vrhypotf_n)

#define RETURN(ret)                                                     \
{                                                                       \
        *pz = (ret);                                                    \
        pz += stridez;                                                  \
        if ( n_n == 0 )                                                 \
        {                                                               \
                spx = px; spy = py; spz = pz;                           \
                ay0 = *(int*)py;                                        \
                continue;                                               \
        }                                                               \
        n--;                                                            \
        break;                                                          \
}


void
__vrhypotf( int n, float * restrict px, int stridex, float * restrict py,
        int stridey, float * restrict pz, int stridez )
{
        float           *spx, *spy, *spz;
        int             ax0, ay0, n_n;
        float           res, x0, y0;
```

```
261         while ( n > 1 )
262         {
263                 n_n = 0;
264                 spx = px;
265                 spy = py;
266                 spz = pz;
267                 ax0 = *(int*)px;
268                 ay0 = *(int*)py;
269                 for ( ; n > 1 ; n-- )
270                 {
271                         ax0 &= 0x7fffffff;
272                         ay0 &= 0x7fffffff;

274                         px += stridex;

276                         if ( ax0 >= 0x7f800000 || ay0 >= 0x7f800000 )   /* X or
277                         {
278                                 x0 = *(px - stridex);
279                                 y0 = *py;
280                                 res = fabsf(x0) + fabsf(y0);
281                                 if( ax0 == 0x7f800000 ) res = 0.0f;
282                                 else if( ay0 == 0x7f800000 ) res = 0.0f;
283                                 ax0 = *(int*)px;
284                                 py += stridey;
285                                 RETURN ( res )
286                         }
287                         ax0 = *(int*)px;
288                         py += stridey;
289                         if ( ay0 == 0 )         /* Y = 0        */
290                         {
291                                 int tx = *(int*)(px - stridex) & 0x7fffffff;
292                                 if ( tx == 0 )  /* X = 0        */
293                                 {
294                                         RETURN ( 1.0f / 0.0f )
295                                 }
296                         }
297                         pz += stridez;
298                         n_n++;
299                         ay0 = *(int*)py;
300                 }
301                 if ( n_n > 0 )
302                         __vrhypotf_n( n_n, spx, stridex, spy, stridey, spz, stri
303         }
304         if ( n > 0 )
305         {
306                 ax0 = *(int*)px;
307                 ay0 = *(int*)py;
308                 x0 = *px;
309                 y0 = *py;

311                 ax0 &= 0x7fffffff;
312                 ay0 &= 0x7fffffff;

314                 if ( ax0 >= 0x7f800000 || ay0 >= 0x7f800000 )   /* X or Y = NaN
315                 {
316                         res = fabsf(x0) + fabsf(y0);
317                         if( ax0 == 0x7f800000 ) res = 0.0f;
318                         else if( ay0 == 0x7f800000 ) res = 0.0f;
319                         *pz = res;
320                 }
321                 else if ( ax0 == 0 && ay0 == 0 )        /* X and Y = 0  */
322                 {
323                         *pz = 1.0f / 0.0f;
324                 }
325                 else
```



```
326                 {
327                         double          xx0, res0, hyp0, h_hi0 = 0, dbase0 = 0;
328                         int             ibase0, si0, hyp0h;

330                         hyp0 = x0 * (double)x0 + y0 * (double)y0;

332                         ibase0 = HI(&hyp0);

334                         HI(&dbase0) = (0x60000000 - ((ibase0 & 0x7fe00000) >> 1)

336                         hyp0h = (ibase0 & 0x000fffff) | 0x3ff00000;
337                         HI(&hyp0) = hyp0h;
338                         HI(&h_hi0) = hyp0h & 0x7fffc000;

340                         ibase0 >>= 10;
341                         si0 = ibase0 & 0x7f0;
342                         xx0 = ((double*)((char*)__vlibm_TBL_rhypotf + si0))[0];

344                         xx0 = (hyp0 - h_hi0) * xx0;
345                         res0 = ((double*)((char*)__vlibm_TBL_rhypotf + si0))[1];
346                         res0 *= (((A3 * xx0 + A2) * xx0 + A1) * xx0 + A0);
347                         res0 *= dbase0;
348                         *pz = res0;
349                 }
350         }
351 }

353 static void
354 __vrhypotf_n( int n, float * restrict px, int stridex, float * restrict py,
355         int stridey, float * restrict pz, int stridez )
356 {
357         double          xx0, res0, hyp0, h_hi0 = 0, dbase0 = 0;
358         double          xx1, res1, hyp1, h_hi1 = 0, dbase1 = 0;
359         double          xx2, res2, hyp2, h_hi2 = 0, dbase2 = 0;
360         float           x0, y0;
361         float           x1, y1;
362         float           x2, y2;
363         int             ibase0, si0, hyp0h;
364         int             ibase1, si1, hyp1h;
365         int             ibase2, si2, hyp2h;

367         for ( ; n > 2 ; n -= 3 )
368         {
369                 x0 = *px;
370                 px += stridex;
371                 x1 = *px;
372                 px += stridex;
373                 x2 = *px;
374                 px += stridex;

376                 y0 = *py;
377                 py += stridey;
378                 y1 = *py;
379                 py += stridey;
380                 y2 = *py;
381                 py += stridey;

383                 hyp0 = x0 * (double)x0 + y0 * (double)y0;
384                 hyp1 = x1 * (double)x1 + y1 * (double)y1;
385                 hyp2 = x2 * (double)x2 + y2 * (double)y2;

387                 ibase0 = HI(&hyp0);
388                 ibase1 = HI(&hyp1);
389                 ibase2 = HI(&hyp2);

391                 HI(&dbase0) = (0x60000000 - ((ibase0 & 0x7fe00000) >> 1));
```

```
392                 HI(&dbase1) = (0x60000000 - ((ibase1 & 0x7fe00000) >> 1));
393                 HI(&dbase2) = (0x60000000 - ((ibase2 & 0x7fe00000) >> 1));

395                 hyp0h = (ibase0 & 0x000fffff) | 0x3ff00000;
396                 hyp1h = (ibase1 & 0x000fffff) | 0x3ff00000;
397                 hyp2h = (ibase2 & 0x000fffff) | 0x3ff00000;
398                 HI(&hyp0) = hyp0h;
399                 HI(&hyp1) = hyp1h;
400                 HI(&hyp2) = hyp2h;
401                 HI(&h_hi0) = hyp0h & 0x7fffc000;
402                 HI(&h_hi1) = hyp1h & 0x7fffc000;
403                 HI(&h_hi2) = hyp2h & 0x7fffc000;

405                 ibase0 >>= 10;
406                 ibase1 >>= 10;
407                 ibase2 >>= 10;
408                 si0 = ibase0 & 0x7f0;
409                 si1 = ibase1 & 0x7f0;
410                 si2 = ibase2 & 0x7f0;
411                 xx0 = ((double*)((char*)__vlibm_TBL_rhypotf + si0))[0];
412                 xx1 = ((double*)((char*)__vlibm_TBL_rhypotf + si1))[0];
413                 xx2 = ((double*)((char*)__vlibm_TBL_rhypotf + si2))[0];

415                 xx0 = (hyp0 - h_hi0) * xx0;
416                 xx1 = (hyp1 - h_hi1) * xx1;
417                 xx2 = (hyp2 - h_hi2) * xx2;
418                 res0 = ((double*)((char*)__vlibm_TBL_rhypotf + si0))[1];
419                 res1 = ((double*)((char*)__vlibm_TBL_rhypotf + si1))[1];
420                 res2 = ((double*)((char*)__vlibm_TBL_rhypotf + si2))[1];
421                 res0 *= (((A3 * xx0 + A2) * xx0 + A1) * xx0 + A0);
422                 res1 *= (((A3 * xx1 + A2) * xx1 + A1) * xx1 + A0);
423                 res2 *= (((A3 * xx2 + A2) * xx2 + A1) * xx2 + A0);
424                 res0 *= dbase0;
425                 res1 *= dbase1;
426                 res2 *= dbase2;
427                 *pz = res0;
428                 pz += stridez;
429                 *pz = res1;
430                 pz += stridez;
431                 *pz = res2;
432                 pz += stridez;
433         }

435         for ( ; n > 0 ; n-- )
436         {
437                 x0 = *px;
438                 px += stridex;

440                 y0 = *py;
441                 py += stridey;

443                 hyp0 = x0 * (double)x0 + y0 * (double)y0;

445                 ibase0 = HI(&hyp0);

447                 HI(&dbase0) = (0x60000000 - ((ibase0 & 0x7fe00000) >> 1));

449                 hyp0h = (ibase0 & 0x000fffff) | 0x3ff00000;
450                 HI(&hyp0) = hyp0h;
451                 HI(&h_hi0) = hyp0h & 0x7fffc000;

453                 ibase0 >>= 10;
454                 si0 = ibase0 & 0x7f0;
455                 xx0 = ((double*)((char*)__vlibm_TBL_rhypotf + si0))[0];

457                 xx0 = (hyp0 - h_hi0) * xx0;
```



```
458                 res0 = ((double*)((char*)__vlibm_TBL_rhypotf + si0))[1];
459                 res0 *= (((A3 * xx0 + A2) * xx0 + A1) * xx0 + A0);
460                 res0 *= dbase0;
461                 *pz = res0;
462                 pz += stridez;
463         }
464 }
```

```
**********************************************************
   10547 Sat May 10 12:09:53 2014
new/usr/src/lib/libmvec/common/__vrsqrt.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 *
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 */

/*
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 */
/*
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 */

#include <sys/isa_defs.h>
#include "libm_synonyms.h"
#include "libm_inlines.h"

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/* double rsqrt(double x)
 *
 * Method :
 *      1. Special cases:
 *              for x = NaN                             => QNaN;
 *              for x = +Inf                            => 0;
 *              for x is negative, -Inf                 => QNaN + invalid;
 *              for x = +0                              => +Inf + divide-by-zero
 *              for x = -0                              => -Inf + divide-by-zero
 *      2. Computes reciprocal square root from:
 *              x = m * 2**n
 *      Where:
 *              m = [0.5, 2),
 *              n = ((exponent + 1) & ~1).
```



```
 *      Then:
 *              rsqrt(x) = 1/sqrt( m * 2**n ) = (2 ** (-n/2)) * (1/sqrt(m))
 *      2. Computes 1/sqrt(m) from:
 *              1/sqrt(m) = (1/sqrt(m0)) * (1/sqrt(1 + (1/m0)*dm))
 *      Where:
 *              m = m0 + dm,
 *              m0 = 0.5 * (1 + k/64) for m = [0.5,         0.5+127/256), k = [0
 *              m0 = 1.0 * (0 + k/64) for m = [0.5+127/256, 1.0+127/128), k = [6
 *              m0 = 2.0              for m = [1.0+127/128, 2.0),         k = 12
 *      Then:
 *              1/sqrt(m0) is looked up in a table,
 *              1/m0 is computed as (1/sqrt(m0)) * (1/sqrt(m0)).
 *              1/sqrt(1 + (1/m0)*dm) is computed using approximation:
 *                      1/sqrt(1 + z) = (((((a6 * z + a5) * z + a4) * z + a3)
 *                                                      * z + a2) * z + a1) * z + a0
 *                      where z = [-1/128, 1/128].
 *
 * Accuracy:
 *      The maximum relative error for the approximating
 *      polynomial is 2**(-56.26).
 *      Maximum error observed: less than 0.563 ulp after 1.500.000.000
 *      results.
 */

#define sqrt __sqrt

extern double sqrt ( double );
extern const double __vlibm_TBL_rsqrt[];

static void
__vrsqrt_n( int n, double * restrict px, int stridex, double * restrict py, int

#pragma no_inline(__vrsqrt_n)

#define RETURN(ret)                                                     \
{                                                                       \
        *py = (ret);                                                    \
        py += stridey;                                                  \
        if ( n_n == 0 )                                                 \
        {                                                               \
                spx = px; spy = py;                                     \
                hx = HI(px);                                            \
                continue;                                               \
        }                                                               \
        n--;                                                            \
        break;                                                          \
}

static const double
        DONE = 1.0,
        K1 = -5.00000000000005209867e-01,
        K2 =  3.75000000000004884257e-01,
        K3 = -3.12499999317136886551e-01,
        K4 =  2.73437499359815081532e-01,
        K5 = -2.46116125605037803130e-01,
        K6 =  2.25606914648617522896e-01;

void
__vrsqrt( int n, double * restrict px, int stridex, double * restrict py, int st
{
        double          *spx, *spy;
        int             ax, lx, hx, n_n;
        double          res;

        while ( n > 1 )
        {
```

```
128                 n_n = 0;
129                 spx = px;
130                 spy = py;
131                 hx = HI(px);
132                 for ( ; n > 1 ; n--)
133                 {
134                         px += stridex;
135                         if ( hx >= 0x7ff00000 )         /* X = NaN or Inf
136                         {
137                                 res = *(px - stridex);
138                                 RETURN ( DONE / res )
139                         }
141                         py += stridey;
143                         if ( hx < 0x00100000 )          /* X = denormal, zero or
144                         {
145                                 py -= stridey;
146                                 ax = hx & 0x7fffffff;
147                                 lx = LO((px - stridex));
148                                 res = *(px - stridex);
150                                 if ( (ax | lx) == 0 )   /* |X| = zero   */
151                                 {
152                                         RETURN ( DONE / res )
153                                 }
154                                 else if ( hx >= 0 )     /* X = denormal */
155                                 {
156                                         double          res_c0, dsqrt_exp0;
157                                         int             ind0, sqrt_exp0;
158                                         double          xx0, dexp_hi0, dexp_lo0;
159                                         int             hx0, resh0, res_ch0;
161                                         res = *(long long*)&res;
163                                         hx0 = HI(&res);
164                                         sqrt_exp0 = (0x817 - (hx0 >> 21)) << 20;
165                                         ind0 = (((hx0 >> 10) & 0x7f8) + 8) & -16
167                                         resh0 = (hx0 & 0x001fffff) | 0x3fe00000;
168                                         res_ch0 = (resh0 + 0x00002000) & 0x7fffc
169                                         HI(&res) = resh0;
170                                         HI(&res_c0) = res_ch0;
171                                         LO(&res_c0) = 0;
173                                         dexp_hi0 = ((double*)((char*)__vlibm_TBL
174                                         dexp_lo0 = ((double*)((char*)__vlibm_TBL
175                                         xx0 = dexp_hi0 * dexp_hi0;
176                                         xx0 = (res - res_c0) * xx0;
177                                         res = (((((K6 * xx0 + K5) * xx0 + K4) *
179                                         res = dexp_hi0 * res + dexp_lo0 + dexp_h
181                                         HI(&dsqrt_exp0) = sqrt_exp0;
182                                         LO(&dsqrt_exp0) = 0;
183                                         res *= dsqrt_exp0;
185                                         RETURN ( res )
186                                 }
187                                 else    /* X = negative */
188                                 {
189                                         RETURN ( sqrt(res) )
190                                 }
191                         }
192                         n_n++;
193                         hx = HI(px);
```



```
194                 }
195                 if ( n_n > 0 )
196                         __vrsqrt_n( n_n, spx, stridex, spy, stridey );
197         }
198         if ( n > 0 )
199         {
200                 hx = HI(px);
202                 if ( hx >= 0x7ff00000 )         /* X = NaN or Inf       */
203                 {
204                         res = *px;
205                         *py = DONE / res;
206                 }
207                 else if ( hx < 0x00100000 )     /* X = denormal, zero or negativ
208                 {
209                         ax = hx & 0x7fffffff;
210                         lx = LO(px);
211                         res = *px;
213                         if ( (ax | lx) == 0 )   /* |X| = zero   */
214                         {
215                                 *py = DONE / res;
216                         }
217                         else if ( hx >= 0 )     /* X = denormal */
218                         {
219                                 double          res_c0, dsqrt_exp0;
220                                 int             ind0, sqrt_exp0;
221                                 double          xx0, dexp_hi0, dexp_lo0;
222                                 int             hx0, resh0, res_ch0;
224                                 res = *(long long*)&res;
226                                 hx0 = HI(&res);
227                                 sqrt_exp0 = (0x817 - (hx0 >> 21)) << 20;
228                                 ind0 = (((hx0 >> 10) & 0x7f8) + 8) & -16;
230                                 resh0 = (hx0 & 0x001fffff) | 0x3fe00000;
231                                 res_ch0 = (resh0 + 0x00002000) & 0x7fffc000;
232                                 HI(&res) = resh0;
233                                 HI(&res_c0) = res_ch0;
234                                 LO(&res_c0) = 0;
236                                 dexp_hi0 = ((double*)((char*)__vlibm_TBL_rsqrt +
237                                 dexp_lo0 = ((double*)((char*)__vlibm_TBL_rsqrt +
238                                 xx0 = dexp_hi0 * dexp_hi0;
239                                 xx0 = (res - res_c0) * xx0;
240                                 res = (((((K6 * xx0 + K5) * xx0 + K4) * xx0 + K3
242                                 res = dexp_hi0 * res + dexp_lo0 + dexp_hi0;
244                                 HI(&dsqrt_exp0) = sqrt_exp0;
245                                 LO(&dsqrt_exp0) = 0;
246                                 res *= dsqrt_exp0;
248                                 *py = res;
249                         }
250                         else    /* X = negative */
251                         {
252                                 *py = sqrt(res);
253                         }
254                 }
255                 else
256                 {
257                         double          res_c0, dsqrt_exp0;
258                         int             ind0, sqrt_exp0;
259                         double          xx0, dexp_hi0, dexp_lo0;
```

```
260                         int             resh0, res_ch0;

262                         sqrt_exp0 = (0x5fe - (hx >> 21)) << 20;
263                         ind0 = (((hx >> 10) & 0x7f8) + 8) & -16;

265                         resh0 = (hx & 0x001fffff) | 0x3fe00000;
266                         res_ch0 = (resh0 + 0x00002000) & 0x7fffc000;
267                         HI(&res) = resh0;
268                         LO(&res) = LO(px);
269                         HI(&res_c0) = res_ch0;
270                         LO(&res_c0) = 0;

272                         dexp_hi0 = ((double*)((char*)__vlibm_TBL_rsqrt + ind0))[
273                         dexp_lo0 = ((double*)((char*)__vlibm_TBL_rsqrt + ind0))[
274                         xx0 = dexp_hi0 * dexp_hi0;
275                         xx0 = (res - res_c0) * xx0;
276                         res = (((((K6 * xx0 + K5) * xx0 + K4) * xx0 + K3) * xx0

278                         res = dexp_hi0 * res + dexp_lo0 + dexp_hi0;

280                         HI(&dsqrt_exp0) = sqrt_exp0;
281                         LO(&dsqrt_exp0) = 0;
282                         res *= dsqrt_exp0;

284                         *py = res;
285                 }
286         }
287 }

289 static void
290 __vrsqrt_n( int n, double * restrict px, int stridex, double * restrict py, int
291 {
292         double          res0, res_c0, dsqrt_exp0;
293         double          res1, res_c1, dsqrt_exp1;
294         double          res2, res_c2, dsqrt_exp2;
295         int             ind0, sqrt_exp0;
296         int             ind1, sqrt_exp1;
297         int             ind2, sqrt_exp2;
298         double          xx0, dexp_hi0, dexp_lo0;
299         double          xx1, dexp_hi1, dexp_lo1;
300         double          xx2, dexp_hi2, dexp_lo2;
301         int             hx0, resh0, res_ch0;
302         int             hx1, resh1, res_ch1;
303         int             hx2, resh2, res_ch2;

305         LO(&dsqrt_exp0) = 0;
306         LO(&dsqrt_exp1) = 0;
307         LO(&dsqrt_exp2) = 0;
308         LO(&res_c0) = 0;
309         LO(&res_c1) = 0;
310         LO(&res_c2) = 0;

312         for( ; n > 2 ; n -= 3 )
313         {
314                 hx0 = HI(px);
315                 LO(&res0) = LO(px);
316                 px += stridex;

318                 hx1 = HI(px);
319                 LO(&res1) = LO(px);
320                 px += stridex;

322                 hx2 = HI(px);
323                 LO(&res2) = LO(px);
324                 px += stridex;
```



```
326                 sqrt_exp0 = (0x5fe - (hx0 >> 21)) << 20;
327                 sqrt_exp1 = (0x5fe - (hx1 >> 21)) << 20;
328                 sqrt_exp2 = (0x5fe - (hx2 >> 21)) << 20;
329                 ind0 = (((hx0 >> 10) & 0x7f8) + 8) & -16;
330                 ind1 = (((hx1 >> 10) & 0x7f8) + 8) & -16;
331                 ind2 = (((hx2 >> 10) & 0x7f8) + 8) & -16;

333                 resh0 = (hx0 & 0x001fffff) | 0x3fe00000;
334                 resh1 = (hx1 & 0x001fffff) | 0x3fe00000;
335                 resh2 = (hx2 & 0x001fffff) | 0x3fe00000;
336                 res_ch0 = (resh0 + 0x00002000) & 0x7fffc000;
337                 res_ch1 = (resh1 + 0x00002000) & 0x7fffc000;
338                 res_ch2 = (resh2 + 0x00002000) & 0x7fffc000;
339                 HI(&res0) = resh0;
340                 HI(&res1) = resh1;
341                 HI(&res2) = resh2;
342                 HI(&res_c0) = res_ch0;
343                 HI(&res_c1) = res_ch1;
344                 HI(&res_c2) = res_ch2;

346                 dexp_hi0 = ((double*)((char*)__vlibm_TBL_rsqrt + ind0))[0];
347                 dexp_hi1 = ((double*)((char*)__vlibm_TBL_rsqrt + ind1))[0];
348                 dexp_hi2 = ((double*)((char*)__vlibm_TBL_rsqrt + ind2))[0];
349                 dexp_lo0 = ((double*)((char*)__vlibm_TBL_rsqrt + ind0))[1];
350                 dexp_lo1 = ((double*)((char*)__vlibm_TBL_rsqrt + ind1))[1];
351                 dexp_lo2 = ((double*)((char*)__vlibm_TBL_rsqrt + ind2))[1];
352                 xx0 = dexp_hi0 * dexp_hi0;
353                 xx1 = dexp_hi1 * dexp_hi1;
354                 xx2 = dexp_hi2 * dexp_hi2;
355                 xx0 = (res0 - res_c0) * xx0;
356                 xx1 = (res1 - res_c1) * xx1;
357                 xx2 = (res2 - res_c2) * xx2;
358                 res0 = (((((K6 * xx0 + K5) * xx0 + K4) * xx0 + K3) * xx0 + K2) *
359                 res1 = (((((K6 * xx1 + K5) * xx1 + K4) * xx1 + K3) * xx1 + K2) *
360                 res2 = (((((K6 * xx2 + K5) * xx2 + K4) * xx2 + K3) * xx2 + K2) *

362                 res0 = dexp_hi0 * res0 + dexp_lo0 + dexp_hi0;
363                 res1 = dexp_hi1 * res1 + dexp_lo1 + dexp_hi1;
364                 res2 = dexp_hi2 * res2 + dexp_lo2 + dexp_hi2;

366                 HI(&dsqrt_exp0) = sqrt_exp0;
367                 HI(&dsqrt_exp1) = sqrt_exp1;
368                 HI(&dsqrt_exp2) = sqrt_exp2;
369                 res0 *= dsqrt_exp0;
370                 res1 *= dsqrt_exp1;
371                 res2 *= dsqrt_exp2;

373                 *py = res0;
374                 py += stridey;

376                 *py = res1;
377                 py += stridey;

379                 *py = res2;
380                 py += stridey;
381         }

383         for( ; n > 0 ; n-- )
384         {
385                 hx0 = HI(px);

387                 sqrt_exp0 = (0x5fe - (hx0 >> 21)) << 20;
388                 ind0 = (((hx0 >> 10) & 0x7f8) + 8) & -16;

390                 resh0 = (hx0 & 0x001fffff) | 0x3fe00000;
391                 res_ch0 = (resh0 + 0x00002000) & 0x7fffc000;
```

```
392                 HI(&res0) = resh0;
393                 LO(&res0) = LO(px);
394                 HI(&res_c0) = res_ch0;
395                 LO(&res_c0) = 0;

397                 px += stridex;

399                 dexp_hi0 = ((double*)((char*)__vlibm_TBL_rsqrt + ind0))[0];
400                 dexp_lo0 = ((double*)((char*)__vlibm_TBL_rsqrt + ind0))[1];
401                 xx0 = dexp_hi0 * dexp_hi0;
402                 xx0 = (res0 - res_c0) * xx0;
403                 res0 = (((((K6 * xx0 + K5) * xx0 + K4) * xx0 + K3) * xx0 + K2) *

405                 res0 = dexp_hi0 * res0 + dexp_lo0 + dexp_hi0;

407                 HI(&dsqrt_exp0) = sqrt_exp0;
408                 LO(&dsqrt_exp0) = 0;
409                 res0 *= dsqrt_exp0;

411                 *py = res0;
412                 py += stridey;
413         }
414 }
```

```
**********************************************************
   16867 Sat May 10 12:09:53 2014
new/usr/src/lib/libmvec/common/__vrsqrtf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 *
 * CDDL HEADER END
 */

/*
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 */
/*
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 * Use is subject to license terms.
 */

#include "libm_synonyms.h"
#include "libm_inlines.h"

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/* float rsqrtf(float x)
 *
 * Method :
 *      1. Special cases:
 *              for x = NaN                             => QNaN;
 *              for x = +Inf                            => 0;
 *              for x is negative, -Inf                 => QNaN + invalid;
 *              for x = +0                              => +Inf + divide-by-zero
 *              for x = -0                              => -Inf + divide-by-zero
 *      2. Computes reciprocal square root from:
 *              x = m * 2**n
 *      Where:
 *              m = [0.5, 2),
 *              n = ((exponent + 1) & ~1).
 *      Then:
 *              rsqrtf(x) = 1/sqrt( m * 2**n ) = (2 ** (-n/2)) * (1/sqrt(m))
 *      2. Computes 1/sqrt(m) from:
 *              1/sqrt(m) = (1/sqrt(m0)) * (1/sqrt(1 + (1/m0)*dm))
 *      Where:
 *              m = m0 + dm,
 *              m0 = 0.5 * (1 + k/64) for m = [0.5,         0.5+127/256), k = [0
 *              m0 = 1.0 * (0 + k/64) for m = [0.5+127/256, 1.0+127/128), k = [6
 *      Then:
```



```
 *              1/sqrt(m0), 1/m0 are looked up in a table,
 *              1/sqrt(1 + (1/m0)*dm) is computed using approximation:
 *                      1/sqrt(1 + z) = ((a3 * z + a2) * z + a1) * z + a0
 *                      where z = [-1/64, 1/64].
 *
 * Accuracy:
 *      The maximum relative error for the approximating
 *      polynomial is 2**(-27.87).
 *      Maximum error observed: less than 0.534 ulp for the
 *      whole float type range.
 */

#define sqrtf __sqrtf

extern float sqrtf( float );

static const double __TBL_rsqrtf[] = {
/*
i = [0,63]
 TBL[2*i  ] = 1 / (*(double*)&(0x3fe0000000000000ULL + (i << 46))) * 2**-24;
 TBL[2*i+1] = 1 / sqrtl(*(double*)&(0x3fe0000000000000ULL + (i << 46)));
i = [64,127]
 TBL[2*i  ] = 1 / (*(double*)&(0x3fe0000000000000ULL + (i << 46))) * 2**-23;
 TBL[2*i+1] = 1 / sqrtl(*(double*)&(0x3fe0000000000000ULL + (i << 46)));
*/
 1.192092895507812500e-07, 1.414213562373095145e+00,
 1.173753004807692372e-07, 1.403292830891246678e+00,
 1.155968868371212153e-07, 1.392621247645582816e+00,
 1.138715601679104455e-07, 1.382189480930176239e+00,
 1.121969784007352925e-07, 1.371988681140070776e+00,
 1.105709352355072477e-07, 1.362010449213997720e+00,
 1.089913504464285680e-07, 1.352246807565626429e+00,
 1.074562610035211291e-07, 1.342690173274702525e+00,
 1.059638129340277719e-07, 1.333333333333333259e+00,
 1.045122538527397202e-07, 1.324169421763788712e+00,
 1.030999260979729787e-07, 1.315191898442858331e+00,
 1.017252604166666732e-07, 1.306394529484361744e+00,
 1.003867701480263102e-07, 1.297771369046100353e+00,
 9.908304586038961692e-08, 1.289316742440608454e+00,
 9.781275040064102224e-08, 1.281025230440697049e+00,
 9.657461431962025165e-08, 1.272891654681168160e+00,
 9.536743164062500529e-08, 1.264911064067351764e+00,
 9.419005594135801946e-08, 1.257078722109417734e+00,
 9.304139672256097883e-08, 1.249390095108848575e+00,
 9.192041603915663129e-08, 1.241840841130132489e+00,
 9.082612537202380448e-08, 1.234426799696735299e+00,
 8.975758272058823404e-08, 1.227143982155792789e+00,
 8.871388989825581272e-08, 1.219988562660837327e+00,
 8.769419001436781487e-08, 1.212956869726245390e+00,
 8.669766512784091149e-08, 1.206045378311054516e+00,
 8.572353405898876166e-08, 1.199250702393378276e+00,
 8.477105034722225457e-08, 1.192569587999887881e+00,
 8.383950034340659951e-08, 1.185998906657761864e+00,
 8.292820142663043248e-08, 1.179535649239177086e+00,
 8.203650033602151192e-08, 1.173176920170826420e+00,
 8.116377160904255122e-08, 1.166919931983156466e+00,
 8.030941611842105082e-08, 1.160762000176018604e+00,
 7.947285970052082892e-08, 1.154700538379251462e+00,
 7.865355186855669953e-08, 1.148733053788381086e+00,
 7.785096460459183052e-08, 1.142857142857142793e+00,
 7.706459122474748129e-08, 1.137070487229922211e+00,
 7.629394531250000158e-08, 1.131370849898476027e+00,
 7.553855971534653557e-08, 1.125756071568466909e+00,
 7.479798560049019504e-08, 1.120224067224077489e+00,
 7.407179156553397415e-08, 1.114772822866588297e+00,
 7.335956280048077330e-08, 1.109400392450458294e+00,
```

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 7.26609002976190541 73e-08, 1.1041048949477667573e+00,
 7.1975420106132072725e-08, 1.0988845115895122806e+00,
 7.1302752628504667579e-08, 1.0937374832394612945e+00,
 7.0642541956018514597e-08, 1.0886621079036347126e+00,
 6.9994445240825691959e-08, 1.0836567383657542685e+00,
 6.9358132102272723904e-08, 1.0787197799411873955e+00,
 6.8733284065315314719e-08, 1.0738496883424388795e+00,
 6.8119594029017853361e-08, 1.0690449676496975862e+00,
 6.7516765763274335346e-08, 1.0643041683803828867e+00,
 6.6924513432017540145e-08, 1.0596258856520350822e+00,
 6.6342561141304348632e-08, 1.0550087574332591700e+00,
 6.5770642510775861156e-08, 1.0504514628777803509e+00,
 6.5208500267094023655e-08, 1.0459527207369814228e+00,
 6.4655885858050847233e-08, 1.0415112878465908608e+00,
 6.4112559086134451001e-08, 1.0371259576834630511e+00,
 6.3578287760416665784e-08, 1.0327955589886446131e+00,
 6.3052847365702481089e-08, 1.0285189544531601058e+00,
 6.2536020747950822927e-08, 1.0242950394631678002e+00,
 6.2027597815040656970e-08, 1.0201227409013413627e+00,
 6.1527375252016127325e-08, 1.0160010160015240377e+00,
 6.1035156250000001271e-08, 1.0119288512538813229e+00,
 6.0550750248015869655e-08, 1.0079052613579393416e+00,
 6.0073972687007873182e-08, 1.0039292882210537616e+00,
 1.1920928955078125000e-07, 1.0000000000000000000e+00,
 1.1737530048076923728e-07, 9.9227787671366762812e-01,
 1.1559688683712121533e-07, 9.8473192783466190203e-01,
 1.1387156016791044559e-07, 9.7735555485044178781e-01,
 1.1219697840073529256e-07, 9.7014250014533187638e-01,
 1.1057093523550724772e-07, 9.6308682468615358641e-01,
 1.0899135044642856803e-07, 9.5618288746751489704e-01,
 1.0745626100352112918e-07, 9.4942532655508271588e-01,
 1.0596381293402777190e-07, 9.4280904158206335630e-01,
 1.0451225385273972023e-07, 9.3632917756904454620e-01,
 1.0309992609797297870e-07, 9.2998110995055427441e-01,
 1.0172526041666667320e-07, 9.2376043070340119190e-01,
 1.0038677014802631022e-07, 9.1766293548224708854e-01,
 9.9083045860389616921e-08, 9.1168461167710357351e-01,
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 9.6574614319620251657e-08, 9.0007032074081916306e-01,
 9.5367431640625005294e-08, 8.9442719099991585541e-01,
 9.4190055941358019463e-08, 8.8888888888888883955e-01,
 9.3041396722560978838e-08, 8.8345220859877238162e-01,
 9.1920416039156631290e-08, 8.7811407991752277180e-01,
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 8.9757582720588234048e-08, 8.6772183127462465535e-01,
 8.8713889898255812722e-08, 8.6266218562750729415e-01,
 8.7694190014367814875e-08, 8.5769002787023584933e-01,
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 7.4797985600490195040e-08, 7.9211803438133943089e-01,
 7.4071791565533974158e-08, 7.8826342253143455441e-01,
 7.3359562800480773303e-08, 7.8446454055273617811e-01,
 7.2660900297619054173e-08, 7.8072005835882651859e-01,
 7.1975420106132072725e-08, 7.7702868988581130782e-01,
```



```
 7.1302752628504667579e-08, 7.7338191923653082632e-01,
 7.0642541956018514597e-08, 7.6980035891950104876e-01,
 6.9994445240825691959e-08, 7.6626102817692109959e-01,
 6.9358132102272723904e-08, 7.6277007139647390321e-01,
 6.8733284065315314719e-08, 7.5932639660199918730e-01,
 6.8119594029017853361e-08, 7.5592894601845450619e-01,
 6.7516765763274335346e-08, 7.5257669470687782454e-01,
 6.6924513432017540145e-08, 7.4926864926535519107e-01,
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 6.4655885858050847233e-08, 7.3645969431865865307e-01,
 6.4112559086134451001e-08, 7.3335879762256905856e-01,
 6.3578287760416665784e-08, 7.3029674334022143256e-01,
 6.3052847365702481089e-08, 7.2727272727272729291e-01,
 6.2536020747950822927e-08, 7.2428596834014824513e-01,
 6.2027597815040656970e-08, 7.2133570773394584119e-01,
 6.1527375252016127325e-08, 7.1842120810709964029e-01,
 6.1035156250000001271e-08, 7.1554175279993270653e-01,
 6.0550750248015869655e-08, 7.1269664509979835376e-01,
 6.0073972687007873182e-08, 7.0988520753289097165e-01,
};

static const unsigned long long LCONST[] = {
0x3feffffffee7f18fULL,  /* A0 = 9.99999979623214532750e-01      */
0xbfdfffffffe07e52fULL,  /* A1 =-4.99999998166077580600e-01      */
0x3fd801180ca296d9ULL,  /* A2 = 3.75066768969515586277e-01      */
0xbfd400fc0bbb8e78ULL,  /* A3 =-3.12560092408808548438e-01      */
};

static void
__vrsqrtf_n( int n, float * restrict px, int stridex, float * restrict py, int s

#pragma no_inline(__vrsqrtf_n)

#define RETURN(ret)                                                     \
{                                                                       \
        *py = (ret);                                                    \
        py += stridey;                                                  \
        if ( n_n == 0 )                                                 \
        {                                                               \
                spx = px; spy = py;                                     \
                ax0 = *(int*)px;                                        \
                continue;                                               \
        }                                                               \
        n--;                                                            \
        break;                                                          \
}

void
__vrsqrtf( int n, float * restrict px, int stridex, float * restrict py, int str
{
        float           *spx, *spy;
        int             ax0, n_n;
        float           res;
        float           FONE = 1.0f, FTWO = 2.0f;

        while ( n > 1 )
        {
                n_n = 0;
                spx = px;
                spy = py;
                ax0 = *(int*)px;
                for ( ; n > 1 ; n-- )
                {
                        px += stridex;
```

```
260                     if ( ax0 >= 0x7f800000 )        /* X = NaN or Inf
261                     {
262                             res = *(px - stridex);
263                             RETURN ( FONE / res )
264                     }

266                     py += stridey;

268                     if ( ax0 < 0x00800000 )         /* X = denormal, zero or
269                     {
270                             py -= stridey;
271                             res = *(px - stridex);

273                             if ( (ax0 & 0x7fffffff) == 0 )  /* |X| = zero
274                             {
275                                     RETURN ( FONE / res )
276                             }
277                             else if ( ax0 >= 0 )    /* X = denormal */
278                             {
279                                     double          A0 = ((double*)LCONST)[0
280                                     double          A1 = ((double*)LCONST)[1
281                                     double          A2 = ((double*)LCONST)[2
282                                     double          A3 = ((double*)LCONST)[3

284                                     double          res0, xx0, tbl_div0, tbl
285                                     float           fres0;
286                                     int             iax0, si0, iexp0;

288                                     res = *(int*)&res;
289                                     res *= FTWO;
290                                     ax0 = *(int*)&res;
291                                     iexp0 = ax0 >> 24;
292                                     iexp0 = 0x3f + 0x4b - iexp0;
293                                     iexp0 = iexp0 << 23;

295                                     si0 = (ax0 >> 13) & 0x7f0;

297                                     tbl_div0 = ((double*)((char*)__TBL_rsqrt
298                                     tbl_sqrt0 = ((double*)((char*)__TBL_rsqr
299                                     iax0 = ax0 & 0x7ffe0000;
300                                     iax0 = ax0 - iax0;
301                                     xx0 = iax0 * tbl_div0;
302                                     res0 = tbl_sqrt0 * (((A3 * xx0 + A2) * x

304                                     fres0 = res0;
305                                     iexp0 += *(int*)&fres0;
306                                     RETURN(*(float*)&iexp0)
307                             }
308                             else    /* X = negative */
309                             {
310                                     RETURN ( sqrtf(res) )
311                             }
312                     }
313                     n_n++;
314                     ax0 = *(int*)px;
315             }
316             if ( n_n > 0 )
317                     __vrsqrtf_n( n_n, spx, stridex, spy, stridey );
318     }

320     if ( n > 0 )
321     {
322             ax0 = *(int*)px;

324             if ( ax0 >= 0x7f800000 )        /* X = NaN or Inf       */
325             {
```



```
326                     res = *px;
327                     *py = FONE / res;
328             }
329             else if ( ax0 < 0x00800000 )    /* X = denormal, zero or negativ
330             {
331                     res = *px;

333                     if ( (ax0 & 0x7fffffff) == 0 )  /* |X| = zero   */
334                     {
335                             *py = FONE / res;
336                     }
337                     else if ( ax0 >= 0 )    /* X = denormal */
338                     {
339                             double          A0 = ((double*)LCONST)[0];
340                             double          A1 = ((double*)LCONST)[1];
341                             double          A2 = ((double*)LCONST)[2];
342                             double          A3 = ((double*)LCONST)[3];
343                             double          res0, xx0, tbl_div0, tbl_sqrt0;
344                             float           fres0;
345                             int             iax0, si0, iexp0;

347                             res = *(int*)&res;
348                             res *= FTWO;
349                             ax0 = *(int*)&res;
350                             iexp0 = ax0 >> 24;
351                             iexp0 = 0x3f + 0x4b - iexp0;
352                             iexp0 = iexp0 << 23;

354                             si0 = (ax0 >> 13) & 0x7f0;

356                             tbl_div0 = ((double*)((char*)__TBL_rsqrtf + si0)
357                             tbl_sqrt0 = ((double*)((char*)__TBL_rsqrtf + si0
358                             iax0 = ax0 & 0x7ffe0000;
359                             iax0 = ax0 - iax0;
360                             xx0 = iax0 * tbl_div0;
361                             res0 = tbl_sqrt0 * (((A3 * xx0 + A2) * xx0 + A1)

363                             fres0 = res0;
364                             iexp0 += *(int*)&fres0;

366                             *(int*)py = iexp0;
367                     }
368                     else    /* X = negative */
369                     {
370                             *py = sqrtf(res);
371                     }
372             }
373             else
374             {
375                     double          A0 = ((double*)LCONST)[0];      /*  9.99
376                     double          A1 = ((double*)LCONST)[1];      /* -4.99
377                     double          A2 = ((double*)LCONST)[2];      /*  3.75
378                     double          A3 = ((double*)LCONST)[3];      /* -3.12
379                     double          res0, xx0, tbl_div0, tbl_sqrt0;
380                     float           fres0;
381                     int             iax0, si0, iexp0;

383                     iexp0 = ax0 >> 24;
384                     iexp0 = 0x3f - iexp0;
385                     iexp0 = iexp0 << 23;

387                     si0 = (ax0 >> 13) & 0x7f0;

389                     tbl_div0 = ((double*)((char*)__TBL_rsqrtf + si0))[0];
390                     tbl_sqrt0 = ((double*)((char*)__TBL_rsqrtf + si0))[1];
391                     iax0 = ax0 & 0x7ffe0000;
```

```
392                         iax0 = ax0 - iax0;
393                         xx0 = iax0 * tbl_div0;
394                         res0 = tbl_sqrt0 * (((A3 * xx0 + A2) * xx0 + A1) * xx0 +

396                         fres0 = res0;
397                         iexp0 += *(int*)&fres0;

399                         *(int*)py = iexp0;
400                 }
401         }
402 }

404 void
405 __vrsqrtf_n( int n, float * restrict px, int stridex, float * restrict py, int s
406 {
407         double          A0 = ((double*)LCONST)[0];      /*  9.999999979623214532
408         double          A1 = ((double*)LCONST)[1];      /* -4.999999981660775806
409         double          A2 = ((double*)LCONST)[2];      /*  3.750667689695155862
410         double          A3 = ((double*)LCONST)[3];      /* -3.125600924088085484
411         double          res0, xx0, tbl_div0, tbl_sqrt0;
412         float           fres0;
413         int             iax0, ax0, si0, iexp0;

415 #if defined(ARCH_v7) || defined(ARCH_v8)
416         double          res1, xx1, tbl_div1, tbl_sqrt1;
417         double          res2, xx2, tbl_div2, tbl_sqrt2;
418         float           fres1, fres2;
419         int             iax1, ax1, si1, iexp1;
420         int             iax2, ax2, si2, iexp2;

422         for( ; n > 2 ; n -= 3 )
423         {
424                 ax0 = *(int*)px;
425                 px += stridex;

427                 ax1 = *(int*)px;
428                 px += stridex;

430                 ax2 = *(int*)px;
431                 px += stridex;

433                 iexp0 = ax0 >> 24;
434                 iexp1 = ax1 >> 24;
435                 iexp2 = ax2 >> 24;
436                 iexp0 = 0x3f - iexp0;
437                 iexp1 = 0x3f - iexp1;
438                 iexp2 = 0x3f - iexp2;

440                 iexp0 = iexp0 << 23;
441                 iexp1 = iexp1 << 23;
442                 iexp2 = iexp2 << 23;

444                 si0 = (ax0 >> 13) & 0x7f0;
445                 si1 = (ax1 >> 13) & 0x7f0;
446                 si2 = (ax2 >> 13) & 0x7f0;

448                 tbl_div0 = ((double*)((char*)__TBL_rsqrtf + si0))[0];
449                 tbl_div1 = ((double*)((char*)__TBL_rsqrtf + si1))[0];
450                 tbl_div2 = ((double*)((char*)__TBL_rsqrtf + si2))[0];
451                 tbl_sqrt0 = ((double*)((char*)__TBL_rsqrtf + si0))[1];
452                 tbl_sqrt1 = ((double*)((char*)__TBL_rsqrtf + si1))[1];
453                 tbl_sqrt2 = ((double*)((char*)__TBL_rsqrtf + si2))[1];
454                 iax0 = ax0 & 0x7ffe0000;
455                 iax1 = ax1 & 0x7ffe0000;
456                 iax2 = ax2 & 0x7ffe0000;
457                 iax0 = ax0 - iax0;
```



```
458                 iax1 = ax1 - iax1;
459                 iax2 = ax2 - iax2;
460                 xx0 = iax0 * tbl_div0;
461                 xx1 = iax1 * tbl_div1;
462                 xx2 = iax2 * tbl_div2;
463                 res0 = tbl_sqrt0 * (((A3 * xx0 + A2) * xx0 + A1) * xx0 + A0);
464                 res1 = tbl_sqrt1 * (((A3 * xx1 + A2) * xx1 + A1) * xx1 + A0);
465                 res2 = tbl_sqrt2 * (((A3 * xx2 + A2) * xx2 + A1) * xx2 + A0);

467                 fres0 = res0;
468                 fres1 = res1;
469                 fres2 = res2;

471                 iexp0 += *(int*)&fres0;
472                 iexp1 += *(int*)&fres1;
473                 iexp2 += *(int*)&fres2;
474                 *(int*)py = iexp0;
475                 py += stridey;
476                 *(int*)py = iexp1;
477                 py += stridey;
478                 *(int*)py = iexp2;
479                 py += stridey;
480         }
481 #endif
482         for( ; n > 0 ; n-- )
483         {
484                 ax0 = *(int*)px;
485                 px += stridex;

487                 iexp0 = ax0 >> 24;
488                 iexp0 = 0x3f - iexp0;
489                 iexp0 = iexp0 << 23;

491                 si0 = (ax0 >> 13) & 0x7f0;

493                 tbl_div0 = ((double*)((char*)__TBL_rsqrtf + si0))[0];
494                 tbl_sqrt0 = ((double*)((char*)__TBL_rsqrtf + si0))[1];
495                 iax0 = ax0 & 0x7ffe0000;
496                 iax0 = ax0 - iax0;
497                 xx0 = iax0 * tbl_div0;
498                 res0 = tbl_sqrt0 * (((A3 * xx0 + A2) * xx0 + A1) * xx0 + A0);

500                 fres0 = res0;
501                 iexp0 += *(int*)&fres0;
502                 *(int*)py = iexp0;
503                 py += stridey;
504         }
505 }
```

```
**********************************************************
   28751 Sat May 10 12:09:53 2014
new/usr/src/lib/libmvec/common/__vsin.c
remove unused v from libmvec
fix for patch09 - use __GNU_UNUSED - fix cstyle
fix for patch09 - use __GNU_UNUSED
patch09 - update libmvec: fix build issues by gcc46
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include <sys/isa_defs.h>
#include <sys/ccompile.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];

static const double
        half[2] = { 0.5, -0.5 },
        one             = 1.0,
        invpio2 = 0.63661977236758134307553505,
        pio2_1  = 1.57079632673412561417e+00,
        pio2_2  = 6.07710050630396597660e-11,
        pio2_3  = 2.02226624871116645580e-21,
        pio2_3t = 8.47842766036889964329e-32,
```



```
        pp1             = -1.66666666660576046527626394313498255467 6e-0001,
        pp2             =  8.33326120969096312671837656614618094444 2e-0003,
        qq1             = -4.99999999997771098640702395590871155787 0e-0001,
        qq2             =  4.16665486385721935064505588101884208958 0e-0002,
        poly1[2]= { -1.66666666666629669805215138920301589656e-0001,
                                -4.99999999999931701464060878888294524481e-0001
        poly2[2]= {  8.33333332390951295683993455280336376663e-0003,
                                 4.16666666394861917535640593963708222319e-0002
        poly3[2]= { -1.98412623799797669279155177823009840396 0e-0004,
                                -1.38888552656142867832756687736851681462e-0003
        poly4[2]= {  2.75340362485427723764998762284833035111 0e-0006,
                                 2.47851942368146079661812828945453052475 9e-0005

static const unsigned thresh[2] = { 0x3fc90000, 0x3fc40000 };

/* Don't __ the following; acomp will handle it */
extern double fabs( double );
extern void __vlibm_vsin_big( int, double *, int, double *, int, int );

void
__vsin( int n, double * restrict x, int stridex, double * restrict y,
        int stridey )
{
        double          x0_or_one[4], x1_or_one[4], x2_or_one[4];
        double          y0_or_zero[4], y1_or_zero[4], y2_or_zero[4];
        double          x0, x1, x2, *py0 = 0, *py1 = 0, *py2, *xsave, *ysave;
        unsigned        hx0, hx1, hx2, xsb0, xsb1 = 0, xsb2;
        int             i, biguns, nsave, sxsave, sysave;
        nsave = n;
        xsave = x;
        sxsave = stridex;
        ysave = y;
        sysave = stridey;
        biguns = 0;

        do
        {
LOOP0:
                xsb0 = HI(x);
                hx0 = xsb0 & ~0x80000000;
                if ( hx0 > 0x3fe921fb )
                {
                        biguns = 1;
                        goto MEDIUM;
                }
                if ( hx0 < 0x3e400000 )
                {
                        *y = *x;
                        x += stridex;
                        y += stridey;
                        i = 0;
                        if ( --n <= 0 )
                                break;
                        goto LOOP0;
                }
                x0 = *x;
                py0 = y;
                x += stridex;
                y += stridey;
                i = 1;
                if ( --n <= 0 )
                        break;

LOOP1:
                xsb1 = HI(x);
                hx1 = xsb1 & ~0x80000000;
```

```
123                 if ( hx1 > 0x3fe921fb )
124                 {
125                         biguns = 2;
126                         goto MEDIUM;
127                 }
128                 if ( hx1 < 0x3e400000 )
129                 {
130                         *y = *x;
131                         x += stridex;
132                         y += stridey;
133                         i = 1;
134                         if ( --n <= 0 )
135                                 break;
136                         goto LOOP1;
137                 }
138                 x1 = *x;
139                 py1 = y;
140                 x += stridex;
141                 y += stridey;
142                 i = 2;
143                 if ( --n <= 0 )
144                         break;

146 LOOP2:
147                 xsb2 = HI(x);
148                 hx2 = xsb2 & ~0x80000000;
149                 if ( hx2 > 0x3fe921fb )
150                 {
151                         biguns = 3;
152                         goto MEDIUM;
153                 }
154                 if ( hx2 < 0x3e400000 )
155                 {
156                         *y = *x;
157                         x += stridex;
158                         y += stridey;
159                         i = 2;
160                         if ( --n <= 0 )
161                                 break;
162                         goto LOOP2;
163                 }
164                 x2 = *x;
165                 py2 = y;

167                 i = ( hx0 - 0x3fc90000 ) >> 31;
168                 i |= ( ( hx1 - 0x3fc90000 ) >> 30 ) & 2;
169                 i |= ( ( hx2 - 0x3fc90000 ) >> 29 ) & 4;
170                 switch ( i )
171                 {
172                         double          a0, a1, a2, w0, w1, w2;
173                         double          t0, t1, t2, z0, z1, z2;
174                         unsigned        j0, j1, j2;

176                 case 0:
177                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
178                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
179                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
180                         HI(&t0) = j0;
181                         HI(&t1) = j1;
182                         HI(&t2) = j2;
183                         LO(&t0) = 0;
184                         LO(&t1) = 0;
185                         LO(&t2) = 0;
186                         x0 -= t0;
187                         x1 -= t1;
188                         x2 -= t2;
```



```
189                         z0 = x0 * x0;
190                         z1 = x1 * x1;
191                         z2 = x2 * x2;
192                         t0 = z0 * ( qq1 + z0 * qq2 );
193                         t1 = z1 * ( qq1 + z1 * qq2 );
194                         t2 = z2 * ( qq1 + z2 * qq2 );
195                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
196                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
197                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
198                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
199                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
200                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
201                         xsb0 = ( xsb0 >> 30 ) & 2;
202                         xsb1 = ( xsb1 >> 30 ) & 2;
203                         xsb2 = ( xsb2 >> 30 ) & 2;
204                         a0 = __vlibm_TBL_sincos_hi[j0+xsb0];
205                         a1 = __vlibm_TBL_sincos_hi[j1+xsb1];
206                         a2 = __vlibm_TBL_sincos_hi[j2+xsb2];
207                         t0 = ( __vlibm_TBL_sincos_hi[j0+1] * w0 + a0 * t0 ) + __
208                         t1 = ( __vlibm_TBL_sincos_hi[j1+1] * w1 + a1 * t1 ) + __
209                         t2 = ( __vlibm_TBL_sincos_hi[j2+1] * w2 + a2 * t2 ) + __
210                         *py0 = a0 + t0;
211                         *py1 = a1 + t1;
212                         *py2 = a2 + t2;
213                         break;

215                 case 1:
216                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
217                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
218                         HI(&t1) = j1;
219                         HI(&t2) = j2;
220                         LO(&t1) = 0;
221                         LO(&t2) = 0;
222                         x1 -= t1;
223                         x2 -= t2;
224                         z0 = x0 * x0;
225                         z1 = x1 * x1;
226                         z2 = x2 * x2;
227                         t0 = z0 * ( poly3[0] + z0 * poly4[0] );
228                         t1 = z1 * ( qq1 + z1 * qq2 );
229                         t2 = z2 * ( qq1 + z2 * qq2 );
230                         t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
231                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
232                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
233                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
234                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
235                         xsb1 = ( xsb1 >> 30 ) & 2;
236                         xsb2 = ( xsb2 >> 30 ) & 2;
237                         a1 = __vlibm_TBL_sincos_hi[j1+xsb1];
238                         a2 = __vlibm_TBL_sincos_hi[j2+xsb2];
239                         t0 = x0 + x0 * t0;
240                         t1 = ( __vlibm_TBL_sincos_hi[j1+1] * w1 + a1 * t1 ) + __
241                         t2 = ( __vlibm_TBL_sincos_hi[j2+1] * w2 + a2 * t2 ) + __
242                         *py0 = t0;
243                         *py1 = a1 + t1;
244                         *py2 = a2 + t2;
245                         break;

247                 case 2:
248                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
249                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
250                         HI(&t0) = j0;
251                         HI(&t2) = j2;
252                         LO(&t0) = 0;
253                         LO(&t2) = 0;
254                         x0 -= t0;
```

```
255                     x2 -= t2;
256                     z0 = x0 * x0;
257                     z1 = x1 * x1;
258                     z2 = x2 * x2;
259                     t0 = z0 * ( qq1 + z0 * qq2 );
260                     t1 = z1 * ( poly3[0] + z1 * poly4[0] );
261                     t2 = z2 * ( qq1 + z2 * qq2 );
262                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
263                     t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
264                     w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
265                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
266                     j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
267                     xsb0 = ( xsb0 >> 30 ) & 2;
268                     xsb2 = ( xsb2 >> 30 ) & 2;
269                     a0 = __vlibm_TBL_sincos_hi[j0+xsb0];
270                     a2 = __vlibm_TBL_sincos_hi[j2+xsb2];
271                     t0 = ( __vlibm_TBL_sincos_hi[j0+1] * w0 + a0 * t0 ) + __
272                     t1 = x1 + x1 * t1;
273                     t2 = ( __vlibm_TBL_sincos_hi[j2+1] * w2 + a2 * t2 ) + __
274                     *py0 = a0 + t0;
275                     *py1 = t1;
276                     *py2 = a2 + t2;
277                     break;

279             case 3:
280                     j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
281                     HI(&t2) = j2;
282                     LO(&t2) = 0;
283                     x2 -= t2;
284                     z0 = x0 * x0;
285                     z1 = x1 * x1;
286                     z2 = x2 * x2;
287                     t0 = z0 * ( poly3[0] + z0 * poly4[0] );
288                     t1 = z1 * ( poly3[0] + z1 * poly4[0] );
289                     t2 = z2 * ( qq1 + z2 * qq2 );
290                     t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
291                     t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
292                     w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
293                     j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
294                     xsb2 = ( xsb2 >> 30 ) & 2;
295                     a2 = __vlibm_TBL_sincos_hi[j2+xsb2];
296                     t0 = x0 + x0 * t0;
297                     t1 = x1 + x1 * t1;
298                     t2 = ( __vlibm_TBL_sincos_hi[j2+1] * w2 + a2 * t2 ) + __
299                     *py0 = t0;
300                     *py1 = t1;
301                     *py2 = a2 + t2;
302                     break;

304             case 4:
305                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
306                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
307                     HI(&t0) = j0;
308                     HI(&t1) = j1;
309                     LO(&t0) = 0;
310                     LO(&t1) = 0;
311                     x0 -= t0;
312                     x1 -= t1;
313                     z0 = x0 * x0;
314                     z1 = x1 * x1;
315                     z2 = x2 * x2;
316                     t0 = z0 * ( qq1 + z0 * qq2 );
317                     t1 = z1 * ( qq1 + z1 * qq2 );
318                     t2 = z2 * ( poly3[0] + z2 * poly4[0] );
319                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
320                     w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
```



```
321                     t2 = z2 * ( poly1[0] + z2 * ( poly2[0] + t2 ) );
322                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
323                     j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
324                     xsb0 = ( xsb0 >> 30 ) & 2;
325                     xsb1 = ( xsb1 >> 30 ) & 2;
326                     a0 = __vlibm_TBL_sincos_hi[j0+xsb0];
327                     a1 = __vlibm_TBL_sincos_hi[j1+xsb1];
328                     t0 = ( __vlibm_TBL_sincos_hi[j0+1] * w0 + a0 * t0 ) + __
329                     t1 = ( __vlibm_TBL_sincos_hi[j1+1] * w1 + a1 * t1 ) + __
330                     t2 = x2 + x2 * t2;
331                     *py0 = a0 + t0;
332                     *py1 = a1 + t1;
333                     *py2 = t2;
334                     break;

336             case 5:
337                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
338                     HI(&t1) = j1;
339                     LO(&t1) = 0;
340                     x1 -= t1;
341                     z0 = x0 * x0;
342                     z1 = x1 * x1;
343                     z2 = x2 * x2;
344                     t0 = z0 * ( poly3[0] + z0 * poly4[0] );
345                     t1 = z1 * ( qq1 + z1 * qq2 );
346                     t2 = z2 * ( poly3[0] + z2 * poly4[0] );
347                     t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
348                     w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
349                     t2 = z2 * ( poly1[0] + z2 * ( poly2[0] + t2 ) );
350                     j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
351                     xsb1 = ( xsb1 >> 30 ) & 2;
352                     a1 = __vlibm_TBL_sincos_hi[j1+xsb1];
353                     t0 = x0 + x0 * t0;
354                     t1 = ( __vlibm_TBL_sincos_hi[j1+1] * w1 + a1 * t1 ) + __
355                     t2 = x2 + x2 * t2;
356                     *py0 = t0;
357                     *py1 = a1 + t1;
358                     *py2 = t2;
359                     break;

361             case 6:
362                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
363                     HI(&t0) = j0;
364                     LO(&t0) = 0;
365                     x0 -= t0;
366                     z0 = x0 * x0;
367                     z1 = x1 * x1;
368                     z2 = x2 * x2;
369                     t0 = z0 * ( qq1 + z0 * qq2 );
370                     t1 = z1 * ( poly3[0] + z1 * poly4[0] );
371                     t2 = z2 * ( poly3[0] + z2 * poly4[0] );
372                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
373                     t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
374                     t2 = z2 * ( poly1[0] + z2 * ( poly2[0] + t2 ) );
375                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
376                     xsb0 = ( xsb0 >> 30 ) & 2;
377                     a0 = __vlibm_TBL_sincos_hi[j0+xsb0];
378                     t0 = ( __vlibm_TBL_sincos_hi[j0+1] * w0 + a0 * t0 ) + __
379                     t1 = x1 + x1 * t1;
380                     t2 = x2 + x2 * t2;
381                     *py0 = a0 + t0;
382                     *py1 = t1;
383                     *py2 = t2;
384                     break;

386             case 7:
```

```
387                         z0 = x0 * x0;
388                         z1 = x1 * x1;
389                         z2 = x2 * x2;
390                         t0 = z0 * ( poly3[0] + z0 * poly4[0] );
391                         t1 = z1 * ( poly3[0] + z1 * poly4[0] );
392                         t2 = z2 * ( poly3[0] + z2 * poly4[0] );
393                         t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
394                         t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
395                         t2 = z2 * ( poly1[0] + z2 * ( poly2[0] + t2 ) );
396                         t0 = x0 + x0 * t0;
397                         t1 = x1 + x1 * t1;
398                         t2 = x2 + x2 * t2;
399                         *py0 = t0;
400                         *py1 = t1;
401                         *py2 = t2;
402                         break;
403                 }

405                 x += stridex;
406                 y += stridey;
407                 i = 0;
408         } while ( --n > 0 );

410         if ( i > 0 )
411         {
412                 double          a0, a1, w0, w1;
413                 double          t0, t1, z0, z1;
414                 unsigned        j0, j1;

416                 if ( i > 1 )
417                 {
418                         if ( hx1 < 0x3fc90000 )
419                         {
420                                 z1 = x1 * x1;
421                                 t1 = z1 * ( poly3[0] + z1 * poly4[0] );
422                                 t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
423                                 t1 = x1 + x1 * t1;
424                                 *py1 = t1;
425                         }
426                         else
427                         {
428                                 j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
429                                 HI(&t1) = j1;
430                                 LO(&t1) = 0;
431                                 x1 -= t1;
432                                 z1 = x1 * x1;
433                                 t1 = z1 * ( qq1 + z1 * qq2 );
434                                 w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
435                                 j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >>
436                                 xsb1 = ( xsb1 >> 30 ) & 2;
437                                 a1 = __vlibm_TBL_sincos_hi[j1+xsb1];
438                                 t1 = ( __vlibm_TBL_sincos_hi[j1+1] * w1 + a1 * t
439                                 *py1 = a1 + t1;
440                         }
441                 }
442                 if ( hx0 < 0x3fc90000 )
443                 {
444                         z0 = x0 * x0;
445                         t0 = z0 * ( poly3[0] + z0 * poly4[0] );
446                         t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
447                         t0 = x0 + x0 * t0;
448                         *py0 = t0;
449                 }
450                 else
451                 {
452                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
```



```
453                         HI(&t0) = j0;
454                         LO(&t0) = 0;
455                         x0 -= t0;
456                         z0 = x0 * x0;
457                         t0 = z0 * ( qq1 + z0 * qq2 );
458                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
459                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
460                         xsb0 = ( xsb0 >> 30 ) & 2;
461                         a0 = __vlibm_TBL_sincos_hi[j0+xsb0];
462                         t0 = ( __vlibm_TBL_sincos_hi[j0+1] * w0 + a0 * t0 ) + __
463                         *py0 = a0 + t0;
464                 }
465         }

467         return;

469         /*
470          * MEDIUM RANGE PROCESSING
471          * Jump here at first sign of medium range argument.  We are a bit
472          * confused due to the jump.. fix up several variables and jump into
473          * the nth loop, same as was being processed above.
474          */

476 MEDIUM:

478         x0_or_one[1] = 1.0;
479         x1_or_one[1] = 1.0;
480         x2_or_one[1] = 1.0;
481         x0_or_one[3] = -1.0;
482         x1_or_one[3] = -1.0;
483         x2_or_one[3] = -1.0;
484         y0_or_zero[1] = 0.0;
485         y1_or_zero[1] = 0.0;
486         y2_or_zero[1] = 0.0;
487         y0_or_zero[3] = 0.0;
488         y1_or_zero[3] = 0.0;
489         y2_or_zero[3] = 0.0;

491         if ( biguns == 3 )
492         {
493                 biguns = 0;
494                 xsb0 = xsb0 >> 31;
495                 xsb1 = xsb1 >> 31;
496                 goto loop2;
497         }
498         else if ( biguns == 2 )
499         {
500                 xsb0 = xsb0 >> 31;
501                 biguns = 0;
502                 goto loop1;
503         }
504         biguns = 0;

506         do
507         {
508                 double          fn0, fn1, fn2, a0, a1, a2, w0, w1, w2, y0, y1, y
509                 unsigned        hx;
510                 int             n0, n1, n2;

512 loop0:
513                 hx = HI(x);
514                 xsb0 = hx >> 31;
515                 hx &= ~0x80000000;
516                 if ( hx < 0x3e400000 )
517                 {
518                         *y = *x;
```

```
519                     x += stridex;
520                     y += stridey;
521                     i = 0;
522                     if ( --n <= 0 )
523                             break;
524                     goto loop0;
525             }
526             if ( hx > 0x413921fb )
527             {
528                     if ( hx >= 0x7ff00000 )
529                     {
530                             x0 = *x;
531                             *y = x0 - x0;
532                     }
533                     else
534                             biguns = 1;
535                     x += stridex;
536                     y += stridey;
537                     i = 0;
538                     if ( --n <= 0 )
539                             break;
540                     goto loop0;
541             }
542             x0 = *x;
543             py0 = y;
544             x += stridex;
545             y += stridey;
546             i = 1;
547             if ( --n <= 0 )
548                     break;

550 loop1:
551             hx = HI(x);
552             xsb1 = hx >> 31;
553             hx &= ~0x80000000;
554             if ( hx < 0x3e400000 )
555             {
556                     *y = *x;
557                     x += stridex;
558                     y += stridey;
559                     i = 1;
560                     if ( --n <= 0 )
561                             break;
562                     goto loop1;
563             }
564             if ( hx > 0x413921fb )
565             {
566                     if ( hx >= 0x7ff00000 )
567                     {
568                             x1 = *x;
569                             *y = x1 - x1;
570                     }
571                     else
572                             biguns = 1;
573                     x += stridex;
574                     y += stridey;
575                     i = 1;
576                     if ( --n <= 0 )
577                             break;
578                     goto loop1;
579             }
580             x1 = *x;
581             py1 = y;
582             x += stridex;
583             y += stridey;
584             i = 2;
```



```
585             if ( --n <= 0 )
586                     break;

588 loop2:
589             hx = HI(x);
590             xsb2 = hx >> 31;
591             hx &= ~0x80000000;
592             if ( hx < 0x3e400000 )
593             {
594                     *y = *x;
595                     x += stridex;
596                     y += stridey;
597                     i = 2;
598                     if ( --n <= 0 )
599                             break;
600                     goto loop2;
601             }
602             if ( hx > 0x413921fb )
603             {
604                     if ( hx >= 0x7ff00000 )
605                     {
606                             x2 = *x;
607                             *y = x2 - x2;
608                     }
609                     else
610                             biguns = 1;
611                     x += stridex;
612                     y += stridey;
613                     i = 2;
614                     if ( --n <= 0 )
615                             break;
616                     goto loop2;
617             }
618             x2 = *x;
619             py2 = y;

621             n0 = (int) ( x0 * invpio2 + half[xsb0] );
622             n1 = (int) ( x1 * invpio2 + half[xsb1] );
623             n2 = (int) ( x2 * invpio2 + half[xsb2] );
624             fn0 = (double) n0;
625             fn1 = (double) n1;
626             fn2 = (double) n2;
627             n0 &= 3;
628             n1 &= 3;
629             n2 &= 3;
630             a0 = x0 - fn0 * pio2_1;
631             a1 = x1 - fn1 * pio2_1;
632             a2 = x2 - fn2 * pio2_1;
633             w0 = fn0 * pio2_2;
634             w1 = fn1 * pio2_2;
635             w2 = fn2 * pio2_2;
636             x0 = a0 - w0;
637             x1 = a1 - w1;
638             x2 = a2 - w2;
639             y0 = ( a0 - x0 ) - w0;
640             y1 = ( a1 - x1 ) - w1;
641             y2 = ( a2 - x2 ) - w2;
642             a0 = x0;
643             a1 = x1;
644             a2 = x2;
645             w0 = fn0 * pio2_3 - y0;
646             w1 = fn1 * pio2_3 - y1;
647             w2 = fn2 * pio2_3 - y2;
648             x0 = a0 - w0;
649             x1 = a1 - w1;
650             x2 = a2 - w2;
```

```
651                 y0 = ( a0 - x0 ) - w0;
652                 y1 = ( a1 - x1 ) - w1;
653                 y2 = ( a2 - x2 ) - w2;
654                 a0 = x0;
655                 a1 = x1;
656                 a2 = x2;
657                 w0 = fn0 * pio2_3t - y0;
658                 w1 = fn1 * pio2_3t - y1;
659                 w2 = fn2 * pio2_3t - y2;
660                 x0 = a0 - w0;
661                 x1 = a1 - w1;
662                 x2 = a2 - w2;
663                 y0 = ( a0 - x0 ) - w0;
664                 y1 = ( a1 - x1 ) - w1;
665                 y2 = ( a2 - x2 ) - w2;
666                 xsb0 = HI(&x0);
667                 i = ( ( xsb0 & ~0x80000000 ) - thresh[n0&1] ) >> 31;
668                 xsb1 = HI(&x1);
669                 i |= ( ( ( xsb1 & ~0x80000000 ) - thresh[n1&1] ) >> 30 ) & 2;
670                 xsb2 = HI(&x2);
671                 i |= ( ( ( xsb2 & ~0x80000000 ) - thresh[n2&1] ) >> 29 ) & 4;
672                 switch ( i )
673                 {
674                         double          t0, t1, t2, z0, z1, z2;
675                         unsigned        j0, j1, j2;

677                 case 0:
678                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
679                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
680                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
681                         HI(&t0) = j0;
682                         HI(&t1) = j1;
683                         HI(&t2) = j2;
684                         LO(&t0) = 0;
685                         LO(&t1) = 0;
686                         LO(&t2) = 0;
687                         x0 = ( x0 - t0 ) + y0;
688                         x1 = ( x1 - t1 ) + y1;
689                         x2 = ( x2 - t2 ) + y2;
690                         z0 = x0 * x0;
691                         z1 = x1 * x1;
692                         z2 = x2 * x2;
693                         t0 = z0 * ( qq1 + z0 * qq2 );
694                         t1 = z1 * ( qq1 + z1 * qq2 );
695                         t2 = z2 * ( qq1 + z2 * qq2 );
696                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
697                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
698                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
699                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
700                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
701                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
702                         xsb0 = ( xsb0 >> 30 ) & 2;
703                         xsb1 = ( xsb1 >> 30 ) & 2;
704                         xsb2 = ( xsb2 >> 30 ) & 2;
705                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
706                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
707                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
708                         xsb0 |= 1;
709                         xsb1 |= 1;
710                         xsb2 |= 1;
711                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
712                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
713                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
714                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
715                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
716                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
```



```
717                         *py0 = ( a0 + t0 );
718                         *py1 = ( a1 + t1 );
719                         *py2 = ( a2 + t2 );
720                         break;

722                 case 1:
723                         j0 = n0 & 1;
724                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
725                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
726                         HI(&t1) = j1;
727                         HI(&t2) = j2;
728                         LO(&t1) = 0;
729                         LO(&t2) = 0;
730                         x0_or_one[0] = x0;
731                         x0_or_one[2] = -x0;
732                         y0_or_zero[0] = y0;
733                         y0_or_zero[2] = -y0;
734                         x1 = ( x1 - t1 ) + y1;
735                         x2 = ( x2 - t2 ) + y2;
736                         z0 = x0 * x0;
737                         z1 = x1 * x1;
738                         z2 = x2 * x2;
739                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
740                         t1 = z1 * ( qq1 + z1 * qq2 );
741                         t2 = z2 * ( qq1 + z2 * qq2 );
742                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
743                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
744                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
745                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
746                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
747                         xsb1 = ( xsb1 >> 30 ) & 2;
748                         xsb2 = ( xsb2 >> 30 ) & 2;
749                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
750                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
751                         xsb1 |= 1;
752                         xsb2 |= 1;
753                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
754                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
755                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
756                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
757                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
758                         *py0 = t0;
759                         *py1 = ( a1 + t1 );
760                         *py2 = ( a2 + t2 );
761                         break;

763                 case 2:
764                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
765                         j1 = n1 & 1;
766                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
767                         HI(&t0) = j0;
768                         HI(&t2) = j2;
769                         LO(&t0) = 0;
770                         LO(&t2) = 0;
771                         x1_or_one[0] = x1;
772                         x1_or_one[2] = -x1;
773                         x0 = ( x0 - t0 ) + y0;
774                         y1_or_zero[0] = y1;
775                         y1_or_zero[2] = -y1;
776                         x2 = ( x2 - t2 ) + y2;
777                         z0 = x0 * x0;
778                         z1 = x1 * x1;
779                         z2 = x2 * x2;
780                         t0 = z0 * ( qq1 + z0 * qq2 );
781                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
782                         t2 = z2 * ( qq1 + z2 * qq2 );
```

```
783                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
784                     t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
785                     w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
786                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
787                     j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
788                     xsb0 = ( xsb0 >> 30 ) & 2;
789                     xsb2 = ( xsb2 >> 30 ) & 2;
790                     n0 ^= ( xsb0 & ~( n0 << 1 ) );
791                     n2 ^= ( xsb2 & ~( n2 << 1 ) );
792                     xsb0 |= 1;
793                     xsb2 |= 1;
794                     a0 = __vlibm_TBL_sincos_hi[j0+n0];
795                     a2 = __vlibm_TBL_sincos_hi[j2+n2];
796                     t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
797                     t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
798                     t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
799                     *py0 = ( a0 + t0 );
800                     *py1 = t1;
801                     *py2 = ( a2 + t2 );
802                     break;

804             case 3:
805                     j0 = n0 & 1;
806                     j1 = n1 & 1;
807                     j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
808                     HI(&t2) = j2;
809                     LO(&t2) = 0;
810                     x0_or_one[0] = x0;
811                     x0_or_one[2] = -x0;
812                     x1_or_one[0] = x1;
813                     x1_or_one[2] = -x1;
814                     y0_or_zero[0] = y0;
815                     y0_or_zero[2] = -y0;
816                     y1_or_zero[0] = y1;
817                     y1_or_zero[2] = -y1;
818                     x2 = ( x2 - t2 ) + y2;
819                     z0 = x0 * x0;
820                     z1 = x1 * x1;
821                     z2 = x2 * x2;
822                     t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
823                     t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
824                     t2 = z2 * ( qq1 + z2 * qq2 );
825                     t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
826                     t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
827                     w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
828                     j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
829                     xsb2 = ( xsb2 >> 30 ) & 2;
830                     n2 ^= ( xsb2 & ~( n2 << 1 ) );
831                     xsb2 |= 1;
832                     a2 = __vlibm_TBL_sincos_hi[j2+n2];
833                     t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
834                     t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
835                     t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
836                     *py0 = t0;
837                     *py1 = t1;
838                     *py2 = ( a2 + t2 );
839                     break;

841             case 4:
842                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
843                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
844                     j2 = n2 & 1;
845                     HI(&t0) = j0;
846                     HI(&t1) = j1;
847                     LO(&t0) = 0;
848                     LO(&t1) = 0;
```



```
849                     x2_or_one[0] = x2;
850                     x2_or_one[2] = -x2;
851                     x0 = ( x0 - t0 ) + y0;
852                     x1 = ( x1 - t1 ) + y1;
853                     y2_or_zero[0] = y2;
854                     y2_or_zero[2] = -y2;
855                     z0 = x0 * x0;
856                     z1 = x1 * x1;
857                     z2 = x2 * x2;
858                     t0 = z0 * ( qq1 + z0 * qq2 );
859                     t1 = z1 * ( qq1 + z1 * qq2 );
860                     t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
861                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
862                     w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
863                     t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
864                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
865                     j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
866                     xsb0 = ( xsb0 >> 30 ) & 2;
867                     xsb1 = ( xsb1 >> 30 ) & 2;
868                     n0 ^= ( xsb0 & ~( n0 << 1 ) );
869                     n1 ^= ( xsb1 & ~( n1 << 1 ) );
870                     xsb0 |= 1;
871                     xsb1 |= 1;
872                     a0 = __vlibm_TBL_sincos_hi[j0+n0];
873                     a1 = __vlibm_TBL_sincos_hi[j1+n1];
874                     t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
875                     t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
876                     t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
877                     *py0 = ( a0 + t0 );
878                     *py1 = ( a1 + t1 );
879                     *py2 = t2;
880                     break;

882             case 5:
883                     j0 = n0 & 1;
884                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
885                     j2 = n2 & 1;
886                     HI(&t1) = j1;
887                     LO(&t1) = 0;
888                     x0_or_one[0] = x0;
889                     x0_or_one[2] = -x0;
890                     x2_or_one[0] = x2;
891                     x2_or_one[2] = -x2;
892                     y0_or_zero[0] = y0;
893                     y0_or_zero[2] = -y0;
894                     x1 = ( x1 - t1 ) + y1;
895                     y2_or_zero[0] = y2;
896                     y2_or_zero[2] = -y2;
897                     z0 = x0 * x0;
898                     z1 = x1 * x1;
899                     z2 = x2 * x2;
900                     t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
901                     t1 = z1 * ( qq1 + z1 * qq2 );
902                     t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
903                     t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
904                     w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
905                     t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
906                     j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
907                     xsb1 = ( xsb1 >> 30 ) & 2;
908                     n1 ^= ( xsb1 & ~( n1 << 1 ) );
909                     xsb1 |= 1;
910                     a1 = __vlibm_TBL_sincos_hi[j1+n1];
911                     t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
912                     t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
913                     t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
914                     *py0 = t0;
```

```
915                         *py1 = ( a1 + t1 );
916                         *py2 = t2;
917                         break;

919                 case 6:
920                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
921                         j1 = n1 & 1;
922                         j2 = n2 & 1;
923                         HI(&t0) = j0;
924                         LO(&t0) = 0;
925                         x1_or_one[0] = x1;
926                         x1_or_one[2] = -x1;
927                         x2_or_one[0] = x2;
928                         x2_or_one[2] = -x2;
929                         x0 = ( x0 - t0 ) + y0;
930                         y1_or_zero[0] = y1;
931                         y1_or_zero[2] = -y1;
932                         y2_or_zero[0] = y2;
933                         y2_or_zero[2] = -y2;
934                         z0 = x0 * x0;
935                         z1 = x1 * x1;
936                         z2 = x2 * x2;
937                         t0 = z0 * ( qq1 + z0 * qq2 );
938                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
939                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
940                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
941                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
942                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
943                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
944                         xsb0 = ( xsb0 >> 30 ) & 2;
945                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
946                         xsb0 |= 1;
947                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
948                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
949                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
950                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
951                         *py0 = ( a0 + t0 );
952                         *py1 = t1;
953                         *py2 = t2;
954                         break;

956                 case 7:
957                         j0 = n0 & 1;
958                         j1 = n1 & 1;
959                         j2 = n2 & 1;
960                         x0_or_one[0] = x0;
961                         x0_or_one[2] = -x0;
962                         x1_or_one[0] = x1;
963                         x1_or_one[2] = -x1;
964                         x2_or_one[0] = x2;
965                         x2_or_one[2] = -x2;
966                         y0_or_zero[0] = y0;
967                         y0_or_zero[2] = -y0;
968                         y1_or_zero[0] = y1;
969                         y1_or_zero[2] = -y1;
970                         y2_or_zero[0] = y2;
971                         y2_or_zero[2] = -y2;
972                         z0 = x0 * x0;
973                         z1 = x1 * x1;
974                         z2 = x2 * x2;
975                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
976                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
977                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
978                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
979                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
980                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
```



```
981                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
982                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
983                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
984                         *py0 = t0;
985                         *py1 = t1;
986                         *py2 = t2;
987                         break;
988                 }

990                 x += stridex;
991                 y += stridey;
992                 i = 0;
993         } while ( --n > 0 );

995         if ( i > 0 )
996         {
997                 double          fn0, fn1, a0, a1, w0, w1, y0, y1;
998                 double          t0, t1, z0, z1;
999                 unsigned        j0, j1;
1000                int             n0, n1;

1002                if ( i > 1 )
1003                {
1004                        n1 = (int) ( x1 * invpio2 + half[xsb1] );
1005                        fn1 = (double) n1;
1006                        n1 &= 3;
1007                        a1 = x1 - fn1 * pio2_1;
1008                        w1 = fn1 * pio2_2;
1009                        x1 = a1 - w1;
1010                        y1 = ( a1 - x1 ) - w1;
1011                        a1 = x1;
1012                        w1 = fn1 * pio2_3 - y1;
1013                        x1 = a1 - w1;
1014                        y1 = ( a1 - x1 ) - w1;
1015                        a1 = x1;
1016                        w1 = fn1 * pio2_3t - y1;
1017                        x1 = a1 - w1;
1018                        y1 = ( a1 - x1 ) - w1;
1019                        xsb1 = HI(&x1);
1020                        if ( ( xsb1 & ~0x80000000 ) < thresh[n1&1] )
1021                        {
1022                                j1 = n1 & 1;
1023                                x1_or_one[0] = x1;
1024                                x1_or_one[2] = -x1;
1025                                y1_or_zero[0] = y1;
1026                                y1_or_zero[2] = -y1;
1027                                z1 = x1 * x1;
1028                                t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1029                                t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 )
1030                                t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_on
1031                                *py1 = t1;
1032                        }
1033                        else
1034                        {
1035                                j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
1036                                HI(&t1) = j1;
1037                                LO(&t1) = 0;
1038                                x1 = ( x1 - t1 ) + y1;
1039                                z1 = x1 * x1;
1040                                t1 = z1 * ( qq1 + z1 * qq2 );
1041                                w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
1042                                j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >>
1043                                xsb1 = ( xsb1 >> 30 ) & 2;
1044                                n1 ^= ( xsb1 & ~( n1 << 1 ) );
1045                                xsb1 |= 1;
1046                                a1 = __vlibm_TBL_sincos_hi[j1+n1];
```

```
1047                                t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] *
1048                                *py1 = ( a1 + t1 );
1049                        }
1050                }
1051                n0 = (int) ( x0 * invpio2 + half[xsb0] );
1052                fn0 = (double) n0;
1053                n0 &= 3;
1054                a0 = x0 - fn0 * pio2_1;
1055                w0 = fn0 * pio2_2;
1056                x0 = a0 - w0;
1057                y0 = ( a0 - x0 ) - w0;
1058                a0 = x0;
1059                w0 = fn0 * pio2_3 - y0;
1060                x0 = a0 - w0;
1061                y0 = ( a0 - x0 ) - w0;
1062                a0 = x0;
1063                w0 = fn0 * pio2_3t - y0;
1064                x0 = a0 - w0;
1065                y0 = ( a0 - x0 ) - w0;
1066                xsb0 = HI(&x0);
1067                if ( ( xsb0 & ~0x80000000 ) < thresh[n0&1] )
1068                {
1069                        j0 = n0 & 1;
1070                        x0_or_one[0] = x0;
1071                        x0_or_one[2] = -x0;
1072                        y0_or_zero[0] = y0;
1073                        y0_or_zero[2] = -y0;
1074                        z0 = x0 * x0;
1075                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1076                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1077                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1078                        *py0 = t0;
1079                }
1080                else
1081                {
1082                        j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
1083                        HI(&t0) = j0;
1084                        LO(&t0) = 0;
1085                        x0 = ( x0 - t0 ) + y0;
1086                        z0 = x0 * x0;
1087                        t0 = z0 * ( qq1 + z0 * qq2 );
1088                        w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
1089                        j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1090                        xsb0 = ( xsb0 >> 30 ) & 2;
1091                        n0 ^= ( xsb0 & ~( n0 << 1 ) );
1092                        xsb0 |= 1;
1093                        a0 = __vlibm_TBL_sincos_hi[j0+n0];
1094                        t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
1095                        *py0 = ( a0 + t0 );
1096                }
1097        }

1099        if ( biguns )
1100                __vlibm_vsin_big( nsave, xsave, sxsave, ysave, sysave, 0x413921f
1101 }
```

```
**********************************************************
    4435 Sat May 10 12:09:53 2014
new/usr/src/lib/libmvec/common/__vsinbig.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];
extern int __vlibm_rem_pio2m( double *, double *, int, int, int );

static const double
        zero    = 0.0,
        one             = 1.0,
        two24   = 16777216.0,
        pp1             = -1.66666666660576046527626394313498255467 6e-0001,
        pp2             =  8.33326120969096312671837656614618094444 2e-0003,
        p1              = -1.66666666666662966980521513892030158965 6e-0001,
        p2              =  8.33333332390951295683993455280336766 3e-0003,
        p3              = -1.98412623799797669279155177823009840396 0e-0004,
        p4              =  2.75340362485427723764998762284833035111 0e-0006,
        qq1             = -4.99999999997771098640702395590871155787 0e-0001,
        qq2             =  4.16665486385721935064505588101884208958 0e-0002,
        q1              = -4.99999999999993170146406087888829452448 1e-0001,
        q2              =  4.16666666394861917535640593963708222319 e-0002,
        q3              = -1.38888855265614286783275668773685168146 2e-0003,
        q4              =  2.47851942368146079661812828945453052475 9e-0005;

void
__vlibm_vsin_big( int n, double * restrict x, int stridex, double * restrict y,
        int stridey, int thresh )
{
        for ( ; n--; x += stridex, y += stridey )
        {
                double          tx, tt[3], ty[2], t, w, z, a;
                unsigned        hx, xsb;
                int                     e0, nx, j;

                hx = HI(x);
                xsb = hx & 0x80000000;
                hx &= ~0x80000000;
                if ( hx <= thresh || hx >= 0x7ff00000 )
                        continue;
                e0 = ( hx >> 20 ) - 1046;
                HI(&tx) = 0x41600000 | ( hx & 0xfffff );
                LO(&tx) = LO(x);
                tt[0] = (double)( (int) tx );
                tx = ( tx - tt[0] ) * two24;
                if ( tx != zero )
                {
                        nx = 2;
                        tt[1] = (double)( (int) tx );
                        tt[2] = ( tx - tt[1] ) * two24;
                        if ( tt[2] != zero )
                                nx = 3;
                }
                else
                {
                        nx = 1;
                        tt[1] = tt[2] = zero;
                }
                nx = __vlibm_rem_pio2m( tt, ty, e0, nx, 2 );
                if ( xsb )
                {
                        nx = -nx;
                        ty[0] = -ty[0];
                        ty[1] = -ty[1];
                }

                /* now nx and ty[*] are the quadrant and reduced arg */
                xsb = ( nx & 2 ) << 30;
                hx = HI(&ty[0]);
                if ( nx & 1 )
                {
                        if ( hx & 0x80000000 )
                        {
                                ty[0] = -ty[0];
                                ty[1] = -ty[1];
                                hx &= ~0x80000000;
                        }
                        if ( hx < 0x3fc40000 )
                        {
                                z = ty[0] * ty[0];
                                t = z * ( q1 + z * ( q2 + z * ( q3 + z * q4 ) ) )
                                a = one + t;
                        }
                        else
                        {
                                j = ( hx + 0x4000 ) & 0x7fff8000;
                                HI(&t) = j;
```

```
128                                 LO(&t) = 0;
129                                 ty[0] = ( ty[0] - t ) + ty[1];
130                                 z = ty[0] * ty[0];
131                                 t = z * ( qq1 + z * qq2 );
132                                 w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
133                                 j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;
134                                 a = __vlibm_TBL_sincos_hi[j+1];
135                                 t = __vlibm_TBL_sincos_lo[j+1] - ( __vlibm_TBL_s
136                                 a += t;
137                         }
138                 }
139                 else
140                 {
141                         if ( hx & 0x80000000 )
142                         {
143                                 ty[0] = -ty[0];
144                                 ty[1] = -ty[1];
145                                 hx &= ~0x80000000;
146                                 xsb ^= 0x80000000;
147                         }
148                         if ( hx < 0x3fc90000 )
149                         {
150                                 z = ty[0] * ty[0];
151                                 t = z * ( p1 + z * ( p2 + z * ( p3 + z * p4 ) )
152                                 a = ty[0] + ( ty[1] + ty[0] * t );
153                         }
154                         else
155                         {
156                                 j = ( hx + 0x4000 ) & 0x7fff8000;
157                                 HI(&t) = j;
158                                 LO(&t) = 0;
159                                 ty[0] = ( ty[0] - t ) + ty[1];
160                                 z = ty[0] * ty[0];
161                                 t = z * ( qq1 + z * qq2 );
162                                 w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
163                                 j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;
164                                 a = __vlibm_TBL_sincos_hi[j];
165                                 t = ( __vlibm_TBL_sincos_hi[j+1] * w + a * t ) +
166                                 a += t;
167                         }
168                 }
169                 if ( xsb ) a = -a;
170                 *y = a;
171         }
172 }
```

```
**********************************************************
   18051 Sat May 10 12:09:53 2014
new/usr/src/lib/libmvec/common/__vsinbig_ultra3.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];

static const double
        half[2] = { 0.5, -0.5 },
        one             = 1.0,
        invpio2 = 0.6366197723675813430755350,
        pio2_1  = 1.57079632673412561416600,
        pio2_2  = 6.07710050630396597659600e-11,
        pio2_3  = 2.02226248711166455796000e-21,
        pio2_3t = 8.47842766036889964300000e-32,
        pp1             = -1.66666666660576046527626394313498255467600e-0001,
        pp2             =  8.33326120969096312671837656614618094444200e-0003,
        qq1             = -4.99999999997771098640702395590871155787000e-0001,
        qq2             =  4.16665486385721935064505588101884208958000e-0002,
        poly1[2]= { -1.66666666666629669805215138920301589656e-0001,
                                -4.99999999999993170146406087888294524481e-0001
        poly2[2]= {  8.33333333239095129568399345528033637663e-0003,
                                 4.16666666394861917535640593963708222319e-0002
        poly3[2]= { -1.98412623799797669279155177823009840396000e-0004,
                                -1.38888855265614286783275668773685168146200e-0003
        poly4[2]= {  2.75340362485427723764998762284833035111000e-0006,
                                 2.47851942368146079661812828945453052475900e-0005

static const unsigned thresh[2] = { 0x3fc90000, 0x3fc40000 };

extern void __vlibm_vsin_big( int, double *, int, double *, int, int );

void
__vlibm_vsin_big_ultra3( int n, double * restrict x, int stridex, double * restr
        int stridey, int pthresh )
{
        double          x0_or_one[4], x1_or_one[4], x2_or_one[4];
        double          y0_or_zero[4], y1_or_zero[4], y2_or_zero[4];
        double          x0, x1, x2, *py0, *py1, *py2, *xsave, *ysave;
        unsigned        xsb0, xsb1, xsb2;
        int                     i, biguns, nsave, sxsave, sysave;

        nsave = n;
        xsave = x;
        sxsave = stridex;
        ysave = y;
        sysave = stridey;
        biguns = 0;

        x0_or_one[1] = 1.0;
        x1_or_one[1] = 1.0;
        x2_or_one[1] = 1.0;
        x0_or_one[3] = -1.0;
        x1_or_one[3] = -1.0;
        x2_or_one[3] = -1.0;
        y0_or_zero[1] = 0.0;
        y1_or_zero[1] = 0.0;
        y2_or_zero[1] = 0.0;
        y0_or_zero[3] = 0.0;
        y1_or_zero[3] = 0.0;
        y2_or_zero[3] = 0.0;

        do
        {
                double          fn0, fn1, fn2, a0, a1, a2, w0, w1, w2, y0, y1, y
                unsigned        hx;
                int                     n0, n1, n2;

loop0:
                hx = HI(x);
                xsb0 = hx >> 31;
                hx &= ~0x80000000;
                if ( hx <= pthresh || hx > 0x413921fb )
                {
                        if ( hx > 0x413921fb && hx < 0x7ff00000)
                                biguns = 1;
                        x += stridex;
                        y += stridey;
                        i = 0;
                        if ( --n <= 0 )
                                break;
                        goto loop0;
                }
                x0 = *x;
                py0 = y;
                x += stridex;
                y += stridey;
```

```
128                 i = 1;
129                 if ( --n <= 0 )
130                         break;

132 loop1:
133                 hx = HI(x);
134                 xsb1 = hx >> 31;
135                 hx &= ~0x80000000;
136                 if ( hx <= pthresh || hx > 0x413921fb )
137                 {
138                         if ( hx > 0x413921fb && hx < 0x7ff00000)
139                                 biguns = 1;
140                         x += stridex;
141                         y += stridey;
142                         i = 1;
143                         if ( --n <= 0 )
144                                 break;
145                         goto loop1;
146                 }
147                 x1 = *x;
148                 py1 = y;
149                 x += stridex;
150                 y += stridey;
151                 i = 2;
152                 if ( --n <= 0 )
153                         break;

155 loop2:
156                 hx = HI(x);
157                 xsb2 = hx >> 31;
158                 hx &= ~0x80000000;
159                 if ( hx <= pthresh || hx > 0x413921fb )
160                 {
161                         if ( hx > 0x413921fb && hx < 0x7ff00000)
162                                 biguns = 1;
163                         x += stridex;
164                         y += stridey;
165                         i = 2;
166                         if ( --n <= 0 )
167                                 break;
168                         goto loop2;
169                 }
170                 x2 = *x;
171                 py2 = y;

173                 n0 = (int) ( x0 * invpio2 + half[xsb0] );
174                 n1 = (int) ( x1 * invpio2 + half[xsb1] );
175                 n2 = (int) ( x2 * invpio2 + half[xsb2] );
176                 fn0 = (double) n0;
177                 fn1 = (double) n1;
178                 fn2 = (double) n2;
179                 n0 &= 3;
180                 n1 &= 3;
181                 n2 &= 3;
182                 a0 = x0 - fn0 * pio2_1;
183                 a1 = x1 - fn1 * pio2_1;
184                 a2 = x2 - fn2 * pio2_1;
185                 w0 = fn0 * pio2_2;
186                 w1 = fn1 * pio2_2;
187                 w2 = fn2 * pio2_2;
188                 x0 = a0 - w0;
189                 x1 = a1 - w1;
190                 x2 = a2 - w2;
191                 y0 = ( a0 - x0 ) - w0;
192                 y1 = ( a1 - x1 ) - w1;
193                 y2 = ( a2 - x2 ) - w2;
```



```
194                 a0 = x0;
195                 a1 = x1;
196                 a2 = x2;
197                 w0 = fn0 * pio2_3 - y0;
198                 w1 = fn1 * pio2_3 - y1;
199                 w2 = fn2 * pio2_3 - y2;
200                 x0 = a0 - w0;
201                 x1 = a1 - w1;
202                 x2 = a2 - w2;
203                 y0 = ( a0 - x0 ) - w0;
204                 y1 = ( a1 - x1 ) - w1;
205                 y2 = ( a2 - x2 ) - w2;
206                 a0 = x0;
207                 a1 = x1;
208                 a2 = x2;
209                 w0 = fn0 * pio2_3t - y0;
210                 w1 = fn1 * pio2_3t - y1;
211                 w2 = fn2 * pio2_3t - y2;
212                 x0 = a0 - w0;
213                 x1 = a1 - w1;
214                 x2 = a2 - w2;
215                 y0 = ( a0 - x0 ) - w0;
216                 y1 = ( a1 - x1 ) - w1;
217                 y2 = ( a2 - x2 ) - w2;
218                 xsb0 = HI(&x0);
219                 i = ( ( xsb0 & ~0x80000000 ) - thresh[n0&1] ) >> 31;
220                 xsb1 = HI(&x1);
221                 i |= ( ( ( xsb1 & ~0x80000000 ) - thresh[n1&1] ) >> 30 ) & 2;
222                 xsb2 = HI(&x2);
223                 i |= ( ( ( xsb2 & ~0x80000000 ) - thresh[n2&1] ) >> 29 ) & 4;
224                 switch ( i )
225                 {
226                         double          t0, t1, t2, z0, z1, z2;
227                         unsigned        j0, j1, j2;

229                 case 0:
230                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
231                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
232                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
233                         HI(&t0) = j0;
234                         HI(&t1) = j1;
235                         HI(&t2) = j2;
236                         LO(&t0) = 0;
237                         LO(&t1) = 0;
238                         LO(&t2) = 0;
239                         x0 = ( x0 - t0 ) + y0;
240                         x1 = ( x1 - t1 ) + y1;
241                         x2 = ( x2 - t2 ) + y2;
242                         z0 = x0 * x0;
243                         z1 = x1 * x1;
244                         z2 = x2 * x2;
245                         t0 = z0 * ( qq1 + z0 * qq2 );
246                         t1 = z1 * ( qq1 + z1 * qq2 );
247                         t2 = z2 * ( qq1 + z2 * qq2 );
248                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
249                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
250                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
251                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
252                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
253                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
254                         xsb0 = ( xsb0 >> 30 ) & 2;
255                         xsb1 = ( xsb1 >> 30 ) & 2;
256                         xsb2 = ( xsb2 >> 30 ) & 2;
257                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
258                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
259                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
```

```
260                         xsb0 |= 1;
261                         xsb1 |= 1;
262                         xsb2 |= 1;
263                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
264                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
265                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
266                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
267                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
268                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
269                         *py0 = ( a0 + t0 );
270                         *py1 = ( a1 + t1 );
271                         *py2 = ( a2 + t2 );
272                         break;

274                 case 1:
275                         j0 = n0 & 1;
276                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
277                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
278                         HI(&t1) = j1;
279                         HI(&t2) = j2;
280                         LO(&t1) = 0;
281                         LO(&t2) = 0;
282                         x0_or_one[0] = x0;
283                         x0_or_one[2] = -x0;
284                         y0_or_zero[0] = y0;
285                         y0_or_zero[2] = -y0;
286                         x1 = ( x1 - t1 ) + y1;
287                         x2 = ( x2 - t2 ) + y2;
288                         z0 = x0 * x0;
289                         z1 = x1 * x1;
290                         z2 = x2 * x2;
291                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
292                         t1 = z1 * ( qq1 + z1 * qq2 );
293                         t2 = z2 * ( qq1 + z2 * qq2 );
294                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
295                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
296                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
297                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
298                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
299                         xsb1 = ( xsb1 >> 30 ) & 2;
300                         xsb2 = ( xsb2 >> 30 ) & 2;
301                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
302                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
303                         xsb1 |= 1;
304                         xsb2 |= 1;
305                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
306                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
307                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
308                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
309                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
310                         *py0 = t0;
311                         *py1 = ( a1 + t1 );
312                         *py2 = ( a2 + t2 );
313                         break;

315                 case 2:
316                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
317                         j1 = n1 & 1;
318                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
319                         HI(&t0) = j0;
320                         HI(&t2) = j2;
321                         LO(&t0) = 0;
322                         LO(&t2) = 0;
323                         x1_or_one[0] = x1;
324                         x1_or_one[2] = -x1;
325                         x0 = ( x0 - t0 ) + y0;
```



```
326                         y1_or_zero[0] = y1;
327                         y1_or_zero[2] = -y1;
328                         x2 = ( x2 - t2 ) + y2;
329                         z0 = x0 * x0;
330                         z1 = x1 * x1;
331                         z2 = x2 * x2;
332                         t0 = z0 * ( qq1 + z0 * qq2 );
333                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
334                         t2 = z2 * ( qq1 + z2 * qq2 );
335                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
336                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
337                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
338                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
339                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
340                         xsb0 = ( xsb0 >> 30 ) & 2;
341                         xsb2 = ( xsb2 >> 30 ) & 2;
342                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
343                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
344                         xsb0 |= 1;
345                         xsb2 |= 1;
346                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
347                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
348                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
349                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
350                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
351                         *py0 = ( a0 + t0 );
352                         *py1 = t1;
353                         *py2 = ( a2 + t2 );
354                         break;

356                 case 3:
357                         j0 = n0 & 1;
358                         j1 = n1 & 1;
359                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
360                         HI(&t2) = j2;
361                         LO(&t2) = 0;
362                         x0_or_one[0] = x0;
363                         x0_or_one[2] = -x0;
364                         x1_or_one[0] = x1;
365                         x1_or_one[2] = -x1;
366                         y0_or_zero[0] = y0;
367                         y0_or_zero[2] = -y0;
368                         y1_or_zero[0] = y1;
369                         y1_or_zero[2] = -y1;
370                         x2 = ( x2 - t2 ) + y2;
371                         z0 = x0 * x0;
372                         z1 = x1 * x1;
373                         z2 = x2 * x2;
374                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
375                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
376                         t2 = z2 * ( qq1 + z2 * qq2 );
377                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
378                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
379                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
380                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
381                         xsb2 = ( xsb2 >> 30 ) & 2;
382                         n2 ^= ( xsb2 & ~( n2 << 1 ) );
383                         xsb2 |= 1;
384                         a2 = __vlibm_TBL_sincos_hi[j2+n2];
385                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
386                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
387                         t2 = ( __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)] * w2 + a2
388                         *py0 = t0;
389                         *py1 = t1;
390                         *py2 = ( a2 + t2 );
391                         break;
```

```
393                 case 4:
394                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
395                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
396                         j2 = n2 & 1;
397                         HI(&t0) = j0;
398                         HI(&t1) = j1;
399                         LO(&t0) = 0;
400                         LO(&t1) = 0;
401                         x2_or_one[0] = x2;
402                         x2_or_one[2] = -x2;
403                         x0 = ( x0 - t0 ) + y0;
404                         x1 = ( x1 - t1 ) + y1;
405                         y2_or_zero[0] = y2;
406                         y2_or_zero[2] = -y2;
407                         z0 = x0 * x0;
408                         z1 = x1 * x1;
409                         z2 = x2 * x2;
410                         t0 = z0 * ( qq1 + z0 * qq2 );
411                         t1 = z1 * ( qq1 + z1 * qq2 );
412                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
413                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
414                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
415                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
416                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
417                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
418                         xsb0 = ( xsb0 >> 30 ) & 2;
419                         xsb1 = ( xsb1 >> 30 ) & 2;
420                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
421                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
422                         xsb0 |= 1;
423                         xsb1 |= 1;
424                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
425                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
426                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
427                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
428                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
429                         *py0 = ( a0 + t0 );
430                         *py1 = ( a1 + t1 );
431                         *py2 = t2;
432                         break;

434                 case 5:
435                         j0 = n0 & 1;
436                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
437                         j2 = n2 & 1;
438                         HI(&t1) = j1;
439                         LO(&t1) = 0;
440                         x0_or_one[0] = x0;
441                         x0_or_one[2] = -x0;
442                         x2_or_one[0] = x2;
443                         x2_or_one[2] = -x2;
444                         y0_or_zero[0] = y0;
445                         y0_or_zero[2] = -y0;
446                         x1 = ( x1 - t1 ) + y1;
447                         y2_or_zero[0] = y2;
448                         y2_or_zero[2] = -y2;
449                         z0 = x0 * x0;
450                         z1 = x1 * x1;
451                         z2 = x2 * x2;
452                         t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
453                         t1 = z1 * ( qq1 + z1 * qq2 );
454                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
455                         t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
456                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
457                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
```



```
458                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
459                         xsb1 = ( xsb1 >> 30 ) & 2;
460                         n1 ^= ( xsb1 & ~( n1 << 1 ) );
461                         xsb1 |= 1;
462                         a1 = __vlibm_TBL_sincos_hi[j1+n1];
463                         t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
464                         t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] * w1 + a1
465                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
466                         *py0 = t0;
467                         *py1 = ( a1 + t1 );
468                         *py2 = t2;
469                         break;

471                 case 6:
472                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
473                         j1 = n1 & 1;
474                         j2 = n2 & 1;
475                         HI(&t0) = j0;
476                         LO(&t0) = 0;
477                         x1_or_one[0] = x1;
478                         x1_or_one[2] = -x1;
479                         x2_or_one[0] = x2;
480                         x2_or_one[2] = -x2;
481                         x0 = ( x0 - t0 ) + y0;
482                         y1_or_zero[0] = y1;
483                         y1_or_zero[2] = -y1;
484                         y2_or_zero[0] = y2;
485                         y2_or_zero[2] = -y2;
486                         z0 = x0 * x0;
487                         z1 = x1 * x1;
488                         z2 = x2 * x2;
489                         t0 = z0 * ( qq1 + z0 * qq2 );
490                         t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
491                         t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
492                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
493                         t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
494                         t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
495                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
496                         xsb0 = ( xsb0 >> 30 ) & 2;
497                         n0 ^= ( xsb0 & ~( n0 << 1 ) );
498                         xsb0 |= 1;
499                         a0 = __vlibm_TBL_sincos_hi[j0+n0];
500                         t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
501                         t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
502                         t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
503                         *py0 = ( a0 + t0 );
504                         *py1 = t1;
505                         *py2 = t2;
506                         break;

508                 case 7:
509                         j0 = n0 & 1;
510                         j1 = n1 & 1;
511                         j2 = n2 & 1;
512                         x0_or_one[0] = x0;
513                         x0_or_one[2] = -x0;
514                         x1_or_one[0] = x1;
515                         x1_or_one[2] = -x1;
516                         x2_or_one[0] = x2;
517                         x2_or_one[2] = -x2;
518                         y0_or_zero[0] = y0;
519                         y0_or_zero[2] = -y0;
520                         y1_or_zero[0] = y1;
521                         y1_or_zero[2] = -y1;
522                         y2_or_zero[0] = y2;
523                         y2_or_zero[2] = -y2;
```

```
524                     z0 = x0 * x0;
525                     z1 = x1 * x1;
526                     z2 = x2 * x2;
527                     t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
528                     t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
529                     t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
530                     t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
531                     t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
532                     t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
533                     t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
534                     t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
535                     t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
536                     *py0 = t0;
537                     *py1 = t1;
538                     *py2 = t2;
539                     break;
540             }

542             x += stridex;
543             y += stridey;
544             i = 0;
545     } while ( --n > 0 );

547     if ( i > 0 )
548     {
549             double          fn0, fn1, a0, a1, w0, w1, y0, y1;
550             double          t0, t1, z0, z1;
551             unsigned        j0, j1;
552             int                     n0, n1;

554             if ( i > 1 )
555             {
556                     n1 = (int) ( x1 * invpio2 + half[xsb1] );
557                     fn1 = (double) n1;
558                     n1 &= 3;
559                     a1 = x1 - fn1 * pio2_1;
560                     w1 = fn1 * pio2_2;
561                     x1 = a1 - w1;
562                     y1 = ( a1 - x1 ) - w1;
563                     a1 = x1;
564                     w1 = fn1 * pio2_3 - y1;
565                     x1 = a1 - w1;
566                     y1 = ( a1 - x1 ) - w1;
567                     a1 = x1;
568                     w1 = fn1 * pio2_3t - y1;
569                     x1 = a1 - w1;
570                     y1 = ( a1 - x1 ) - w1;
571                     xsb1 = HI(&x1);
572                     if ( ( xsb1 & ~0x80000000 ) < thresh[n1&1] )
573                     {
574                             j1 = n1 & 1;
575                             x1_or_one[0] = x1;
576                             x1_or_one[2] = -x1;
577                             y1_or_zero[0] = y1;
578                             y1_or_zero[2] = -y1;
579                             z1 = x1 * x1;
580                             t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
581                             t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 )
582                             t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_on
583                             *py1 = t1;
584                     }
585                     else
586                     {
587                             j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
588                             HI(&t1) = j1;
589                             LO(&t1) = 0;
```



```
590                             x1 = ( x1 - t1 ) + y1;
591                             z1 = x1 * x1;
592                             t1 = z1 * ( qq1 + z1 * qq2 );
593                             w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
594                             j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >>
595                             xsb1 = ( xsb1 >> 30 ) & 2;
596                             n1 ^= ( xsb1 & ~( n1 << 1 ) );
597                             xsb1 |= 1;
598                             a1 = __vlibm_TBL_sincos_hi[j1+n1];
599                             t1 = ( __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)] *
600                             *py1 = ( a1 + t1 );
601                     }
602             }
603             n0 = (int) ( x0 * invpio2 + half[xsb0] );
604             fn0 = (double) n0;
605             n0 &= 3;
606             a0 = x0 - fn0 * pio2_1;
607             w0 = fn0 * pio2_2;
608             x0 = a0 - w0;
609             y0 = ( a0 - x0 ) - w0;
610             a0 = x0;
611             w0 = fn0 * pio2_3 - y0;
612             x0 = a0 - w0;
613             y0 = ( a0 - x0 ) - w0;
614             a0 = x0;
615             w0 = fn0 * pio2_3t - y0;
616             x0 = a0 - w0;
617             y0 = ( a0 - x0 ) - w0;
618             xsb0 = HI(&x0);
619             if ( ( xsb0 & ~0x80000000 ) < thresh[n0&1] )
620             {
621                     j0 = n0 & 1;
622                     x0_or_one[0] = x0;
623                     x0_or_one[2] = -x0;
624                     y0_or_zero[0] = y0;
625                     y0_or_zero[2] = -y0;
626                     z0 = x0 * x0;
627                     t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
628                     t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
629                     t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
630                     *py0 = t0;
631             }
632             else
633             {
634                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
635                     HI(&t0) = j0;
636                     LO(&t0) = 0;
637                     x0 = ( x0 - t0 ) + y0;
638                     z0 = x0 * x0;
639                     t0 = z0 * ( qq1 + z0 * qq2 );
640                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
641                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
642                     xsb0 = ( xsb0 >> 30 ) & 2;
643                     n0 ^= ( xsb0 & ~( n0 << 1 ) );
644                     xsb0 |= 1;
645                     a0 = __vlibm_TBL_sincos_hi[j0+n0];
646                     t0 = ( __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)] * w0 + a0
647                     *py0 = ( a0 + t0 );
648             }
649     }

651     if ( biguns )
652             __vlibm_vsin_big( nsave, xsave, sxsave, ysave, sysave, 0x413921f
653 }
```

```
**********************************************************
    4421 Sat May 10 12:09:53 2014
new/usr/src/lib/libmvec/common/__vsinbigf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];
extern int __vlibm_rem_pio2m( double *, double *, int, int, int );

static const double
        zero    = 0.0,
        one             = 1.0,
        two24   = 16777216.0,
        pp1             = -1.6666666666057604652762639431349825546 76e-0001,
        pp2             =  8.3332612096909631267183765661461809444 42e-0003,
        p1              = -1.6666666666666629669805215138920301589656e-0001,
        p2              =  8.3333333239095129568399345528036376663e-0003,
        p3              = -1.9841262379979766927915517782300984039 60e-0004,
        p4              =  2.7534036248542772376499876228483303511 10e-0006,
        qq1             = -4.9999999999771098640702395590871155787 0e-0001,
        qq2             =  4.1666548638572193506450558810188420895 80e-0002,
        q1              = -4.9999999999999317014640608788882945244 81e-0001,
        q2              =  4.1666666663948619175356405939637082223 19e-0002,
        q3              = -1.3888885526561428678327566873685168146 2e-0003,
        q4              =  2.4785194236814607966181282894545305247 59e-0005;

void
__vlibm_vsin_bigf( int n, float * restrict x, int stridex, float * restrict y,
        int stridey )
{
        for ( ; n--; x += stridex, y += stridey )
        {
                double          tx, tt[3], ty[2], t, w, z, a;
                unsigned        hx, xsb;
                int                     e0, nx, j;

                tx = *x;
                hx = HI(&tx);
                xsb = hx & 0x80000000;
                hx &= ~0x80000000;
                if ( hx <= 0x413921fb || hx >= 0x7ff00000 )
                        continue;
                e0 = ( hx >> 20 ) - 1046;
                HI(&tx) = 0x41600000 | ( hx & 0xfffff );

                tt[0] = (double)( (int) tx );
                tx = ( tx - tt[0] ) * two24;
                if ( tx != zero )
                {
                        nx = 2;
                        tt[1] = (double)( (int) tx );
                        tt[2] = ( tx - tt[1] ) * two24;
                        if ( tt[2] != zero )
                                nx = 3;
                }
                else
                {
                        nx = 1;
                        tt[1] = tt[2] = zero;
                }
                nx = __vlibm_rem_pio2m( tt, ty, e0, nx, 2 );
                if ( xsb )
                {
                        nx = -nx;
                        ty[0] = -ty[0];
                        ty[1] = -ty[1];
                }

                /* now nx and ty[*] are the quadrant and reduced arg */
                xsb = ( nx & 2 ) << 30;
                hx = HI(&ty[0]);
                if ( nx & 1 )
                {
                        if ( hx & 0x80000000 )
                        {
                                ty[0] = -ty[0];
                                ty[1] = -ty[1];
                                hx &= ~0x80000000;
                        }
                        if ( hx < 0x3fc40000 )
                        {
                                z = ty[0] * ty[0];
                                t = z * ( q1 + z * ( q2 + z * ( q3 + z * q4 ) )
                                a = one + t;
                        }
                        else
                        {
                                j = ( hx + 0x4000 ) & 0x7fff8000;
```

```
128                                 HI(&t) = j;
129                                 LO(&t) = 0;
130                                 ty[0] = ( ty[0] - t ) + ty[1];
131                                 z = ty[0] * ty[0];
132                                 t = z * ( qq1 + z * qq2 );
133                                 w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
134                                 j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;
135                                 a = __vlibm_TBL_sincos_hi[j+1];
136                                 t = __vlibm_TBL_sincos_lo[j+1] - ( __vlibm_TBL_s
137                                 a += t;
138                         }
139                 }
140                 else
141                 {
142                         if ( hx & 0x80000000 )
143                         {
144                                 ty[0] = -ty[0];
145                                 ty[1] = -ty[1];
146                                 hx &= ~0x80000000;
147                                 xsb ^= 0x80000000;
148                         }
149                         if ( hx < 0x3fc90000 )
150                         {
151                                 z = ty[0] * ty[0];
152                                 t = z * ( p1 + z * ( p2 + z * ( p3 + z * p4 ) )
153                                 a = ty[0] + ( ty[1] + ty[0] * t );
154                         }
155                         else
156                         {
157                                 j = ( hx + 0x4000 ) & 0x7fff8000;
158                                 HI(&t) = j;
159                                 LO(&t) = 0;
160                                 ty[0] = ( ty[0] - t ) + ty[1];
161                                 z = ty[0] * ty[0];
162                                 t = z * ( qq1 + z * qq2 );
163                                 w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
164                                 j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;
165                                 a = __vlibm_TBL_sincos_hi[j];
166                                 t = ( __vlibm_TBL_sincos_hi[j+1] * w + a * t ) +
167                                 a += t;
168                         }
169                 }
170                 if ( xsb ) a = -a;
171                 *y = a;
172         }
173 }
```

```
**********************************************************
   39377 Sat May 10 12:09:54 2014
new/usr/src/lib/libmvec/common/__vsincos.c
remove unused v from libmvec
fix for patch09 - use __GNU_UNUSED - fix cstyle
fix for patch09 - use __GNU_UNUSED
patch09 - update libmvec: fix build issues by gcc46
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

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 */

#include <sys/isa_defs.h>
#include <sys/ccompile.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

/*
 * vsincos.c
 *
 * Vector sine and cosine function.  Just slight modifications to vcos.c.
 */

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];

static const double
        half[2] = { 0.5, -0.5 },
```



```
        one             = 1.0,
        invpio2 = 0.6366197723675813430755350,  /* 53 bits of pi/2 */
        pio2_1  = 1.5707963267341256141660,  /* first 33 bits of pi/2 */
        pio2_2  = 6.0771005063039659765960e-11, /* second 33 bits of pi/2 */
        pio2_3  = 2.0222662487111664557960e-21, /* third 33 bits of pi/2 */
        pio2_3t = 8.4784276603688996439590e-32, /* pi/2 - pio2_3 */
        pp1             = -1.6666666666057604652762639431349825546760e-0001,
        pp2             =  8.3332612096909631267183765661461809444420e-0003,
        qq1             = -4.9999999999777109864070239559087115578700e-0001,
        qq2             =  4.1666548638572193506450558810188420895800e-0002,
        poly1[2]= { -1.6666666666662966980521513892030158965600e-0001,
                                -4.9999999999999317014640608788882945244810e-0001
        poly2[2]= {  8.3333333239095129568399345528033637666300e-0003,
                                 4.1666666663948619175356405939637082223190e-0002
        poly3[2]= { -1.9841262379979766927915517782300984039600e-0004,
                                -1.3888885526561428678327566877368516814620e-0003
        poly4[2]= {  2.7534036248542772376499876228483303511100e-0006,
                                 2.4785194236814607966181282894545305247590e-0005

/* Don't __ the following; acomp will handle it */
extern double fabs( double );
extern void __vlibm_vsincos_big( int, double *, int, double *, int, double *, in

/*
 * y[i*stridey] := sin( x[i*stridex] ), for i = 0..n.
 * c[i*stridec] := cos( x[i*stridex] ), for i = 0..n.
 *
 * Calls __vlibm_vsincos_big to handle all elts which have abs >~ 1.647e+06.
 * Argument reduction is done here for elts pi/4 < arg < 1.647e+06.
 *
 * elts < 2^-27 use the approximation 1.0 ~ cos(x).
 */
void
__vsincos( int n, double * restrict x, int stridex,
                                double * restrict y, int stridey,
                                double * restrict c, int stridec )
{
        double          x0_or_one[4], x1_or_one[4], x2_or_one[4];
        double          y0_or_zero[4], y1_or_zero[4], y2_or_zero[4];
        double          x0, x1, x2,
                        *py0, *py1, *py2,
                        *pc0, *pc1, *pc2,
                        *xsave, *ysave, *csave;
        unsigned        hx0, hx1, hx2, xsb0, xsb1, xsb2;
        int             i, biguns, nsave, sxsave, sysave, scsave;
        nsave = n;
        xsave = x;
        sxsave = stridex;
        ysave = y;
        sysave = stridey;
        csave = c;
        scsave = stridec;
        biguns = 0;

        do /* MAIN LOOP */
        {

                /* Gotos here so _break_ exits MAIN LOOP. */
LOOP0:  /* Find first arg in right range. */
                xsb0 = HI(x); /* get most significant word */
                hx0 = xsb0 & ~0x80000000; /* mask off sign bit */
                if ( hx0 > 0x3fe921fb ) {
                        /* Too big: arg reduction needed, so leave for second pa
                        biguns = 1;
                        x += stridex;
                        y += stridey;
```

```
123                     c += stridec;
124                     i = 0;
125                     if ( --n <= 0 )
126                             break;
127                     goto LOOP0;
128             }
129             if ( hx0 < 0x3e400000 ) {
130                     /* Too small.  cos x ~ 1, sin x ~ x. */
131                     *c = 1.0;
132                     *y = *x;
133                     x += stridex;
134                     y += stridey;
135                     c += stridec;
136                     i = 0;
137                     if ( --n <= 0 )
138                             break;
139                     goto LOOP0;
140             }
141             x0 = *x;
142             py0 = y;
143             pc0 = c;
144             x += stridex;
145             y += stridey;
146             c += stridec;
147             i = 1;
148             if ( --n <= 0 )
149                     break;

151 LOOP1: /* Get second arg, same as above. */
152             xsb1 = HI(x);
153             hx1 = xsb1 & ~0x80000000;
154             if ( hx1 > 0x3fe921fb )
155             {
156                     biguns = 1;
157                     x += stridex;
158                     y += stridey;
159                     c += stridec;
160                     i = 1;
161                     if ( --n <= 0 )
162                             break;
163                     goto LOOP1;
164             }
165             if ( hx1 < 0x3e400000 )
166             {
167                     *c = 1.0;
168                     *y = *x;
169                     x += stridex;
170                     y += stridey;
171                     c += stridec;
172                     i = 1;
173                     if ( --n <= 0 )
174                             break;
175                     goto LOOP1;
176             }
177             x1 = *x;
178             py1 = y;
179             pc1 = c;
180             x += stridex;
181             y += stridey;
182             c += stridec;
183             i = 2;
184             if ( --n <= 0 )
185                     break;

187 LOOP2: /* Get third arg, same as above. */
188             xsb2 = HI(x);
```



```
189             hx2 = xsb2 & ~0x80000000;
190             if ( hx2 > 0x3fe921fb )
191             {
192                     biguns = 1;
193                     x += stridex;
194                     y += stridey;
195                     c += stridec;
196                     i = 2;
197                     if ( --n <= 0 )
198                             break;
199                     goto LOOP2;
200             }
201             if ( hx2 < 0x3e400000 )
202             {
203                     *c = 1.0;
204                     *y = *x;
205                     x += stridex;
206                     y += stridey;
207                     c += stridec;
208                     i = 2;
209                     if ( --n <= 0 )
210                             break;
211                     goto LOOP2;
212             }
213             x2 = *x;
214             py2 = y;
215             pc2 = c;

217             /*
218              * 0x3fc40000 = 5/32 ~ 0.15625
219              * Get msb after subtraction.  Will be 1 only if
220              * hx0 - 5/32 is negative.
221              */
222             i = ( hx2 - 0x3fc40000 ) >> 31;
223             i |= ( ( hx1 - 0x3fc40000 ) >> 30 ) & 2;
224             i |= ( ( hx0 - 0x3fc40000 ) >> 29 ) & 4;
225             switch ( i )
226             {
227                     double          a1_0, a1_1, a1_2, a2_0, a2_1, a2_2;
228                     double          w0, w1, w2;
229                     double          t0, t1, t2, t1_0, t1_1, t1_2, t2_0, t2_1
230                     double          z0, z1, z2;
231                     unsigned        j0, j1, j2;

233             case 0: /* All are > 5/32 */
234                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
235                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
236                     j2 = ( xsb2 + 0x4000 ) & 0xffff8000;

238                     HI(&t0) = j0;
239                     HI(&t1) = j1;
240                     HI(&t2) = j2;
241                     LO(&t0) = 0;
242                     LO(&t1) = 0;
243                     LO(&t2) = 0;

245                     x0 -= t0;
246                     x1 -= t1;
247                     x2 -= t2;

249                     z0 = x0 * x0;
250                     z1 = x1 * x1;
251                     z2 = x2 * x2;

253                     t0 = z0 * ( qq1 + z0 * qq2 );
254                     t1 = z1 * ( qq1 + z1 * qq2 );
```

```
255                         t2 = z2 * ( qq1 + z2 * qq2 );

257                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
258                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
259                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );

261                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
262                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
263                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~

265                         xsb0 = ( xsb0 >> 30 ) & 2;
266                         xsb1 = ( xsb1 >> 30 ) & 2;
267                         xsb2 = ( xsb2 >> 30 ) & 2;

269                         a1_0 = __vlibm_TBL_sincos_hi[j0+xsb0]; /* sin_hi(t) */
270                         a1_1 = __vlibm_TBL_sincos_hi[j1+xsb1];
271                         a1_2 = __vlibm_TBL_sincos_hi[j2+xsb2];

273                         a2_0 = __vlibm_TBL_sincos_hi[j0+1];     /* cos_hi(t) */
274                         a2_1 = __vlibm_TBL_sincos_hi[j1+1];
275                         a2_2 = __vlibm_TBL_sincos_hi[j2+1];
276                                 /* cos_lo(t) */
277                         t2_0 = __vlibm_TBL_sincos_lo[j0+1] - ( a1_0*w0 - a2_0*t0
278                         t2_1 = __vlibm_TBL_sincos_lo[j1+1] - ( a1_1*w1 - a2_1*t1
279                         t2_2 = __vlibm_TBL_sincos_lo[j2+1] - ( a1_2*w2 - a2_2*t2

281                         *pc0 = a2_0 + t2_0;
282                         *pc1 = a2_1 + t2_1;
283                         *pc2 = a2_2 + t2_2;

285                         t1_0 = a2_0*w0 + a1_0*t0;
286                         t1_1 = a2_1*w1 + a1_1*t1;
287                         t1_2 = a2_2*w2 + a1_2*t2;

289                         t1_0 += __vlibm_TBL_sincos_lo[j0+xsb0]; /* sin_lo(t) */
290                         t1_1 += __vlibm_TBL_sincos_lo[j1+xsb1];
291                         t1_2 += __vlibm_TBL_sincos_lo[j2+xsb2];

293                         *py0 = a1_0 + t1_0;
294                         *py1 = a1_1 + t1_1;
295                         *py2 = a1_2 + t1_2;

297                         break;

299                 case 1:
300                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
301                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
302                         HI(&t0) = j0;
303                         HI(&t1) = j1;
304                         LO(&t0) = 0;
305                         LO(&t1) = 0;
306                         x0 -= t0;
307                         x1 -= t1;
308                         z0 = x0 * x0;
309                         z1 = x1 * x1;
310                         z2 = x2 * x2;
311                         t0 = z0 * ( qq1 + z0 * qq2 );
312                         t1 = z1 * ( qq1 + z1 * qq2 );
313                         t2 = z2 * ( poly3[1] + z2 * poly4[1] );
314                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
315                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
316                         t2 = z2 * ( poly1[1] + z2 * ( poly2[1] + t2 ) );
317                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
318                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
319                         xsb0 = ( xsb0 >> 30 ) & 2;
320                         xsb1 = ( xsb1 >> 30 ) & 2;
```



```
322                         a1_0 = __vlibm_TBL_sincos_hi[j0+xsb0]; /* sin_hi(t) */
323                         a1_1 = __vlibm_TBL_sincos_hi[j1+xsb1];

325                         a2_0 = __vlibm_TBL_sincos_hi[j0+1];     /* cos_hi(t) */
326                         a2_1 = __vlibm_TBL_sincos_hi[j1+1];
327                                 /* cos_lo(t) */
328                         t2_0 = __vlibm_TBL_sincos_lo[j0+1] - ( a1_0*w0 - a2_0*t0
329                         t2_1 = __vlibm_TBL_sincos_lo[j1+1] - ( a1_1*w1 - a2_1*t1

331                         *pc0 = a2_0 + t2_0;
332                         *pc1 = a2_1 + t2_1;
333                         *pc2 = one + t2;

335                         t1_0 = a2_0*w0 + a1_0*t0;
336                         t1_1 = a2_1*w1 + a1_1*t1;
337                         t2 = z2 * ( poly3[0] + z2 * poly4[0] );

339                         t1_0 += __vlibm_TBL_sincos_lo[j0+xsb0]; /* sin_lo(t) */
340                         t1_1 += __vlibm_TBL_sincos_lo[j1+xsb1];
341                         t2 = z2 * ( poly1[0] + z2 * ( poly2[0] + t2 ) );

343                         *py0 = a1_0 + t1_0;
344                         *py1 = a1_1 + t1_1;
345                         t2 = x2 + x2 * t2;
346                         *py2 = t2;

348                         break;

350                 case 2:
351                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
352                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
353                         HI(&t0) = j0;
354                         HI(&t2) = j2;
355                         LO(&t0) = 0;
356                         LO(&t2) = 0;
357                         x0 -= t0;
358                         x2 -= t2;
359                         z0 = x0 * x0;
360                         z1 = x1 * x1;
361                         z2 = x2 * x2;
362                         t0 = z0 * ( qq1 + z0 * qq2 );
363                         t1 = z1 * ( poly3[1] + z1 * poly4[1] );
364                         t2 = z2 * ( qq1 + z2 * qq2 );
365                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
366                         t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
367                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
368                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
369                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
370                         xsb0 = ( xsb0 >> 30 ) & 2;
371                         xsb2 = ( xsb2 >> 30 ) & 2;

373                         a1_0 = __vlibm_TBL_sincos_hi[j0+xsb0]; /* sin_hi(t) */
374                         a1_2 = __vlibm_TBL_sincos_hi[j2+xsb2];

376                         a2_0 = __vlibm_TBL_sincos_hi[j0+1];     /* cos_hi(t) */
377                         a2_2 = __vlibm_TBL_sincos_hi[j2+1];
378                                 /* cos_lo(t) */
379                         t2_0 = __vlibm_TBL_sincos_lo[j0+1] - ( a1_0*w0 - a2_0*t0
380                         t2_2 = __vlibm_TBL_sincos_lo[j2+1] - ( a1_2*w2 - a2_2*t2

382                         *pc0 = a2_0 + t2_0;
383                         *pc1 = one + t1;
384                         *pc2 = a2_2 + t2_2;

386                         t1_0 = a2_0*w0 + a1_0*t0;
```

```
387                         t1 = z1 * ( poly3[0] + z1 * poly4[0] );
388                         t1_2 = a2_2*w2 + a1_2*t2;

390                         t1_0 += __vlibm_TBL_sincos_lo[j0+xsb0]; /* sin_lo(t) */
391                         t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
392                         t1_2 += __vlibm_TBL_sincos_lo[j2+xsb2];

394                         *py0 = a1_0 + t1_0;
395                         t1 = x1 + x1 * t1;
396                         *py1 = t1;
397                         *py2 = a1_2 + t1_2;

399                         break;

401                 case 3:
402                         j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
403                         HI(&t0) = j0;
404                         LO(&t0) = 0;
405                         x0 -= t0;
406                         z0 = x0 * x0;
407                         z1 = x1 * x1;
408                         z2 = x2 * x2;
409                         t0 = z0 * ( qq1 + z0 * qq2 );
410                         t1 = z1 * ( poly3[1] + z1 * poly4[1] );
411                         t2 = z2 * ( poly3[1] + z2 * poly4[1] );
412                         w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
413                         t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
414                         t2 = z2 * ( poly1[1] + z2 * ( poly2[1] + t2 ) );
415                         j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
416                         xsb0 = ( xsb0 >> 30 ) & 2;
417                         a1_0 = __vlibm_TBL_sincos_hi[j0+xsb0]; /* sin_hi(t) */

419                         a2_0 = __vlibm_TBL_sincos_hi[j0+1];     /* cos_hi(t) */

421                         t2_0 = __vlibm_TBL_sincos_lo[j0+1] - ( a1_0*w0 - a2_0*t0

423                         *pc0 = a2_0 + t2_0;
424                         *pc1 = one + t1;
425                         *pc2 = one + t2;

427                         t1_0 = a2_0*w0 + a1_0*t0;
428                         t1 = z1 * ( poly3[0] + z1 * poly4[0] );
429                         t2 = z2 * ( poly3[0] + z2 * poly4[0] );

431                         t1_0 += __vlibm_TBL_sincos_lo[j0+xsb0]; /* sin_lo(t) */
432                         t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
433                         t2 = z2 * ( poly1[0] + z2 * ( poly2[0] + t2 ) );

435                         *py0 = a1_0 + t1_0;
436                         t1 = x1 + x1 * t1;
437                         *py1 = t1;
438                         t2 = x2 + x2 * t2;
439                         *py2 = t2;

441                         break;

443                 case 4:
444                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
445                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
446                         HI(&t1) = j1;
447                         HI(&t2) = j2;
448                         LO(&t1) = 0;
449                         LO(&t2) = 0;
450                         x1 -= t1;
451                         x2 -= t2;
452                         z0 = x0 * x0;
```



```
453                         z1 = x1 * x1;
454                         z2 = x2 * x2;
455                         t0 = z0 * ( poly3[1] + z0 * poly4[1] );
456                         t1 = z1 * ( qq1 + z1 * qq2 );
457                         t2 = z2 * ( qq1 + z2 * qq2 );
458                         t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
459                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
460                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
461                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
462                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
463                         xsb1 = ( xsb1 >> 30 ) & 2;
464                         xsb2 = ( xsb2 >> 30 ) & 2;

466                         a1_1 = __vlibm_TBL_sincos_hi[j1+xsb1];
467                         a1_2 = __vlibm_TBL_sincos_hi[j2+xsb2];

469                         a2_1 = __vlibm_TBL_sincos_hi[j1+1];
470                         a2_2 = __vlibm_TBL_sincos_hi[j2+1];
471                                 /* cos_lo(t) */
472                         t2_1 = __vlibm_TBL_sincos_lo[j1+1] - ( a1_1*w1 - a2_1*t1
473                         t2_2 = __vlibm_TBL_sincos_lo[j2+1] - ( a1_2*w2 - a2_2*t2

475                         *pc0 = one + t0;
476                         *pc1 = a2_1 + t2_1;
477                         *pc2 = a2_2 + t2_2;

479                         t0 = z0 * ( poly3[0] + z0 * poly4[0] );
480                         t1_1 = a2_1*w1 + a1_1*t1;
481                         t1_2 = a2_2*w2 + a1_2*t2;

483                         t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
484                         t1_1 += __vlibm_TBL_sincos_lo[j1+xsb1];
485                         t1_2 += __vlibm_TBL_sincos_lo[j2+xsb2];

487                         t0 = x0 + x0 * t0;
488                         *py0 = t0;
489                         *py1 = a1_1 + t1_1;
490                         *py2 = a1_2 + t1_2;

492                         break;

494                 case 5:
495                         j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
496                         HI(&t1) = j1;
497                         LO(&t1) = 0;
498                         x1 -= t1;
499                         z0 = x0 * x0;
500                         z1 = x1 * x1;
501                         z2 = x2 * x2;
502                         t0 = z0 * ( poly3[1] + z0 * poly4[1] );
503                         t1 = z1 * ( qq1 + z1 * qq2 );
504                         t2 = z2 * ( poly3[1] + z2 * poly4[1] );
505                         t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
506                         w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
507                         t2 = z2 * ( poly1[1] + z2 * ( poly2[1] + t2 ) );
508                         j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
509                         xsb1 = ( xsb1 >> 30 ) & 2;

511                         a1_1 = __vlibm_TBL_sincos_hi[j1+xsb1];

513                         a2_1 = __vlibm_TBL_sincos_hi[j1+1];

515                         t2_1 = __vlibm_TBL_sincos_lo[j1+1] - ( a1_1*w1 - a2_1*t1

517                         *pc0 = one + t0;
518                         *pc1 = a2_1 + t2_1;
```

```
519                         *pc2 = one + t2;
520
521                         t0 = z0 * ( poly3[0] + z0 * poly4[0] );
522                         t1_1 = a2_1*w1 + a1_1*t1;
523                         t2 = z2 * ( poly3[0] + z2 * poly4[0] );
524
525                         t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
526                         t1_1 += __vlibm_TBL_sincos_lo[j1+xsb1];
527                         t2 = z2 * ( poly1[0] + z2 * ( poly2[0] + t2 ) );
528
529                         t0 = x0 + x0 * t0;
530                         *py0 = t0;
531                         *py1 = a1_1 + t1_1;
532                         t2 = x2 + x2 * t2;
533                         *py2 = t2;
534
535                         break;
536
537                 case 6:
538                         j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
539                         HI(&t2) = j2;
540                         LO(&t2) = 0;
541                         x2 -= t2;
542                         z0 = x0 * x0;
543                         z1 = x1 * x1;
544                         z2 = x2 * x2;
545                         t0 = z0 * ( poly3[1] + z0 * poly4[1] );
546                         t1 = z1 * ( poly3[1] + z1 * poly4[1] );
547                         t2 = z2 * ( qq1 + z2 * qq2 );
548                         t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
549                         t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
550                         w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
551                         j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
552                         xsb2 = ( xsb2 >> 30 ) & 2;
553                         a1_2 = __vlibm_TBL_sincos_hi[j2+xsb2];
554
555                         a2_2 = __vlibm_TBL_sincos_hi[j2+1];
556
557                         t2_2 = __vlibm_TBL_sincos_lo[j2+1] - ( a1_2*w2 - a2_2*t2
558
559                         *pc0 = one + t0;
560                         *pc1 = one + t1;
561                         *pc2 = a2_2 + t2_2;
562
563                         t0 = z0 * ( poly3[0] + z0 * poly4[0] );
564                         t1 = z1 * ( poly3[0] + z1 * poly4[0] );
565                         t1_2 = a2_2*w2 + a1_2*t2;
566
567                         t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
568                         t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
569                         t1_2 += __vlibm_TBL_sincos_lo[j2+xsb2];
570
571                         t0 = x0 + x0 * t0;
572                         *py0 = t0;
573                         t1 = x1 + x1 * t1;
574                         *py1 = t1;
575                         *py2 = a1_2 + t1_2;
576
577                         break;
578
579                 case 7: /* All are < 5/32 */
580                         z0 = x0 * x0;
581                         z1 = x1 * x1;
582                         z2 = x2 * x2;
583                         t0 = z0 * ( poly3[1] + z0 * poly4[1] );
584                         t1 = z1 * ( poly3[1] + z1 * poly4[1] );
```



```
585                         t2 = z2 * ( poly3[1] + z2 * poly4[1] );
586                         t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
587                         t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
588                         t2 = z2 * ( poly1[1] + z2 * ( poly2[1] + t2 ) );
589                         *pc0 = one + t0;
590                         *pc1 = one + t1;
591                         *pc2 = one + t2;
592                         t0 = z0 * ( poly3[0] + z0 * poly4[0] );
593                         t1 = z1 * ( poly3[0] + z1 * poly4[0] );
594                         t2 = z2 * ( poly3[0] + z2 * poly4[0] );
595                         t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
596                         t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
597                         t2 = z2 * ( poly1[0] + z2 * ( poly2[0] + t2 ) );
598                         t0 = x0 + x0 * t0;
599                         t1 = x1 + x1 * t1;
600                         t2 = x2 + x2 * t2;
601                         *py0 = t0;
602                         *py1 = t1;
603                         *py2 = t2;
604                         break;
605                 }
606
607                 x += stridex;
608                 y += stridey;
609                 c += stridec;
610                 i = 0;
611         } while ( --n > 0 ); /* END MAIN LOOP */
612
613         /*
614          * CLEAN UP last 0, 1, or 2 elts.
615          */
616         if ( i > 0 ) /* Clean up elts at tail.  i < 3. */
617         {
618                 double          a1_0, a1_1, a2_0, a2_1;
619                 double          w0, w1;
620                 double          t0, t1, t1_0, t1_1, t2_0, t2_1;
621                 double          z0, z1;
622                 unsigned        j0, j1;
623
624                 if ( i > 1 )
625                 {
626                         if ( hx1 < 0x3fc40000 )
627                         {
628                                 z1 = x1 * x1;
629                                 t1 = z1 * ( poly3[1] + z1 * poly4[1] );
630                                 t1 = z1 * ( poly1[1] + z1 * ( poly2[1] + t1 ) );
631                                 t1 = one + t1;
632                                 *pc1 = t1;
633                                 t1 = z1 * ( poly3[0] + z1 * poly4[0] );
634                                 t1 = z1 * ( poly1[0] + z1 * ( poly2[0] + t1 ) );
635                                 t1 = x1 + x1 * t1;
636                                 *py1 = t1;
637                         }
638                         else
639                         {
640                                 j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
641                                 HI(&t1) = j1;
642                                 LO(&t1) = 0;
643                                 x1 -= t1;
644                                 z1 = x1 * x1;
645                                 t1 = z1 * ( qq1 + z1 * qq2 );
646                                 w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
647                                 j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >>
648                                 xsb1 = ( xsb1 >> 30 ) & 2;
649                                 a1_1 = __vlibm_TBL_sincos_hi[j1+xsb1];
650                                 a2_1 = __vlibm_TBL_sincos_hi[j1+1];
```

```
651                             t2_1 = __vlibm_TBL_sincos_lo[j1+1] - ( a1_1*w1 -
652                             *pc1 = a2_1 + t2_1;
653                             t1_1 = a2_1*w1 + a1_1*t1;
654                             t1_1 += __vlibm_TBL_sincos_lo[j1+xsb1];
655                             *py1 = a1_1 + t1_1;
656                     }
657             }
658             if ( hx0 < 0x3fc40000 )
659             {
660                     z0 = x0 * x0;
661                     t0 = z0 * ( poly3[1] + z0 * poly4[1] );
662                     t0 = z0 * ( poly1[1] + z0 * ( poly2[1] + t0 ) );
663                     t0 = one + t0;
664                     *pc0 = t0;
665                     t0 = z0 * ( poly3[0] + z0 * poly4[0] );
666                     t0 = z0 * ( poly1[0] + z0 * ( poly2[0] + t0 ) );
667                     t0 = x0 + x0 * t0;
668                     *py0 = t0;
669             }
670             else
671             {
672                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
673                     HI(&t0) = j0;
674                     LO(&t0) = 0;
675                     x0 -= t0;
676                     z0 = x0 * x0;
677                     t0 = z0 * ( qq1 + z0 * qq2 );
678                     w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
679                     j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
680                     xsb0 = ( xsb0 >> 30 ) & 2;
681                     a1_0 = __vlibm_TBL_sincos_hi[j0+xsb0]; /* sin_hi(t) */
682                     a2_0 = __vlibm_TBL_sincos_hi[j0+1];     /* cos_hi(t) */
683                     t2_0 = __vlibm_TBL_sincos_lo[j0+1] - ( a1_0*w0 - a2_0*t0
684                     *pc0 = a2_0 + t2_0;
685                     t1_0 = a2_0*w0 + a1_0*t0;
686                     t1_0 += __vlibm_TBL_sincos_lo[j0+xsb0]; /* sin_lo(t) */
687                     *py0 = a1_0 + t1_0;
688             }
689     } /* END CLEAN UP */

691     if ( !biguns )
692             return;

694     /*
695      * Take care of BIGUNS.
696      */
697     n = nsave;
698     x = xsave;
699     stridex = sxsave;
700     y = ysave;
701     stridey = sysave;
702     c = csave;
703     stridec = scsave;
704     biguns = 0;

706     x0_or_one[1] = 1.0;
707     x1_or_one[1] = 1.0;
708     x2_or_one[1] = 1.0;
709     x0_or_one[3] = -1.0;
710     x1_or_one[3] = -1.0;
711     x2_or_one[3] = -1.0;
712     y0_or_zero[1] = 0.0;
713     y1_or_zero[1] = 0.0;
714     y2_or_zero[1] = 0.0;
715     y0_or_zero[3] = 0.0;
716     y1_or_zero[3] = 0.0;
```



```
717     y2_or_zero[3] = 0.0;

719     do
720     {
721             double          fn0, fn1, fn2, a0, a1, a2, w0, w1, w2, y0, y1, y
722             unsigned        hx;
723             int                     n0, n1, n2;

725             /*
726              * Find 3 more to work on: Not already done, not too big.
727              */
728 loop0:
729             hx = HI(x);
730             xsb0 = hx >> 31;
731             hx &= ~0x80000000;
732             if ( hx <= 0x3fe921fb ) /* Done above. */
733             {
734                     x += stridex;
735                     y += stridey;
736                     c += stridec;
737                     i = 0;
738                     if ( --n <= 0 )
739                             break;
740                     goto loop0;
741             }
742             if ( hx > 0x413921fb ) /* (1.6471e+06) Too big: leave it. */
743             {
744                     if ( hx >= 0x7ff00000 ) /* Inf or NaN */
745                     {
746                             x0 = *x;
747                             *y = x0 - x0;
748                             *c = x0 - x0;
749                     }
750                     else {
751                             biguns = 1;
752                     }
753                     x += stridex;
754                     y += stridey;
755                     c += stridec;
756                     i = 0;
757                     if ( --n <= 0 )
758                             break;
759                     goto loop0;
760             }
761             x0 = *x;
762             py0 = y;
763             pc0 = c;
764             x += stridex;
765             y += stridey;
766             c += stridec;
767             i = 1;
768             if ( --n <= 0 )
769                     break;

771 loop1:
772             hx = HI(x);
773             xsb1 = hx >> 31;
774             hx &= ~0x80000000;
775             if ( hx <= 0x3fe921fb )
776             {
777                     x += stridex;
778                     y += stridey;
779                     c += stridec;
780                     i = 1;
781                     if ( --n <= 0 )
782                             break;
```

```
783                     goto loop1;
784             }
785             if ( hx > 0x413921fb )
786             {
787                     if ( hx >= 0x7ff00000 )
788                     {
789                             x1 = *x;
790                             *y = x1 - x1;
791                             *c = x1 - x1;
792                     }
793                     else {
794                             biguns = 1;
795                     }
796                     x += stridex;
797                     y += stridey;
798                     c += stridec;
799                     i = 1;
800                     if ( --n <= 0 )
801                             break;
802                     goto loop1;
803             }
804             x1 = *x;
805             py1 = y;
806             pc1 = c;
807             x += stridex;
808             y += stridey;
809             c += stridec;
810             i = 2;
811             if ( --n <= 0 )
812                     break;

814 loop2:
815             hx = HI(x);
816             xsb2 = hx >> 31;
817             hx &= ~0x80000000;
818             if ( hx <= 0x3fe921fb )
819             {
820                     x += stridex;
821                     y += stridey;
822                     c += stridec;
823                     i = 2;
824                     if ( --n <= 0 )
825                             break;
826                     goto loop2;
827             }
828             if ( hx > 0x413921fb )
829             {
830                     if ( hx >= 0x7ff00000 )
831                     {
832                             x2 = *x;
833                             *y = x2 - x2;
834                             *c = x2 - x2;
835                     }
836                     else {
837                             biguns = 1;
838                     }
839                     x += stridex;
840                     y += stridey;
841                     c += stridec;
842                     i = 2;
843                     if ( --n <= 0 )
844                             break;
845                     goto loop2;
846             }
847             x2 = *x;
848             py2 = y;
```



```
849             pc2 = c;

851             n0 = (int) ( x0 * invpio2 + half[xsb0] );
852             n1 = (int) ( x1 * invpio2 + half[xsb1] );
853             n2 = (int) ( x2 * invpio2 + half[xsb2] );
854             fn0 = (double) n0;
855             fn1 = (double) n1;
856             fn2 = (double) n2;
857             n0 &= 3;
858             n1 &= 3;
859             n2 &= 3;
860             a0 = x0 - fn0 * pio2_1;
861             a1 = x1 - fn1 * pio2_1;
862             a2 = x2 - fn2 * pio2_1;
863             w0 = fn0 * pio2_2;
864             w1 = fn1 * pio2_2;
865             w2 = fn2 * pio2_2;
866             x0 = a0 - w0;
867             x1 = a1 - w1;
868             x2 = a2 - w2;
869             y0 = ( a0 - x0 ) - w0;
870             y1 = ( a1 - x1 ) - w1;
871             y2 = ( a2 - x2 ) - w2;
872             a0 = x0;
873             a1 = x1;
874             a2 = x2;
875             w0 = fn0 * pio2_3 - y0;
876             w1 = fn1 * pio2_3 - y1;
877             w2 = fn2 * pio2_3 - y2;
878             x0 = a0 - w0;
879             x1 = a1 - w1;
880             x2 = a2 - w2;
881             y0 = ( a0 - x0 ) - w0;
882             y1 = ( a1 - x1 ) - w1;
883             y2 = ( a2 - x2 ) - w2;
884             a0 = x0;
885             a1 = x1;
886             a2 = x2;
887             w0 = fn0 * pio2_3t - y0;
888             w1 = fn1 * pio2_3t - y1;
889             w2 = fn2 * pio2_3t - y2;
890             x0 = a0 - w0;
891             x1 = a1 - w1;
892             x2 = a2 - w2;
893             y0 = ( a0 - x0 ) - w0;
894             y1 = ( a1 - x1 ) - w1;
895             y2 = ( a2 - x2 ) - w2;
896             xsb2 = HI(&x2);
897             i = ( ( xsb2 & ~0x80000000 ) - 0x3fc40000 ) >> 31;
898             xsb1 = HI(&x1);
899             i |= ( ( ( xsb1 & ~0x80000000 ) - 0x3fc40000 ) >> 30 ) & 2;
900             xsb0 = HI(&x0);
901             i |= ( ( ( xsb0 & ~0x80000000 ) - 0x3fc40000 ) >> 29 ) & 4;
902             switch ( i )
903             {
904                     double          a1_0, a1_1, a1_2, a2_0, a2_1, a2_2;
905                     double          t0, t1, t2, t1_0, t1_1, t1_2, t2_0, t2_1
906                     double          z0, z1, z2;
907                     unsigned        j0, j1, j2;

909             case 0:
910                     j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
911                     j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
912                     j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
913                     HI(&t0) = j0;
914                     HI(&t1) = j1;
```

```
                        HI(&t2) = j2;
                        LO(&t0) = 0;
                        LO(&t1) = 0;
                        LO(&t2) = 0;
                        x0 = ( x0 - t0 ) + y0;
                        x1 = ( x1 - t1 ) + y1;
                        x2 = ( x2 - t2 ) + y2;
                        z0 = x0 * x0;
                        z1 = x1 * x1;
                        z2 = x2 * x2;
                        t0 = z0 * ( qq1 + z0 * qq2 );
                        t1 = z1 * ( qq1 + z1 * qq2 );
                        t2 = z2 * ( qq1 + z2 * qq2 );
                        w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
                        w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
                        w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
                        j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
                        j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
                        j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
                        xsb0 = ( xsb0 >> 30 ) & 2;
                        xsb1 = ( xsb1 >> 30 ) & 2;
                        xsb2 = ( xsb2 >> 30 ) & 2;
                        n0 ^= ( xsb0 & ~( n0 << 1 ) );
                        n1 ^= ( xsb1 & ~( n1 << 1 ) );
                        n2 ^= ( xsb2 & ~( n2 << 1 ) );
                        xsb0 |= 1;
                        xsb1 |= 1;
                        xsb2 |= 1;

                        a1_0 = __vlibm_TBL_sincos_hi[j0+n0];
                        a1_1 = __vlibm_TBL_sincos_hi[j1+n1];
                        a1_2 = __vlibm_TBL_sincos_hi[j2+n2];

                        a2_0 = __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)];
                        a2_1 = __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)];
                        a2_2 = __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)];

                        t2_0 = __vlibm_TBL_sincos_lo[j0+((n0+xsb0)&3)] - ( a1_0*
                        t2_1 = __vlibm_TBL_sincos_lo[j1+((n1+xsb1)&3)] - ( a1_1*
                        t2_2 = __vlibm_TBL_sincos_lo[j2+((n2+xsb2)&3)] - ( a1_2*

                        w0 *= a2_0;
                        w1 *= a2_1;
                        w2 *= a2_2;

                        *pc0 = a2_0 + t2_0;
                        *pc1 = a2_1 + t2_1;
                        *pc2 = a2_2 + t2_2;

                        t1_0 = w0 + a1_0*t0;
                        t1_1 = w1 + a1_1*t1;
                        t1_2 = w2 + a1_2*t2;

                        t1_0 += __vlibm_TBL_sincos_lo[j0+n0];
                        t1_1 += __vlibm_TBL_sincos_lo[j1+n1];
                        t1_2 += __vlibm_TBL_sincos_lo[j2+n2];

                        *py0 = a1_0 + t1_0;
                        *py1 = a1_1 + t1_1;
                        *py2 = a1_2 + t1_2;

                        break;

                case 1:
                        j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
                        j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
```



```
                        j2 = n2 & 1;
                        HI(&t0) = j0;
                        HI(&t1) = j1;
                        LO(&t0) = 0;
                        LO(&t1) = 0;
                        x2_or_one[0] = x2;
                        x2_or_one[2] = -x2;
                        x0 = ( x0 - t0 ) + y0;
                        x1 = ( x1 - t1 ) + y1;
                        y2_or_zero[0] = y2;
                        y2_or_zero[2] = -y2;
                        z0 = x0 * x0;
                        z1 = x1 * x1;
                        z2 = x2 * x2;
                        t0 = z0 * ( qq1 + z0 * qq2 );
                        t1 = z1 * ( qq1 + z1 * qq2 );
                        t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
                        w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
                        w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
                        t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
                        j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
                        j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
                        xsb0 = ( xsb0 >> 30 ) & 2;
                        xsb1 = ( xsb1 >> 30 ) & 2;
                        n0 ^= ( xsb0 & ~( n0 << 1 ) );
                        n1 ^= ( xsb1 & ~( n1 << 1 ) );
                        xsb0 |= 1;
                        xsb1 |= 1;
                        a1_0 = __vlibm_TBL_sincos_hi[j0+n0];
                        a1_1 = __vlibm_TBL_sincos_hi[j1+n1];

                        a2_0 = __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)];
                        a2_1 = __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)];

                        t2_0 = __vlibm_TBL_sincos_lo[j0+((n0+xsb0)&3)] - ( a1_0*
                        t2_1 = __vlibm_TBL_sincos_lo[j1+((n1+xsb1)&3)] - ( a1_1*
                        t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *

                        *pc0 = a2_0 + t2_0;
                        *pc1 = a2_1 + t2_1;
                        *py2 = t2;

                        n2 = (n2 + 1) & 3;
                        j2 = (j2 + 1) & 1;
                        t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );

                        t1_0 = a2_0*w0 + a1_0*t0;
                        t1_1 = a2_1*w1 + a1_1*t1;
                        t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );

                        t1_0 += __vlibm_TBL_sincos_lo[j0+n0];
                        t1_1 += __vlibm_TBL_sincos_lo[j1+n1];
                        t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *

                        *py0 = a1_0 + t1_0;
                        *py1 = a1_1 + t1_1;
                        *pc2 = t2;

                        break;

                case 2:
                        j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
                        j1 = n1 & 1;
                        j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
                        HI(&t0) = j0;
                        HI(&t2) = j2;
```

```
1047                        LO(&t0) = 0;
1048                        LO(&t2) = 0;
1049                        x1_or_one[0] = x1;
1050                        x1_or_one[2] = -x1;
1051                        x0 = ( x0 - t0 ) + y0;
1052                        y1_or_zero[0] = y1;
1053                        y1_or_zero[2] = -y1;
1054                        x2 = ( x2 - t2 ) + y2;
1055                        z0 = x0 * x0;
1056                        z1 = x1 * x1;
1057                        z2 = x2 * x2;
1058                        t0 = z0 * ( qq1 + z0 * qq2 );
1059                        t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1060                        t2 = z2 * ( qq1 + z2 * qq2 );
1061                        w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
1062                        t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
1063                        w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
1064                        j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1065                        j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1066                        xsb0 = ( xsb0 >> 30 ) & 2;
1067                        xsb2 = ( xsb2 >> 30 ) & 2;
1068                        n0 ^= ( xsb0 & ~( n0 << 1 ) );
1069                        n2 ^= ( xsb2 & ~( n2 << 1 ) );
1070                        xsb0 |= 1;
1071                        xsb2 |= 1;

1073                        a1_0 = __vlibm_TBL_sincos_hi[j0+n0];
1074                        a1_2 = __vlibm_TBL_sincos_hi[j2+n2];

1076                        a2_0 = __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)];
1077                        a2_2 = __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)];

1079                        t2_0 = __vlibm_TBL_sincos_lo[j0+((n0+xsb0)&3)] - ( a1_0*
1080                        t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
1081                        t2_2 = __vlibm_TBL_sincos_lo[j2+((n2+xsb2)&3)] - ( a1_2*

1083                        *pc0 = a2_0 + t2_0;
1084                        *py1 = t1;
1085                        *pc2 = a2_2 + t2_2;

1087                        n1 = (n1 + 1) & 3;
1088                        j1 = (j1 + 1) & 1;
1089                        t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );

1091                        t1_0 = a2_0*w0 + a1_0*t0;
1092                        t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
1093                        t1_2 = a2_2*w2 + a1_2*t2;

1095                        t1_0 += __vlibm_TBL_sincos_lo[j0+n0];
1096                        t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
1097                        t1_2 += __vlibm_TBL_sincos_lo[j2+n2];

1099                        *py0 = a1_0 + t1_0;
1100                        *pc1 = t1;
1101                        *py2 = a1_2 + t1_2;

1103                        break;

1105                case 3:
1106                        j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
1107                        j1 = n1 & 1;
1108                        j2 = n2 & 1;
1109                        HI(&t0) = j0;
1110                        LO(&t0) = 0;
1111                        x1_or_one[0] = x1;
1112                        x1_or_one[2] = -x1;
```



```
1113                        x2_or_one[0] = x2;
1114                        x2_or_one[2] = -x2;
1115                        x0 = ( x0 - t0 ) + y0;
1116                        y1_or_zero[0] = y1;
1117                        y1_or_zero[2] = -y1;
1118                        y2_or_zero[0] = y2;
1119                        y2_or_zero[2] = -y2;
1120                        z0 = x0 * x0;
1121                        z1 = x1 * x1;
1122                        z2 = x2 * x2;
1123                        t0 = z0 * ( qq1 + z0 * qq2 );
1124                        t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1125                        t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
1126                        w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
1127                        t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
1128                        t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
1129                        j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1130                        xsb0 = ( xsb0 >> 30 ) & 2;
1131                        n0 ^= ( xsb0 & ~( n0 << 1 ) );
1132                        xsb0 |= 1;

1134                        a1_0 = __vlibm_TBL_sincos_hi[j0+n0];
1135                        a2_0 = __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)];

1137                        t2_0 = __vlibm_TBL_sincos_lo[j0+((n0+xsb0)&3)] - ( a1_0*
1138                        t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
1139                        t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *

1141                        *pc0 = a2_0 + t2_0;
1142                        *py1 = t1;
1143                        *py2 = t2;

1145                        n1 = (n1 + 1) & 3;
1146                        n2 = (n2 + 1) & 3;
1147                        j1 = (j1 + 1) & 1;
1148                        j2 = (j2 + 1) & 1;

1150                        t1_0 = a2_0*w0 + a1_0*t0;
1151                        t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1152                        t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );

1154                        t1_0 += __vlibm_TBL_sincos_lo[j0+n0];
1155                        t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
1156                        t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );

1158                        t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
1159                        t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *

1161                        *py0 = a1_0 + t1_0;
1162                        *pc1 = t1;
1163                        *pc2 = t2;

1165                        break;

1167                case 4:
1168                        j0 = n0 & 1;
1169                        j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
1170                        j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
1171                        HI(&t1) = j1;
1172                        HI(&t2) = j2;
1173                        LO(&t1) = 0;
1174                        LO(&t2) = 0;
1175                        x0_or_one[0] = x0;
1176                        x0_or_one[2] = -x0;
1177                        y0_or_zero[0] = y0;
1178                        y0_or_zero[2] = -y0;
```

```
1179                        x1 = ( x1 - t1 ) + y1;
1180                        x2 = ( x2 - t2 ) + y2;
1181                        z0 = x0 * x0;
1182                        z1 = x1 * x1;
1183                        z2 = x2 * x2;
1184                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1185                        t1 = z1 * ( qq1 + z1 * qq2 );
1186                        t2 = z2 * ( qq1 + z2 * qq2 );
1187                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1188                        w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
1189                        w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
1190                        j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1191                        j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1192                        xsb1 = ( xsb1 >> 30 ) & 2;
1193                        xsb2 = ( xsb2 >> 30 ) & 2;
1194                        n1 ^= ( xsb1 & ~( n1 << 1 ) );
1195                        n2 ^= ( xsb2 & ~( n2 << 1 ) );
1196                        xsb1 |= 1;
1197                        xsb2 |= 1;

1199                        a1_1 = __vlibm_TBL_sincos_hi[j1+n1];
1200                        a1_2 = __vlibm_TBL_sincos_hi[j2+n2];

1202                        a2_1 = __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)];
1203                        a2_2 = __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)];

1205                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1206                        t2_1 = __vlibm_TBL_sincos_lo[j1+((n1+xsb1)&3)] - ( a1_1*
1207                        t2_2 = __vlibm_TBL_sincos_lo[j2+((n2+xsb2)&3)] - ( a1_2*

1209                        *py0 = t0;
1210                        *pc1 = a2_1 + t2_1;
1211                        *pc2 = a2_2 + t2_2;

1213                        n0 = (n0 + 1) & 3;
1214                        j0 = (j0 + 1) & 1;
1215                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );

1217                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1218                        t1_1 = a2_1*w1 + a1_1*t1;
1219                        t1_2 = a2_2*w2 + a1_2*t2;

1221                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1222                        t1_1 += __vlibm_TBL_sincos_lo[j1+n1];
1223                        t1_2 += __vlibm_TBL_sincos_lo[j2+n2];

1225                        *py1 = a1_1 + t1_1;
1226                        *py2 = a1_2 + t1_2;
1227                        *pc0 = t0;

1229                        break;

1231                case 5:
1232                        j0 = n0 & 1;
1233                        j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
1234                        j2 = n2 & 1;
1235                        HI(&t1) = j1;
1236                        LO(&t1) = 0;
1237                        x0_or_one[0] = x0;
1238                        x0_or_one[2] = -x0;
1239                        x2_or_one[0] = x2;
1240                        x2_or_one[2] = -x2;
1241                        y0_or_zero[0] = y0;
1242                        y0_or_zero[2] = -y0;
1243                        x1 = ( x1 - t1 ) + y1;
1244                        y2_or_zero[0] = y2;
```



```
1245                        y2_or_zero[2] = -y2;
1246                        z0 = x0 * x0;
1247                        z1 = x1 * x1;
1248                        z2 = x2 * x2;
1249                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1250                        t1 = z1 * ( qq1 + z1 * qq2 );
1251                        t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
1252                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1253                        w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
1254                        t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
1255                        j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1256                        xsb1 = ( xsb1 >> 30 ) & 2;
1257                        n1 ^= ( xsb1 & ~( n1 << 1 ) );
1258                        xsb1 |= 1;

1260                        a1_1 = __vlibm_TBL_sincos_hi[j1+n1];
1261                        a2_1 = __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)];

1263                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1264                        t2_1 = __vlibm_TBL_sincos_lo[j1+((n1+xsb1)&3)] - ( a1_1*
1265                        t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *

1267                        *py0 = t0;
1268                        *pc1 = a2_1 + t2_1;
1269                        *py2 = t2;

1271                        n0 = (n0 + 1) & 3;
1272                        n2 = (n2 + 1) & 3;
1273                        j0 = (j0 + 1) & 1;
1274                        j2 = (j2 + 1) & 1;

1276                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1277                        t1_1 = a2_1*w1 + a1_1*t1;
1278                        t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );

1280                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1281                        t1_1 += __vlibm_TBL_sincos_lo[j1+n1];
1282                        t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );

1284                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1285                        t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *

1287                        *pc0 = t0;
1288                        *py1 = a1_1 + t1_1;
1289                        *pc2 = t2;

1291                        break;

1293                case 6:
1294                        j0 = n0 & 1;
1295                        j1 = n1 & 1;
1296                        j2 = ( xsb2 + 0x4000 ) & 0xffff8000;
1297                        HI(&t2) = j2;
1298                        LO(&t2) = 0;
1299                        x0_or_one[0] = x0;
1300                        x0_or_one[2] = -x0;
1301                        x1_or_one[0] = x1;
1302                        x1_or_one[2] = -x1;
1303                        y0_or_zero[0] = y0;
1304                        y0_or_zero[2] = -y0;
1305                        y1_or_zero[0] = y1;
1306                        y1_or_zero[2] = -y1;
1307                        x2 = ( x2 - t2 ) + y2;
1308                        z0 = x0 * x0;
1309                        z1 = x1 * x1;
1310                        z2 = x2 * x2;
```

```
1311                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1312                        t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1313                        t2 = z2 * ( qq1 + z2 * qq2 );
1314                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1315                        t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
1316                        w2 = x2 * ( one + z2 * ( pp1 + z2 * pp2 ) );
1317                        j2 = ( ( ( j2 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1318                        xsb2 = ( xsb2 >> 30 ) & 2;
1319                        n2 ^= ( xsb2 & ~( n2 << 1 ) );
1320                        xsb2 |= 1;

1322                        a1_2 = __vlibm_TBL_sincos_hi[j2+n2];
1323                        a2_2 = __vlibm_TBL_sincos_hi[j2+((n2+xsb2)&3)];

1325                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1326                        t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
1327                        t2_2 = __vlibm_TBL_sincos_lo[j2+((n2+xsb2)&3)] - ( a1_2*

1329                        *py0 = t0;
1330                        *py1 = t1;
1331                        *pc2 = a2_2 + t2_2;

1333                        n0 = (n0 + 1) & 3;
1334                        n1 = (n1 + 1) & 3;
1335                        j0 = (j0 + 1) & 1;
1336                        j1 = (j1 + 1) & 1;

1338                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1339                        t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1340                        t1_2 = a2_2*w2 + a1_2*t2;

1342                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1343                        t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
1344                        t1_2 += __vlibm_TBL_sincos_lo[j2+n2];

1346                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1347                        t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *

1349                        *pc0 = t0;
1350                        *pc1 = t1;
1351                        *py2 = a1_2 + t1_2;

1353                        break;

1355                case 7:
1356                        j0 = n0 & 1;
1357                        j1 = n1 & 1;
1358                        j2 = n2 & 1;
1359                        x0_or_one[0] = x0;
1360                        x0_or_one[2] = -x0;
1361                        x1_or_one[0] = x1;
1362                        x1_or_one[2] = -x1;
1363                        x2_or_one[0] = x2;
1364                        x2_or_one[2] = -x2;
1365                        y0_or_zero[0] = y0;
1366                        y0_or_zero[2] = -y0;
1367                        y1_or_zero[0] = y1;
1368                        y1_or_zero[2] = -y1;
1369                        y2_or_zero[0] = y2;
1370                        y2_or_zero[2] = -y2;
1371                        z0 = x0 * x0;
1372                        z1 = x1 * x1;
1373                        z2 = x2 * x2;
1374                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1375                        t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1376                        t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
```



```
1377                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1378                        t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
1379                        t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
1380                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1381                        t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
1382                        t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
1383                        *py0 = t0;
1384                        *py1 = t1;
1385                        *py2 = t2;

1387                        n0 = (n0 + 1) & 3;
1388                        n1 = (n1 + 1) & 3;
1389                        n2 = (n2 + 1) & 3;
1390                        j0 = (j0 + 1) & 1;
1391                        j1 = (j1 + 1) & 1;
1392                        j2 = (j2 + 1) & 1;
1393                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1394                        t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1395                        t2 = z2 * ( poly3[j2] + z2 * poly4[j2] );
1396                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1397                        t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 ) );
1398                        t2 = z2 * ( poly1[j2] + z2 * ( poly2[j2] + t2 ) );
1399                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1400                        t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_one[n1] *
1401                        t2 = x2_or_one[n2] + ( y2_or_zero[n2] + x2_or_one[n2] *
1402                        *pc0 = t0;
1403                        *pc1 = t1;
1404                        *pc2 = t2;
1405                        break;
1406                }

1408                x += stridex;
1409                y += stridey;
1410                c += stridec;
1411                i = 0;
1412        } while ( --n > 0 );

1414        if ( i > 0 )
1415        {
1416                double          a1_0, a1_1, a2_0, a2_1;
1417                double          t0, t1, t1_0, t1_1, t2_0, t2_1;
1418                double          fn0, fn1, a0, a1, w0, w1, y0, y1;
1419                double          z0, z1;
1420                unsigned        j0, j1;
1421                int             n0, n1;

1423                if ( i > 1 )
1424                {
1425                        n1 = (int) ( x1 * invpio2 + half[xsb1] );
1426                        fn1 = (double) n1;
1427                        n1 &= 3;
1428                        a1 = x1 - fn1 * pio2_1;
1429                        w1 = fn1 * pio2_2;
1430                        x1 = a1 - w1;
1431                        y1 = ( a1 - x1 ) - w1;
1432                        a1 = x1;
1433                        w1 = fn1 * pio2_3 - y1;
1434                        x1 = a1 - w1;
1435                        y1 = ( a1 - x1 ) - w1;
1436                        a1 = x1;
1437                        w1 = fn1 * pio2_3t - y1;
1438                        x1 = a1 - w1;
1439                        y1 = ( a1 - x1 ) - w1;
1440                        xsb1 = HI(&x1);
1441                        if ( ( xsb1 & ~0x80000000 ) < 0x3fc40000 )
1442                        {
```

```
1443                                j1 = n1 & 1;
1444                                x1_or_one[0] = x1;
1445                                x1_or_one[2] = -x1;
1446                                y1_or_zero[0] = y1;
1447                                y1_or_zero[2] = -y1;
1448                                z1 = x1 * x1;
1449                                t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1450                                t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 )
1451                                t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_on
1452                                *py1 = t1;
1453                                n1 = (n1 + 1) & 3;
1454                                j1 = (j1 + 1) & 1;
1455                                t1 = z1 * ( poly3[j1] + z1 * poly4[j1] );
1456                                t1 = z1 * ( poly1[j1] + z1 * ( poly2[j1] + t1 )
1457                                t1 = x1_or_one[n1] + ( y1_or_zero[n1] + x1_or_on
1458                                *pc1 = t1;
1459                        }
1460                        else
1461                        {
1462                                j1 = ( xsb1 + 0x4000 ) & 0xffff8000;
1463                                HI(&t1) = j1;
1464                                LO(&t1) = 0;
1465                                x1 = ( x1 - t1 ) + y1;
1466                                z1 = x1 * x1;
1467                                t1 = z1 * ( qq1 + z1 * qq2 );
1468                                w1 = x1 * ( one + z1 * ( pp1 + z1 * pp2 ) );
1469                                j1 = ( ( ( j1 & ~0x80000000 ) - 0x3fc40000 ) >>
1470                                xsb1 = ( xsb1 >> 30 ) & 2;
1471                                n1 ^= ( xsb1 & ~( n1 << 1 ) );
1472                                xsb1 |= 1;
1473                                a1_1 = __vlibm_TBL_sincos_hi[j1+n1];
1474                                a2_1 = __vlibm_TBL_sincos_hi[j1+((n1+xsb1)&3)];
1475                                t2_1 = __vlibm_TBL_sincos_lo[j1+((n1+xsb1)&3)] -
1476                                *pc1 = a2_1 + t2_1;
1477                                t1_1 = a2_1*w1 + a1_1*t1;
1478                                t1_1 += __vlibm_TBL_sincos_lo[j1+n1];
1479                                *py1 = a1_1 + t1_1;
1480                        }
1481                }
1482                n0 = (int) ( x0 * invpio2 + half[xsb0] );
1483                fn0 = (double) n0;
1484                n0 &= 3;
1485                a0 = x0 - fn0 * pio2_1;
1486                w0 = fn0 * pio2_2;
1487                x0 = a0 - w0;
1488                y0 = ( a0 - x0 ) - w0;
1489                a0 = x0;
1490                w0 = fn0 * pio2_3 - y0;
1491                x0 = a0 - w0;
1492                y0 = ( a0 - x0 ) - w0;
1493                a0 = x0;
1494                w0 = fn0 * pio2_3t - y0;
1495                x0 = a0 - w0;
1496                y0 = ( a0 - x0 ) - w0;
1497                xsb0 = HI(&x0);
1498                if ( ( xsb0 & ~0x80000000 ) < 0x3fc40000 )
1499                {
1500                        j0 = n0 & 1;
1501                        x0_or_one[0] = x0;
1502                        x0_or_one[2] = -x0;
1503                        y0_or_zero[0] = y0;
1504                        y0_or_zero[2] = -y0;
1505                        z0 = x0 * x0;
1506                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1507                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1508                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
```



```
1509                        *py0 = t0;
1510                        n0 = (n0 + 1) & 3;
1511                        j0 = (j0 + 1) & 1;
1512                        t0 = z0 * ( poly3[j0] + z0 * poly4[j0] );
1513                        t0 = z0 * ( poly1[j0] + z0 * ( poly2[j0] + t0 ) );
1514                        t0 = x0_or_one[n0] + ( y0_or_zero[n0] + x0_or_one[n0] *
1515                        *pc0 = t0;
1516                }
1517                else
1518                {
1519                        j0 = ( xsb0 + 0x4000 ) & 0xffff8000;
1520                        HI(&t0) = j0;
1521                        LO(&t0) = 0;
1522                        x0 = ( x0 - t0 ) + y0;
1523                        z0 = x0 * x0;
1524                        t0 = z0 * ( qq1 + z0 * qq2 );
1525                        w0 = x0 * ( one + z0 * ( pp1 + z0 * pp2 ) );
1526                        j0 = ( ( ( j0 & ~0x80000000 ) - 0x3fc40000 ) >> 13 ) & ~
1527                        xsb0 = ( xsb0 >> 30 ) & 2;
1528                        n0 ^= ( xsb0 & ~( n0 << 1 ) );
1529                        xsb0 |= 1;
1530                        a1_0 = __vlibm_TBL_sincos_hi[j0+n0];
1531                        a2_0 = __vlibm_TBL_sincos_hi[j0+((n0+xsb0)&3)];
1532                        t2_0 = __vlibm_TBL_sincos_lo[j0+((n0+xsb0)&3)] - ( a1_0*
1533                        *pc0 = a2_0 + t2_0;
1534                        t1_0 = a2_0*w0 + a1_0*t0;
1535                        t1_0 += __vlibm_TBL_sincos_lo[j0+n0];
1536                        *py0 = a1_0 + t1_0;
1537                }
1538        }

1540        if ( biguns ) {
1541                __vlibm_vsincos_big( nsave, xsave, sxsave, ysave, sysave, csave,
1542        }
1543 }
```

```
**********************************************************
    4238 Sat May 10 12:09:54 2014
new/usr/src/lib/libmvec/common/__vsincosbig.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];
extern int __vlibm_rem_pio2m( double *, double *, int, int, int );

static const double
        zero    = 0.0,
        one             = 1.0,
        two24   = 16777216.0,
        pp1             = -1.6666666666057604652762639431349825546 76e-0001,
        pp2             =  8.3332612096909631267183765661461809444 42e-0003,
        p1              = -1.6666666666666629669805215138920301589656e-0001,
        p2              =  8.3333333239095129568399345528033637666 3e-0003,
        p3              = -1.9841262379979766927915517782300984039 60e-0004,
        p4              =  2.7534036248542772376499876228483303511 10e-0006,
        qq1             = -4.9999999999777109864070239559087115578 70e-0001,
        qq2             =  4.1666548638572193506450558810188420895 80e-0002,
        q1              = -4.9999999999999317014640608788882945244 81e-0001,
```



```
        q2              =  4.1666666663948619175356405939637082223 19e-0002,
        q3              = -1.3888885526561428678327566873685168146 2e-0003,
        q4              =  2.4785194236814607966181282894545305247 59e-0005;

void
__vlibm_vsincos_big( int n, double * restrict x, int stridex,
        double * restrict ss, int stridess,
        double * restrict cc, int stridecc, int thresh )
{
        for ( ; n--; x += stridex, ss += stridess, cc += stridecc )
        {
                double          ts, tc, tx, tt[3], ty[2], t, w, z, c, s;
                unsigned        hx, xsb;
                int                     e0, nx, j;

                hx = HI(x);
                xsb = hx & 0x80000000;
                hx &= ~0x80000000;
                if ( hx <= thresh || hx >= 0x7ff00000 )
                        continue;

                /*
                 * Argument reduction part.
                 */
                e0 = ( hx >> 20 ) - 1046;
                HI(&tx) = 0x41600000 | ( hx & 0xfffff );
                LO(&tx) = LO(x);
                tt[0] = (double)( (int) tx );
                tx = ( tx - tt[0] ) * two24;
                if ( tx != zero )
                {
                        nx = 2;
                        tt[1] = (double)( (int) tx );
                        tt[2] = ( tx - tt[1] ) * two24;
                        if ( tt[2] != zero )
                                nx = 3;
                }
                else
                {
                        nx = 1;
                        tt[1] = tt[2] = zero;
                }
                nx = __vlibm_rem_pio2m( tt, ty, e0, nx, 2 );
                if ( xsb )
                {
                        nx = -nx;
                        ty[0] = -ty[0];
                        ty[1] = -ty[1];
                }

                /* now nx and ty[*] are the quadrant and reduced arg */
                hx = HI(&ty[0]);
                xsb = 0;
                if ( hx & 0x80000000 )
                {
                        ty[0] = -ty[0];
                        ty[1] = -ty[1];
                        hx &= ~0x80000000;
                        xsb = 1;
                }
                if ( hx < 0x3fc40000 )
                {
                        z = ty[0] * ty[0];
                        t = z * ( q1 + z * ( q2 + z * ( q3 + z * q4 ) ) );
                        c = one + t;
                        t = z * ( p1 + z * ( p2 + z * ( p3 + z * p4 ) ) );
```

```
128                         s = ty[0] + ( ty[1] + ty[0] * t );
129                 }
130                 else {
131                         j = ( hx + 0x4000 ) & 0x7fff8000;
132                         HI(&t) = j;
133                         LO(&t) = 0;
134                         ty[0] = ( ty[0] - t ) + ty[1];
135                         z = ty[0] * ty[0];
136                         t = z * ( qq1 + z * qq2 );
137                         w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
138                         j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;

140                         c = __vlibm_TBL_sincos_hi[j+1];
141                         tc = __vlibm_TBL_sincos_lo[j+1] - ( __vlibm_TBL_sincos_h
142                         c += tc;

144                         s = __vlibm_TBL_sincos_hi[j];
145                         ts = ( __vlibm_TBL_sincos_hi[j+1] * w + s * t ) + __vlib
146                         s += ts;
147                 }
148                 if ( xsb ) {
149                         s = -s;
150                 }

152                 switch ( nx & 3 ) {
153                 case 0:
154                         *ss = s;
155                         *cc = c;
156                         break;

158                 case 1:
159                         *ss = c;
160                         *cc = -s;
161                         break;

163                 case 2:
164                         *ss = -s;
165                         *cc = -c;
166                         break;

168                 case 3:
169                         *ss = -c;
170                         *cc = s;
171                         break;
172                 }
173         }
174 }
```

```
**********************************************************
    4181 Sat May 10 12:09:54 2014
new/usr/src/lib/libmvec/common/__vsincosbigf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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/*
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/*
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 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int*)x)
#define LO(x)   *(unsigned*)x
#else
#define HI(x)   *(int*)x
#define LO(x)   *(1+(unsigned*)x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern const double __vlibm_TBL_sincos_hi[], __vlibm_TBL_sincos_lo[];
extern int __vlibm_rem_pio2m( double *, double *, int, int, int );

static const double
        zero    = 0.0,
        one             = 1.0,
        two24   = 16777216.0,
        pp1             = -1.6666666666057604652762639431349825546 76e-0001,
        pp2             =  8.3332612096909631267183765661461809444 42e-0003,
        p1              = -1.6666666666666629669805215138920301589656e-0001,
        p2              =  8.3333333239095129568399345528036376663e-0003,
        p3              = -1.9841262379979766927915517782300984039 60e-0004,
        p4              =  2.7534036248542772376499876228483303511 10e-0006,
        qq1             = -4.9999999999777109864070239559087115578 70e-0001,
        qq2             =  4.1666548638572193506450558810188420895 80e-0002,
        q1              = -4.9999999999999317014640608788882945244 81e-0001,
        q2              =  4.1666666663948619175356405939637082223 19e-0002,
        q3              = -1.3888885526561428678327566873685168146 2e-0003,
        q4              =  2.4785194236814607966181282894545305247 59e-0005;

void
__vlibm_vsincos_bigf( int n, float * restrict x, int stridex,
        float * restrict ss, int stridess, float * restrict cc, int stridecc )
{
        for ( ; n--; x += stridex, ss += stridess, cc += stridecc )
        {
                double          ts, tc, tx, tt[3], ty[2], t, w, z, c, s;
                unsigned        hx, xsb;
                int                     e0, nx, j;

                tx = *x;
                hx = HI(&tx);
                xsb = hx & 0x80000000;
                hx &= ~0x80000000;
                if ( hx <= 0x413921fb || hx >= 0x7ff00000 )
                        continue;
                e0 = ( hx >> 20 ) - 1046;
                HI(&tx) = 0x41600000 | ( hx & 0xfffff );

                tt[0] = (double)( (int) tx );
                tx = ( tx - tt[0] ) * two24;
                if ( tx != zero )
                {
                        nx = 2;
                        tt[1] = (double)( (int) tx );
                        tt[2] = ( tx - tt[1] ) * two24;
                        if ( tt[2] != zero )
                                nx = 3;
                }
                else
                {
                        nx = 1;
                        tt[1] = tt[2] = zero;
                }
                nx = __vlibm_rem_pio2m( tt, ty, e0, nx, 2 );
                if ( xsb )
                {
                        nx = -nx;
                        ty[0] = -ty[0];
                        ty[1] = -ty[1];
                }

                /* now nx and ty[*] are the quadrant and reduced arg */
                xsb = 0;
                hx = HI(&ty[0]);
                if ( hx & 0x80000000 )
                {
                        ty[0] = -ty[0];
                        ty[1] = -ty[1];
                        hx &= ~0x80000000;
                        xsb = 1;
                }
                if ( hx < 0x3fc40000 )
                {
                        z = ty[0] * ty[0];
                        t = z * ( q1 + z * ( q2 + z * ( q3 + z * q4 ) ) );
                        c = one + t;

                        t = z * ( p1 + z * ( p2 + z * ( p3 + z * p4 ) ) );
                        s = ty[0] + ( ty[1] + ty[0] * t );
                }
                else {
```

```
128                         j = ( hx + 0x4000 ) & 0x7fff8000;
129                         HI(&t) = j;
130                         LO(&t) = 0;
131                         ty[0] = ( ty[0] - t ) + ty[1];
132                         z = ty[0] * ty[0];
133                         t = z * ( qq1 + z * qq2 );
134                         w = ty[0] * ( one + z * ( pp1 + z * pp2 ) );
135                         j = ( ( j - 0x3fc40000 ) >> 13 ) & ~3;

137                         c = __vlibm_TBL_sincos_hi[j+1];
138                         tc = __vlibm_TBL_sincos_lo[j+1] - ( __vlibm_TBL_sincos_h
139                         c += tc;

141                         s = __vlibm_TBL_sincos_hi[j];
142                         ts = ( __vlibm_TBL_sincos_hi[j+1] * w + s * t ) + __vlib
143                         s += ts;
144                 }
145                 if ( xsb ) {
146                         s = -s;
147                 }

149                 switch ( nx & 3 ) {
150                 case 0:
151                         *ss = s;
152                         *cc = c;
153                         break;

155                 case 1:
156                         *ss = c;
157                         *cc = -s;
158                         break;

160                 case 2:
161                         *ss = -s;
162                         *cc = -c;
163                         break;

165                 case 3:
166                         *ss = -c;
167                         *cc = s;
168                         break;
169                 }
170         }
171 }
```

```
**********************************************************
    7042 Sat May 10 12:09:54 2014
new/usr/src/lib/libmvec/common/__vsincosf.c
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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/*
 * __vsincosf: single precision vector sincos
 *
 * Algorithm:
 *
 * For |x| < pi/4, approximate sin(x) by a polynomial x+x*z*(S0+
 * z*(S1+z*S2)) and cos(x) by a polynomial 1+z*(-1/2+z*(C0+z*(C1+
 * z*C2))), where z = x*x, all evaluated in double precision.
 *
 * Accuracy:
 *
 * The largest error is less than 0.6 ulps.
 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int *)&x)
#define LO(x)   *(unsigned *)&x
#else
#define HI(x)   *(int *)&x
#define LO(x)   *(1+(unsigned *)&x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern int __vlibm_rem_pio2m(double *, double *, int, int, int);
```



```
static const double C[] = {
        -1.666665524424430847168e-01,    /* 2^ -3 * -1.5555460000000 */
        8.332191966474056243390e-03,     /* 2^ -7 *  1.11077E0000000 */
        -1.951879094121977686688e-04,    /* 2^-13 * -1.9956B60000000 */
        1.0,
        -0.5,
        4.166664555668830871580e-02,     /* 2^ -5 *  1.55554A0000000 */
        -1.388730364851653575900e-03,    /* 2^-10 * -1.6C0C1E0000000 */
        2.443099037918727849950e-05,     /* 2^-16 *  1.99E24E0000000 */
        0.636619772367581343075535,      /* 2^ -1  * 1.45F306DC9C883 */
        6755399441055744.0,              /* 2^ 52  * 1.8000000000000 */
        1.570796326734125614166,         /* 2^  0  * 1.921FB54400000 */
        6.077100506506192601475e-11,     /* 2^-34  * 1.0B4611A626331 */
};

#define S0      C[0]
#define S1      C[1]
#define S2      C[2]
#define one     C[3]
#define mhalf   C[4]
#define C0      C[5]
#define C1      C[6]
#define C2      C[7]
#define invpio2 C[8]
#define c3two51 C[9]
#define pio2_1  C[10]
#define pio2_t  C[11]

#define PREPROCESS(N, sindex, cindex, label)                            \
        hx = *(int *)x;                                                 \
        ix = hx & 0x7fffffff;                                           \
        t = *x;                                                         \
        x += stridex;                                                   \
        if (ix <= 0x3f490fdb) { /* |x| < pi/4 */                        \
                if (ix == 0) {                                          \
                        s[sindex] = t;                                  \
                        c[cindex] = one;                                \
                        goto label;                                     \
                }                                                       \
                y##N = (double)t;                                       \
                n##N = 0;                                               \
        } else if (ix <= 0x49c90fdb) { /* |x| < 2^19*pi */              \
                y##N = (double)t;                                       \
                medium = 1;                                             \
        } else {                                                        \
                if (ix >= 0x7f800000) { /* inf or nan */                \
                        s[sindex] = c[cindex] = t / t;                  \
                        goto label;                                     \
                }                                                       \
                z##N = y##N = (double)t;                                \
                hx = HI(y##N);                                          \
                n##N = ((hx >> 20) & 0x7ff) - 1046;                     \
                HI(z##N) = (hx & 0xfffff) | 0x41600000;                 \
                n##N = __vlibm_rem_pio2m(&z##N, &y##N, n##N, 1, 0);     \
                if (hx < 0) {                                           \
                        y##N = -y##N;                                   \
                        n##N = -n##N;                                   \
                }                                                       \
                z##N = y##N * y##N;                                     \
                f##N = (float)(y##N + y##N * z##N * (S0 + z##N *        \
                    (S1 + z##N * S2)));                                 \
                g##N = (float)(one + z##N * (mhalf + z##N * (C0 +       \
                  z##N * (C1 + z##N * C2))));                           \
                if (n##N & 2) {                                         \
                        f##N = -f##N;                                   \
                        g##N = -g##N;                                   \
```

```
127                 }                                                       \
128                 if (n##N & 1) {                                         \
129                         s[sindex] = g##N;                               \
130                         c[cindex] = -f##N;                              \
131                 } else {                                                \
132                         s[sindex] = f##N;                               \
133                         c[cindex] = g##N;                               \
134                 }                                                       \
135                 goto label;                                             \
136         }

138 #define PROCESS(N)                                                      \
139         if (medium) {                                                   \
140                 z##N = y##N * invpio2 + c3two51;                        \
141                 n##N = LO(z##N);                                        \
142                 z##N -= c3two51;                                        \
143                 y##N = (y##N - z##N * pio2_1) - z##N * pio2_t;          \
144         }                                                               \
145         z##N = y##N * y##N;                                             \
146         f##N = (float)(y##N + y##N * z##N * (S0 + z##N * (S1 + z##N * S2)));\
147         g##N = (float)(one + z##N * (mhalf + z##N * (C0 + z##N *         \
148             (C1 + z##N * C2))));                                        \
149         if (n##N & 2) {                                                 \
150                 f##N = -f##N;                                           \
151                 g##N = -g##N;                                           \
152         }                                                               \
153         if (n##N & 1) {                                                 \
154                 *s = g##N;                                              \
155                 *c = -f##N;                                             \
156         } else {                                                        \
157                 *s = f##N;                                              \
158                 *c = g##N;                                              \
159         }                                                               \
160         s += strides;                                                   \
161         c += stridec

163 void
164 __vsincosf(int n, float *restrict x, int stridex,
165     float *restrict s, int strides, float *restrict c, int stridec)
166 {
167         double          y0, y1, y2, y3;
168         double          z0, z1, z2, z3;
169         float           f0, f1, f2, f3, t;
170         float           g0, g1, g2, g3;
171         int             n0 = 0, n1 = 0, n2 = 0, n3, hx, ix, medium;

173         s -= strides;
174         c -= stridec;

176         for (;;) {
177 begin:
178                 s += strides;
179                 c += stridec;

181                 if (--n < 0)
182                         break;

184                 medium = 0;
185                 PREPROCESS(0, 0, 0, begin);

187                 if (--n < 0)
188                         goto process1;

190                 PREPROCESS(1, strides, stridec, process1);

192                 if (--n < 0)
```



```
193                         goto process2;

195                 PREPROCESS(2, (strides << 1), (stridec << 1), process2);

197                 if (--n < 0)
198                         goto process3;

200                 PREPROCESS(3, (strides << 1) + strides,
201                     (stridec << 1) + stridec, process3);

203                 if (medium) {
204                         z0 = y0 * invpio2 + c3two51;
205                         z1 = y1 * invpio2 + c3two51;
206                         z2 = y2 * invpio2 + c3two51;
207                         z3 = y3 * invpio2 + c3two51;

209                         n0 = LO(z0);
210                         n1 = LO(z1);
211                         n2 = LO(z2);
212                         n3 = LO(z3);

214                         z0 -= c3two51;
215                         z1 -= c3two51;
216                         z2 -= c3two51;
217                         z3 -= c3two51;

219                         y0 = (y0 - z0 * pio2_1) - z0 * pio2_t;
220                         y1 = (y1 - z1 * pio2_1) - z1 * pio2_t;
221                         y2 = (y2 - z2 * pio2_1) - z2 * pio2_t;
222                         y3 = (y3 - z3 * pio2_1) - z3 * pio2_t;
223                 }

225                 z0 = y0 * y0;
226                 z1 = y1 * y1;
227                 z2 = y2 * y2;
228                 z3 = y3 * y3;

230                 f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
231                 f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
232                 f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
233                 f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));

235                 g0 = (float)(one + z0 * (mhalf + z0 * (C0 + z0 *
236                     (C1 + z0 * C2))));
237                 g1 = (float)(one + z1 * (mhalf + z1 * (C0 + z1 *
238                     (C1 + z1 * C2))));
239                 g2 = (float)(one + z2 * (mhalf + z2 * (C0 + z2 *
240                     (C1 + z2 * C2))));
241                 g3 = (float)(one + z3 * (mhalf + z3 * (C0 + z3 *
242                     (C1 + z3 * C2))));

244                 if (n0 & 2) {
245                         f0 = -f0;
246                         g0 = -g0;
247                 }
248                 if (n1 & 2) {
249                         f1 = -f1;
250                         g1 = -g1;
251                 }
252                 if (n2 & 2) {
253                         f2 = -f2;
254                         g2 = -g2;
255                 }
256                 if (n3 & 2) {
257                         f3 = -f3;
258                         g3 = -g3;
```

```
259                 }

261                 if (n0 & 1) {
262                         *s = g0;
263                         *c = -f0;
264                 } else {
265                         *s = f0;
266                         *c = g0;
267                 }
268                 s += strides;
269                 c += stridec;

271                 if (n1 & 1) {
272                         *s = g1;
273                         *c = -f1;
274                 } else {
275                         *s = f1;
276                         *c = g1;
277                 }
278                 s += strides;
279                 c += stridec;

281                 if (n2 & 1) {
282                         *s = g2;
283                         *c = -f2;
284                 } else {
285                         *s = f2;
286                         *c = g2;
287                 }
288                 s += strides;
289                 c += stridec;

291                 if (n3 & 1) {
292                         *s = g3;
293                         *c = -f3;
294                 } else {
295                         *s = f3;
296                         *c = g3;
297                 }
298                 continue;

300 process1:
301                 PROCESS(0);
302                 continue;

304 process2:
305                 PROCESS(0);
306                 PROCESS(1);
307                 continue;

309 process3:
310                 PROCESS(0);
311                 PROCESS(1);
312                 PROCESS(2);
313         }
314 }
```

```
**********************************************************
   10486 Sat May 10 12:09:54 2014
new/usr/src/lib/libmvec/common/__vsinf.c
patch08 - libmvec: fixed compilation issues after updates
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
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 * CDDL HEADER END
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 */
/*
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 */

/*
 * __vsinf: single precision vector sin
 *
 * Algorithm:
 *
 * For |x| < pi/4, approximate sin(x) by a polynomial x+x*z*(S0+
 * z*(S1+z*S2)) and cos(x) by a polynomial 1+z*(-1/2+z*(C0+z*(C1+
 * z*C2))), where z = x*x, all evaluated in double precision.
 *
 * Accuracy:
 *
 * The largest error is less than 0.6 ulps.
 */

#include <sys/isa_defs.h>

#ifdef _LITTLE_ENDIAN
#define HI(x)   *(1+(int *)&x)
#define LO(x)   *(unsigned *)&x
#else
#define HI(x)   *(int *)&x
#define LO(x)   *(1+(unsigned *)&x)
#endif

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern int __vlibm_rem_pio2m(double *, double *, int, int, int);
```



```
static const double C[] = {
        -1.666665524424430847168e-01,    /* 2^ -3 * -1.5555460000000 */
        8.332191966474056243390e-03,     /* 2^ -7 *  1.11077E0000000 */
        -1.951879094121977686880e-04,    /* 2^-13 * -1.9956B60000000 */
        1.0,
        -0.5,
        4.166664555668830871580e-02,     /* 2^ -5 *  1.55554A0000000 */
        -1.388730364851653575900e-03,    /* 2^-10 * -1.6C0C1E0000000 */
        2.443099037918727849950e-05,     /* 2^-16 *  1.99E24E0000000 */
        0.636619772367581343075535,      /* 2^ -1  * 1.45F306DC9C883 */
        6755399441055744.0,              /* 2^ 52  * 1.8000000000000 */
        1.570796326734125614166,         /* 2^  0  * 1.921FB54400000 */
        6.077100506506192601475e-11,     /* 2^-34  * 1.0B4611A626331 */
};

#define S0      C[0]
#define S1      C[1]
#define S2      C[2]
#define one     C[3]
#define mhalf   C[4]
#define C0      C[5]
#define C1      C[6]
#define C2      C[7]
#define invpio2 C[8]
#define c3two51 C[9]
#define pio2_1  C[10]
#define pio2_t  C[11]

#define PREPROCESS(N, index, label)                                     \
        hx = *(int *)x;                                                 \
        ix = hx & 0x7fffffff;                                           \
        t = *x;                                                         \
        x += stridex;                                                   \
        if (ix <= 0x3f490fdb) { /* |x| < pi/4 */                        \
                if (ix == 0) {                                          \
                        y[index] = t;                                   \
                        goto label;                                     \
                }                                                       \
                y##N = (double)t;                                       \
                n##N = 0;                                               \
        } else if (ix <= 0x49c90fdb) { /* |x| < 2^19*pi */              \
                y##N = (double)t;                                       \
                medium = 1;                                             \
        } else {                                                        \
                if (ix >= 0x7f800000) { /* inf or nan */                \
                        y[index] = t / t;                               \
                        goto label;                                     \
                }                                                       \
                z##N = y##N = (double)t;                                \
                hx = HI(y##N);                                          \
                n##N = ((hx >> 20) & 0x7ff) - 1046;                     \
                HI(z##N) = (hx & 0xfffff) | 0x41600000;                 \
                n##N = __vlibm_rem_pio2m(&z##N, &y##N, n##N, 1, 0);     \
                if (hx < 0) {                                           \
                        y##N = -y##N;                                   \
                        n##N = -n##N;                                   \
                }                                                       \
                z##N = y##N * y##N;                                     \
                if (n##N & 1) { /* compute cos y */                     \
                        f##N = (float)(one + z##N * (mhalf + z##N *     \
                            (C0 + z##N * (C1 + z##N * C2))));           \
                } else { /* compute sin y */                            \
                        f##N = (float)(y##N + y##N * z##N * (S0 +       \
                            z##N * (S1 + z##N * S2)));                  \
                }                                                       \
                y[index] = (n##N & 2)? -f##N : f##N;                    \
```

```
127                 goto label;                                         \
128         }

130 #define PROCESS(N)                                                  \
131         if (medium) {                                               \
132                 z##N = y##N * invpio2 + c3two51;                    \
133                 n##N = LO(z##N);                                    \
134                 z##N -= c3two51;                                    \
135                 y##N = (y##N - z##N * pio2_1) - z##N * pio2_t;       \
136         }                                                           \
137         z##N = y##N * y##N;                                         \
138         if (n##N & 1) { /* compute cos y */                         \
139                 f##N = (float)(one + z##N * (mhalf + z##N * (C0 +   \
140                     z##N * (C1 + z##N * C2))));                     \
141         } else { /* compute sin y */                                \
142                 f##N = (float)(y##N + y##N * z##N * (S0 + z##N * (S1 + \
143                     z##N * S2)));                                   \
144         }                                                           \
145         *y = (n##N & 2)? -f##N : f##N;                               \
146         y += stridey

148 void
149 __vsinf(int n, float *restrict x, int stridex, float *restrict y,
150     int stridey)
151 {
152         double          y0, y1, y2, y3;
153         double          z0, z1, z2, z3;
154         float           f0, f1, f2, f3, t;
155         int             n0 = 0, n1 = 0, n2 = 0, n3, hx, ix, medium;

157         y -= stridey;

159         for (;;) {
160 begin:
161                 y += stridey;

163                 if (--n < 0)
164                         break;

166                 medium = 0;
167                 PREPROCESS(0, 0, begin);

169                 if (--n < 0)
170                         goto process1;

172                 PREPROCESS(1, stridey, process1);

174                 if (--n < 0)
175                         goto process2;

177                 PREPROCESS(2, (stridey << 1), process2);

179                 if (--n < 0)
180                         goto process3;

182                 PREPROCESS(3, (stridey << 1) + stridey, process3);

184                 if (medium) {
185                         z0 = y0 * invpio2 + c3two51;
186                         z1 = y1 * invpio2 + c3two51;
187                         z2 = y2 * invpio2 + c3two51;
188                         z3 = y3 * invpio2 + c3two51;

190                         n0 = LO(z0);
191                         n1 = LO(z1);
192                         n2 = LO(z2);
```



```
193                         n3 = LO(z3);

195                         z0 -= c3two51;
196                         z1 -= c3two51;
197                         z2 -= c3two51;
198                         z3 -= c3two51;

200                         y0 = (y0 - z0 * pio2_1) - z0 * pio2_t;
201                         y1 = (y1 - z1 * pio2_1) - z1 * pio2_t;
202                         y2 = (y2 - z2 * pio2_1) - z2 * pio2_t;
203                         y3 = (y3 - z3 * pio2_1) - z3 * pio2_t;
204                 }

206                 z0 = y0 * y0;
207                 z1 = y1 * y1;
208                 z2 = y2 * y2;
209                 z3 = y3 * y3;

211                 hx = (n0 & 1) | ((n1 & 1) << 1) | ((n2 & 1) << 2) |
212                     ((n3 & 1) << 3);
213                 switch (hx) {
214                 case 0:
215                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
216                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
217                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
218                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
219                         break;

221                 case 1:
222                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
223                             z0 * (C1 + z0 * C2))));
224                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
225                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
226                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
227                         break;

229                 case 2:
230                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
231                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
232                             z1 * (C1 + z1 * C2))));
233                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
234                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
235                         break;

237                 case 3:
238                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
239                             z0 * (C1 + z0 * C2))));
240                         f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
241                             z1 * (C1 + z1 * C2))));
242                         f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
243                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
244                         break;

246                 case 4:
247                         f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
248                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
249                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
250                             z2 * (C1 + z2 * C2))));
251                         f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
252                         break;

254                 case 5:
255                         f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
256                             z0 * (C1 + z0 * C2))));
257                         f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
258                         f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
```

```
259                         z2 * (C1 + z2 * C2))));
260                 f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
261                 break;

263         case 6:
264                 f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
265                 f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
266                     z1 * (C1 + z1 * C2))));
267                 f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
268                     z2 * (C1 + z2 * C2))));
269                 f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
270                 break;

272         case 7:
273                 f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
274                     z0 * (C1 + z0 * C2))));
275                 f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
276                     z1 * (C1 + z1 * C2))));
277                 f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
278                     z2 * (C1 + z2 * C2))));
279                 f3 = (float)(y3 + y3 * z3 * (S0 + z3 * (S1 + z3 * S2)));
280                 break;

282         case 8:
283                 f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
284                 f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
285                 f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
286                 f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
287                     z3 * (C1 + z3 * C2))));
288                 break;

290         case 9:
291                 f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
292                     z0 * (C1 + z0 * C2))));
293                 f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
294                 f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
295                 f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
296                     z3 * (C1 + z3 * C2))));
297                 break;

299         case 10:
300                 f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
301                 f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
302                     z1 * (C1 + z1 * C2))));
303                 f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
304                 f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
305                     z3 * (C1 + z3 * C2))));
306                 break;

308         case 11:
309                 f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
310                     z0 * (C1 + z0 * C2))));
311                 f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
312                     z1 * (C1 + z1 * C2))));
313                 f2 = (float)(y2 + y2 * z2 * (S0 + z2 * (S1 + z2 * S2)));
314                 f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
315                     z3 * (C1 + z3 * C2))));
316                 break;

318         case 12:
319                 f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
320                 f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
321                 f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
322                     z2 * (C1 + z2 * C2))));
323                 f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
324                     z3 * (C1 + z3 * C2))));
```



```
325                 break;

327         case 13:
328                 f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
329                     z0 * (C1 + z0 * C2))));
330                 f1 = (float)(y1 + y1 * z1 * (S0 + z1 * (S1 + z1 * S2)));
331                 f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
332                     z2 * (C1 + z2 * C2))));
333                 f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
334                     z3 * (C1 + z3 * C2))));
335                 break;

337         case 14:
338                 f0 = (float)(y0 + y0 * z0 * (S0 + z0 * (S1 + z0 * S2)));
339                 f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
340                     z1 * (C1 + z1 * C2))));
341                 f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
342                     z2 * (C1 + z2 * C2))));
343                 f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
344                     z3 * (C1 + z3 * C2))));
345                 break;

347         default:
348                 f0 = (float)(one + z0 * (mhalf + z0 * (C0 +
349                     z0 * (C1 + z0 * C2))));
350                 f1 = (float)(one + z1 * (mhalf + z1 * (C0 +
351                     z1 * (C1 + z1 * C2))));
352                 f2 = (float)(one + z2 * (mhalf + z2 * (C0 +
353                     z2 * (C1 + z2 * C2))));
354                 f3 = (float)(one + z3 * (mhalf + z3 * (C0 +
355                     z3 * (C1 + z3 * C2))));
356         }

358         *y = (n0 & 2)? -f0 : f0;
359         y += stridey;
360         *y = (n1 & 2)? -f1 : f1;
361         y += stridey;
362         *y = (n2 & 2)? -f2 : f2;
363         y += stridey;
364         *y = (n3 & 2)? -f3 : f3;
365         continue;

367 process1:
368         PROCESS(0);
369         continue;

371 process2:
372         PROCESS(0);
373         PROCESS(1);
374         continue;

376 process3:
377         PROCESS(0);
378         PROCESS(1);
379         PROCESS(2);
380     }
381 }
```

```
**********************************************************
    1351 Sat May 10 12:09:54 2014
new/usr/src/lib/libmvec/common/__vsqrt.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#include "libm_synonyms.h"
#include "libm_inlines.h"

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

#define sqrt __sqrt

extern double sqrt( double );

void
__vsqrt( int n, double * restrict x, int stridex, double * restrict y, int strid
{
        for( ; n > 0 ; n-- )
        {
                *y = sqrt(*x);
                x += stridex;
                y += stridey;
        }
}
```

```
**********************************************************
    1352 Sat May 10 12:09:54 2014
new/usr/src/lib/libmvec/common/__vsqrtf.c
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

#include "libm_synonyms.h"
#include "libm_inlines.h"

#define sqrtf __sqrtf

extern float sqrtf( float );

void
__vsqrtf( int n, float * restrict x, int stridex, float * restrict y, int stride
{
        for( ; n > 0 ; n-- )
        {
                *y = sqrtf(*x);
                x += stridex;
                y += stridey;
        }
}
```

****
1316 Sat May 10 12:09:54 2014
new/usr/src/lib/libmvec/common/__vz_abs.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern void __vhypot( int, double *, int, double *, int, double *, int );

void
__vz_abs( int n, double * restrict x, int stridex, double * restrict y,
        int stridey )
{
        stridex <<= 1;
        __vhypot( n, x, stridex, x + 1, stridex, y, stridey );
}
```

****
1554 Sat May 10 12:09:55 2014
new/usr/src/lib/libmvec/common/__vz_exp.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern void __vexp( int, double *, int, double *, int );
extern void __vsincos( int, double *, int, double *, int, double *, int );

void
__vz_exp( int n, double * restrict x, int stridex, double * restrict y,
        int stridey, double * restrict tmp )
{
        int             i, j;

        stridex <<= 1;
        stridey <<= 1;
        __vexp( n, x, stridex, tmp, 1 );
        __vsincos( n, x + 1, stridex, y + 1, stridey, y, stridey );
        for ( i = j = 0; i < n; i++, j += stridey )
        {
                y[j] *= tmp[i];
                y[j+1] *= tmp[i];
        }
}
```

****
1569 Sat May 10 12:09:55 2014
new/usr/src/lib/libmvec/common/__vz_log.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern void __vatan2( int, double *, int, double *, int, double *, int );
extern void __vhypot( int, double *, int, double *, int, double *, int );
extern void __vlog( int, double *, int, double *, int );

void
__vz_log( int n, double * restrict x, int stridex, double * restrict y,
        int stridey )
{
        stridex <<= 1;
        stridey <<= 1;
        __vhypot( n, x, stridex, x + 1, stridex, y + 1, stridey );
        __vlog( n, y + 1, stridey, y, stridey );
        __vatan2( n, x + 1, stridex, x, stridex, y + 1, stridey );
}
```

****
1651 Sat May 10 12:09:55 2014
new/usr/src/lib/libmvec/common/__vz_pow.c
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

#ifdef __RESTRICT
#define restrict _Restrict
#else
#define restrict
#endif

extern void __vz_exp( int, double *, int, double *, int, double * );
extern void __vz_log( int, double *, int, double *, int );

void
__vz_pow( int n, double * restrict x, int stridex, double * restrict y,
        int stridey, double * restrict z, int stridez, double * restrict tmp )
{
        double  r;
        int             i, j, k;

        __vz_log( n, x, stridex, tmp, 1 );
        stridey <<= 1;
        for ( i = j = 0; i < n; i++, j += stridey )
        {
                k = i << 1;
                r = y[j] * tmp[k] - y[j+1] * tmp[k+1];
                tmp[k+1] = y[j+1] * tmp[k] + y[j] * tmp[k+1];
                tmp[k] = r;
        }
        __vz_exp( n, tmp, 1, z, stridez, tmp + n + n );
}
```

```
**********************************************************
    4034 Sat May 10 12:09:55 2014
new/usr/src/lib/libmvec/common/mapfile-vers
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#
# Interface definition for libmvec.so.1

$mapfile_version 2

$if _ELF32
$add lf64
$endif
$if _sparc && _ELF32
$add sparc32
$endif
$if _sparc && _ELF64
$add sparcv9
$endif
$if _x86 && _ELF32
$add i386
$endif
$if _x86 && _ELF64
$add amd64
$endif

SYMBOL_VERSION SUNW_1.1 {
        global:
                __vatan2;               #LSARC/2003/737
                __vatan2_;              #LSARC/2003/737
                __vatan2f;              #LSARC/2003/737
                __vatan2f_;             #LSARC/2003/737
                __vatan;                #LSARC/2003/737
                __vatan_;               #LSARC/2003/737
                __vatanf;               #LSARC/2003/737
                __vatanf_;              #LSARC/2003/737
                __vc_abs;               #LSARC/2003/737
                __vc_abs_;              #LSARC/2003/737
                __vc_exp;               #LSARC/2003/737
                __vc_exp_;              #LSARC/2003/737
                __vc_log;               #LSARC/2003/737
                __vc_log_;              #LSARC/2003/737
```



```
                __vc_pow;               #LSARC/2003/737
                __vc_pow_;              #LSARC/2003/737
                __vcos;                 #LSARC/2003/737
                __vcos_;                #LSARC/2003/737
                __vcosf;                #LSARC/2003/737
                __vcosf_;               #LSARC/2003/737
                __vexp;                 #LSARC/2003/737
                __vexp_;                #LSARC/2003/737
                __vexpf;                #LSARC/2003/737
                __vexpf_;               #LSARC/2003/737
                __vhypot;               #LSARC/2003/737
                __vhypot_;              #LSARC/2003/737
                __vhypotf;              #LSARC/2003/737
                __vhypotf_;             #LSARC/2003/737
                __vlog;                 #LSARC/2003/737
                __vlog_;                #LSARC/2003/737
                __vlogf;                #LSARC/2003/737
                __vlogf_;               #LSARC/2003/737
                __vpow;                 #LSARC/2003/737
                __vpow_;                #LSARC/2003/737
                __vpowf;                #LSARC/2003/737
                __vpowf_;               #LSARC/2003/737
                __vrhypot;              #LSARC/2003/737
                __vrhypot_;             #LSARC/2003/737
                __vrhypotf;             #LSARC/2003/737
                __vrhypotf_;            #LSARC/2003/737
                __vrsqrt;               #LSARC/2003/737
                __vrsqrt_;              #LSARC/2003/737
                __vrsqrtf;              #LSARC/2003/737
                __vrsqrtf_;             #LSARC/2003/737
                __vsin;                 #LSARC/2003/737
                __vsin_;                #LSARC/2003/737
                __vsincos;              #LSARC/2003/737
                __vsincos_;             #LSARC/2003/737
                __vsincosf;             #LSARC/2003/737
                __vsincosf_;            #LSARC/2003/737
                __vsinf;                #LSARC/2003/737
                __vsinf_;               #LSARC/2003/737
                __vsqrt;                #LSARC/2003/737
                __vsqrt_;               #LSARC/2003/737
                __vsqrtf;               #LSARC/2003/737
                __vsqrtf_;              #LSARC/2003/737
                __vz_abs;               #LSARC/2003/737
                __vz_abs_;              #LSARC/2003/737
                __vz_exp;               #LSARC/2003/737
                __vz_exp_;              #LSARC/2003/737
                __vz_log;               #LSARC/2003/737
                __vz_log_;              #LSARC/2003/737
                __vz_pow;               #LSARC/2003/737
                __vz_pow_;              #LSARC/2003/737
                vatan2_;                #LSARC/2003/737
                vatan2f_;               #LSARC/2003/737
                vatan_;                 #LSARC/2003/737
                vatanf_;                #LSARC/2003/737
                vc_abs_;                #LSARC/2003/737
                vc_exp_;                #LSARC/2003/737
                vc_log_;                #LSARC/2003/737
                vc_pow_;                #LSARC/2003/737
                vcos_;                  #LSARC/2003/737
                vcosf_;                 #LSARC/2003/737
                vexp_;                  #LSARC/2003/737
                vexpf_;                 #LSARC/2003/737
                vhypot_;                #LSARC/2003/737
                vhypotf_;               #LSARC/2003/737
                vlog_;                  #LSARC/2003/737
                vlogf_;                 #LSARC/2003/737
```

```
128                 vpow_;                  #LSARC/2003/737
129                 vpowf_;                 #LSARC/2003/737
130                 vrhypot_;               #LSARC/2003/737
131                 vrhypotf_;              #LSARC/2003/737
132                 vrsqrt_;                #LSARC/2003/737
133                 vrsqrtf_;               #LSARC/2003/737
134                 vsin_;                  #LSARC/2003/737
135                 vsincos_;               #LSARC/2003/737
136                 vsincosf_;              #LSARC/2003/737
137                 vsinf_;                 #LSARC/2003/737
138                 vsqrt_;                 #LSARC/2003/737
139                 vsqrtf_;                #LSARC/2003/737
140                 vz_abs_;                #LSARC/2003/737
141                 vz_exp_;                #LSARC/2003/737
142                 vz_log_;                #LSARC/2003/737
143                 vz_pow_;                #LSARC/2003/737
144         local:
145                 *;
146 };
```

****
1755 Sat May 10 12:09:55 2014
new/usr/src/lib/libmvec/common/mapfilevis-vers
patch01 - 693 import Sun Devpro Math Library
****

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#
# Interface definition for cpu/sparcv8plus+vis/libmvec_isa.so.1

SUNW_1.1 {
        global:
                __vatan;                #LSARC/2003/737
                __vatan2;               #LSARC/2003/737
                __vatan2f;              #LSARC/2003/737
                __vatanf;               #LSARC/2003/737
                __vcos;                 #LSARC/2003/737
                __vcosf;                #LSARC/2003/737
                __vexp;                 #LSARC/2003/737
                __vexpf;                #LSARC/2003/737
                __vhypot;               #LSARC/2003/737
                __vhypotf;              #LSARC/2003/737
                __vlog;                 #LSARC/2003/737
                __vlogf;                #LSARC/2003/737
                __vpow;                 #LSARC/2003/737
                __vpowf;                #LSARC/2003/737
                __vrhypot;              #LSARC/2003/737
                __vrhypotf;             #LSARC/2003/737
                __vrsqrt;               #LSARC/2003/737
                __vrsqrtf;              #LSARC/2003/737
                __vsin;                 #LSARC/2003/737
                __vsincos;              #LSARC/2003/737
                __vsincosf;             #LSARC/2003/737
                __vsinf;                #LSARC/2003/737
                __vsqrt;                #LSARC/2003/737
                __vsqrtf;               #LSARC/2003/737
        local:
                *;
};
```

```
**********************************************************
    1172 Sat May 10 12:09:55 2014
new/usr/src/lib/libmvec/common/mapfilevis2-vers
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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#
# Interface definition for cpu/sparcv9+vis2/libmvec_isa.so.1

SUNW_1.1 {
        global:
                __vcos;                 #LSARC/2003/737
                __vlog;                 #LSARC/2003/737
                __vsin;                 #LSARC/2003/737
                __vsqrtf;               #LSARC/2003/737
        local:
                *;
};
```

```
**********************************************************
    1305 Sat May 10 12:09:55 2014
new/usr/src/lib/libmvec/common/vatan2_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

extern void __vatan2( int, double *, int, double *, int, double *, int );

#pragma weak vatan2_ = __vatan2_

/* just invoke the serial function */
void
__vatan2_( int *n, double *y, int *stridey, double *x, int *stridex,
        double *z, int *stridez )
{
        __vatan2( *n, y, *stridey, x, *stridex, z, *stridez );
}
```

```
**********************************************************
    1304 Sat May 10 12:09:55 2014
new/usr/src/lib/libmvec/common/vatan2f_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

extern void __vatan2f( int, float *, int, float *, int, float *, int );

#pragma weak vatan2f_ = __vatan2f_

/* just invoke the serial function */
void
__vatan2f_( int *n, float *y, int *stridey, float *x, int *stridex,
        float *z, int *stridez )
{
        __vatan2f( *n, y, *stridey, x, *stridex, z, *stridez );
}
```

```
**********************************************************
    1246 Sat May 10 12:09:56 2014
new/usr/src/lib/libmvec/common/vatan_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

extern void __vatan( int, double *, int, double *, int );

#pragma weak vatan_ = __vatan_

/* just invoke the serial function */
void
__vatan_( int *n, double *x, int *stridex, double *y, int *stridey )
{
        __vatan( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1247 Sat May 10 12:09:56 2014
new/usr/src/lib/libmvec/common/vatanf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

extern void __vatanf( int, float *, int, float *, int );

#pragma weak vatanf_ = __vatanf_

/* just invoke the serial function */
void
__vatanf_( int *n, float *x, int *stridex, float *y, int *stridey )
{
        __vatanf( *n, x, *stridex, y, *stridey );
}
```

****
1247 Sat May 10 12:09:56 2014
new/usr/src/lib/libmvec/common/vc_abs_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
****

```
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 */

extern void __vc_abs( int, float *, int, float *, int );

#pragma weak vc_abs_ = __vc_abs_

/* just invoke the serial function */
void
__vc_abs_( int *n, float *x, int *stridex, float *y, int *stridey )
{
        __vc_abs( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1274 Sat May 10 12:09:56 2014
new/usr/src/lib/libmvec/common/vc_exp_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

extern void __vc_exp( int, float *, int, float *, int, float * );

#pragma weak vc_exp_ = __vc_exp_

/* just invoke the serial function */
void
__vc_exp_( int *n, float *x, int *stridex, float *y, int *stridey,
        float *tmp )
{
        __vc_exp( *n, x, *stridex, y, *stridey, tmp );
}
```

```
**********************************************************
    1247 Sat May 10 12:09:56 2014
new/usr/src/lib/libmvec/common/vc_log_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

extern void __vc_log( int, float *, int, float *, int );

#pragma weak vc_log_ = __vc_log_

/* just invoke the serial function */
void
__vc_log_( int *n, float *x, int *stridex, float *y, int *stridey )
{
        __vc_log( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1326 Sat May 10 12:09:56 2014
new/usr/src/lib/libmvec/common/vc_pow_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

extern void __vc_pow( int, float *, int, float *, int, float *, int,
        float * );

#pragma weak vc_pow_ = __vc_pow_

/* just invoke the serial function */
void
__vc_pow_( int *n, float *x, int *stridex, float *y, int *stridey,
        float *z, int *stridez, float *tmp )
{
        __vc_pow( *n, x, *stridex, y, *stridey, z, *stridez, tmp );
}
```

```
**********************************************************
    1976 Sat May 10 12:09:56 2014
new/usr/src/lib/libmvec/common/vcos_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

extern void __vcos( int, double *, int, double *, int );

#if !defined(LIBMVEC_SO_BUILD)
#if defined(ARCH_v8plusa) || defined(ARCH_v8plusb) || defined(ARCH_v9a) || defin
#define CHECK_ULTRA3
#endif
#endif  /* !defined(LIBMVEC_SO_BUILD) */

#ifdef CHECK_ULTRA3
#include <strings.h>
#define sysinfo _sysinfo
#include <sys/systeminfo.h>

#define BUFLEN  257

static int use_ultra3 = 0;

extern void __vcos_ultra3( int, double *, int, double *, int );
#endif

#pragma weak vcos_ = __vcos_

/* just invoke the serial function */
void
__vcos_( int *n, double *x, int *stridex, double *y, int *stridey )
{
#ifdef CHECK_ULTRA3
        int             u;
        char    buf[BUFLEN];

        u = use_ultra3;
```



```
        if (!u) {
                /* use __vcos_ultra3 on Cheetah (and ???) */
                if (sysinfo(SI_ISALIST, buf, BUFLEN) > 0 && !strncmp(buf, "sparc
                        u = 3;
                else
                        u = 1;
                use_ultra3 = u;
        }
        if (u & 2)
                __vcos_ultra3( *n, x, *stridex, y, *stridey );
        else
#endif
        __vcos( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1242 Sat May 10 12:09:56 2014
new/usr/src/lib/libmvec/common/vcosf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

extern void __vcosf( int, float *, int, float *, int );

#pragma weak vcosf_ = __vcosf_

/* just invoke the serial function */
void
__vcosf_( int *n, float *x, int *stridex, float *y, int *stridey )
{
        __vcosf( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1241 Sat May 10 12:09:57 2014
new/usr/src/lib/libmvec/common/vexp_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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extern void __vexp( int, double *, int, double *, int );

#pragma weak vexp_ = __vexp_

/* just invoke the serial function */
void
__vexp_( int *n, double *x, int *stridex, double *y, int *stridey )
{
        __vexp( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1242 Sat May 10 12:09:57 2014
new/usr/src/lib/libmvec/common/vexpf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

extern void __vexpf( int, float *, int, float *, int );

#pragma weak vexpf_ = __vexpf_

/* just invoke the serial function */
void
__vexpf_( int *n, float *x, int *stridex, float *y, int *stridey )
{
        __vexpf( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1305 Sat May 10 12:09:57 2014
new/usr/src/lib/libmvec/common/vhypot_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

extern void __vhypot( int, double *, int, double *, int, double *, int );

#pragma weak vhypot_ = __vhypot_

/* just invoke the serial function */
void
__vhypot_( int *n, double *x, int *stridex, double *y, int *stridey,
        double *z, int *stridez )
{
        __vhypot( *n, x, *stridex, y, *stridey, z, *stridez );
}
```

```
**********************************************************
    1304 Sat May 10 12:09:57 2014
new/usr/src/lib/libmvec/common/vhypotf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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```

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 */

extern void __vhypotf( int, float *, int, float *, int, float *, int );

#pragma weak vhypotf_ = __vhypotf_

/* just invoke the serial function */
void
__vhypotf_( int *n, float *x, int *stridex, float *y, int *stridey,
        float *z, int *stridez )
{
        __vhypotf( *n, x, *stridex, y, *stridey, z, *stridez );
}
```

```
**********************************************************
   21007 Sat May 10 12:09:57 2014
new/usr/src/lib/libmvec/common/vis/__vatan.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

        .file   "__vatan.S"

#include "libm.h"

        RO_DATA

! following is the C version of the ATAN algorithm
!  #include <math.h>
!  #include <stdio.h>
!  double jkatan(double *x)
!  {
!    double  f, z, ans, ansu, ansl, tmp, poly, conup, conlo, dummy;
!    int index, sign, intf, intz;
!    extern const double __vlibm_TBL_atan1[];
!    long *pf = (long *) &f, *pz = (long *) &z;
!
!  /*    Power series  atan(x) = x + p1*x**3 + p2*x**5 + p3*x**7
!   *    Error =  -3.08254E-18   On the interval  |x| < 1/64 */
!
!  /* define dummy names for readability.  Use parray to help compiler optimize
!  #define p3    parray[0]
!  #define p2    parray[1]
!  #define p1    parray[2]
!  #define soffset      3
!
!    static const double parray[] = {
!     -1.42802946844299722E-01,               /* p[3]         */
!      1.99999917247000615E-01,               /* p[2]         */
!     -3.33333333329292858E-01,               /* p[1]         */
!      1.0,                           /* not used for p[0], though
!     -1.0,                           /* used to flip sign of answer
!    };
!
```



```
!    f        = *x;                                 /* fetch argument
!    intf     = pf[0];                              /* grab upper half
!    sign     = intf & 0x80000000;                          /* sign of argument
!    intf    ^= sign;                               /* abs(upper argument)
!    sign     = (unsigned) sign >> 31;              /* sign bit = 0 or 1
!    pf[0]    = intf;
!
!    if( (intf > 0x43600000) || (intf < 0x3e300000) ) /* filter out special case
!    {
!      if(  (intf > 0x7ff00000) ||
!        ((intf == 0x7ff00000) &&  (pf[1] !=0)) ) return (*x-*x);/* return NaN i
!      if( intf < 0x3e300000 )                     /* avoid underflow for small arg
!      {
!        dummy = 1.0e37 + f;
!        dummy = dummy;
!        return (*x);
!      }
!      if( intf > 0x43600000 )                     /* avoid underflow for big arg
!      {
!        index = 2;
!        f     = __vlibm_TBL_atan1[index] + __vlibm_TBL_atan1[index+1];/* pi/2 u
!        f     = parray[soffset + sign] * f;       /* put sign bit on ans
!        return (f);
!      }
!    }
!
!    index    = 0;                                  /* points to 0,0 in table
!    if (intf > 0x40500000)                         /* if(|x| > 64
!    { f = -1.0/f;
!      index  = 2;                                 /* point to pi/2 upper, lower
!    }
!    else if( intf >= 0x3f900000 )                  /* if |x| >= (1/64)...
!    {
!      intz   = (intf + 0x00008000) & 0x7fff0000;/* round arg, keep upper
!      pz[0]  = intz;                              /* store as a double (z)
!      pz[1]  = 0;                                 /* ...lower
!      f      = (f - z)/(1.0 + f*z);               /* get reduced argument
!      index  = (intz - 0x3f900000) >> 15;         /* (index >> 16) << 1)
!      index += 4;                                 /* skip over 0,0,pi/2,pi/2
!    }
!    conup    = __vlibm_TBL_atan1[index];           /* upper table
!    conlo    = __vlibm_TBL_atan1[index+1];         /* lower table
!    tmp      = f*f;
!    poly     = (f*tmp)*((p3*tmp + p2)*tmp + p1);
!    ansu     = conup + f;                                /* compute atan(f)  upper
!    ansl     = (((conup - ansu) + f) + poly) + conlo;
!    ans      = ansu + ansl;
!    ans      = parray[soffset + sign] * ans;
!    return ans;
!  }

/* 8 bytes = 1 double f.p. word */
#define WSIZE   8

        .align  32                      !align with full D-cache line
.COEFFS:
        .double 0r-1.42802946844299722E-01      !p[3]
        .double 0r1.99999917247000615E-01       !p[2]
        .double 0r-3.33333333329292858E-01      !p[1]
        .double 0r-1.0,                         !constant -1.0
        .word   0x00008000,0x0                  !for fp rounding of reduced arg
        .word   0x7fff0000,0x0                  !for fp truncation
        .word   0x47900000,0                    !a number close to 1.0E37
        .word   0x80000000,0x0                  !mask for fp sign bit
        .word   0x3f800000,0x0                  !1.0/128.0 dummy "safe" argument
        .type   .COEFFS,#object
```

```
129         ENTRY(__vatan)
130         save    %sp,-SA(MINFRAME)-16,%sp
131         PIC_SETUP(g5)
132         PIC_SET(g5,__vlibm_TBL_atan1,o4)
133         PIC_SET(g5,.COEFFS,o0)
134 /*
135    __vatan(int n, double *x, int stridex, double *y, stridey)
136    computes y(i) = atan( x(i) ), for 1=1,n.  Stridex, stridey
137    are the distance between x and y elements

139         %i0    n
140         %i1    address of x
141         %i2    stride x
142         %i3    address of y
143         %i4    stride y
144 */
145         cmp     %i0,0                   !if n <=0,
146         ble,pn  %icc,.RETURN            !....then do nothing
147         sll     %i2,3,%i2               !convert stride to byte count
148         sll     %i4,3,%i4               !convert stride to byte count

150 /*  pre-load constants before beginning main loop */

152         ldd     [%o0],%f58              !load p[3]
153         mov     2,%i5                   !argcount = 3

155         ldd     [%o0+WSIZE],%f60        !load p[2]
156         add     %fp,STACK_BIAS-8,%l1            !yaddr1 = &dummy
157         fzero   %f18                    !ansu1 = 0

159         ldd     [%o0+2*WSIZE],%f62      !load p[1]
160         add     %fp,STACK_BIAS-8,%l2            !yaddr2 = &dummy
161         fzero   %f12                    !(poly1) = 0

163         ldd     [%o0+3*WSIZE],%f56      !-1.0
164         fzero   %f14                    !tmp1 = 0

166         ldd     [%o0+4*WSIZE],%f52      !load rounding mask
167         fzero   %f16                    !conup1 = 0

169         ldd     [%o0+5*WSIZE],%f54      !load truncation mask
170         fzero   %f36                    !f1 = 0

172         ldd     [%o0+6*WSIZE],%f50      !1.0e37
173         fzero   %f38                    !f2 = 0

175         ldd     [%o0+7*WSIZE],%f32      !mask for sign bit

177         ldd     [%o4+2*WSIZE],%f46      !pi/2 upper
178         ldd     [%o4+(2*WSIZE+8)],%f48  !pi/2 lower
179         sethi   %hi(0x40500000),%l6     !64.0
180         sethi   %hi(0x3f900000),%l7     !1/64.0
181         mov     0,%l4                   !index1 = 0
182         mov     0,%l5                   !index2 = 0

184 .MAINLOOP:

186     /*---------------------------------------------------------------------
187     /*---------------------------------------------------------------------
188     /*---------------------------------------------------------------------

190 .LOOP0:
191         deccc   %i0                     !--n
192         bneg    1f
193         mov     %i1,%o5                 !xuse = x (delay slot)
```



```
195         ba      2f
196         nop                             !delay slot
197 1:
198         PIC_SET(g5,.COEFFS+8*WSIZE,o5)
199         dec     %i5                     !argcount--
200 2:
201         sethi   %hi(0x80000000),%o7     !mask for sign bit
202 /*2 */  sethi   %hi(0x43600000),%o1     !big = 0x43600000,0
203         ld      [%o5],%o0               !intf = pf[0] = f upper
204         ldd     [%o4+%l5],%f26          !conup2 = __vlibm_TBL_atan1[index2]

206         sethi   %hi(0x3e300000),%o2     !small = 0x3e300000,0
207 /*4 */  andn    %o0,%o7,%o0             !intf = fabs(intf)
208         ldd     [%o5],%f34              !f = *x into f34

210         sub     %o1,%o0,%o1             !(-) if intf > big
211 /*6 */  sub     %o0,%o2,%o2             !(-) if intf < small
212         fand    %f34,%f32,%f40          !sign0 = sign bit
213             fmuld   %f38,%f38,%f24      !tmp2= f2*f2

215 /*7 */  orcc    %o1,%o2,%g0             !(-) if either true
216         bneg,pn  %icc,.SPECIAL0         !if (-) goto special cases below
217         fabsd   %f34,%f34               !abs(f)  (delay slot)
218         !----------------------


221         sethi   %hi(0x8000),%o7         !rounding bit
222 /*8 */  fpadd32 %f34,%f52,%f0           !intf + 0x00008000 (again)
223             faddd   %f26,%f38,%f28      !ansu2 = conup2 + f2

225         add     %o0,%o7,%o0             !intf + 0x00008000  (delay slot)
226 /*9*/   fand    %f0,%f54,%f0            !pz[0] = intz = (intf + 0x00008000) & 0x
227             fmuld   %f58,%f24,%f22      !p[3]*tmp2

229 /*10 */ sethi   %hi(0x7fff0000),%o7     !mask for rounding argument
230         fmuld   %f34,%f0,%f10           !f*z
231         fsubd   %f34,%f0,%f20           !f - z
232           add     %o4,%l4,%l4           !base addr + index1
233           fmuld   %f14,%f12,%f12        !poly1 = (f1*tmp1)*((p3*tmp1 + p2)*tmp1
234           faddd   %f16,%f36,%f16        !(conup1 - ansu1) + f1

236 /*12 */ and     %o0,%o7,%o0             !intz = (intf + 0x00008000) & 0x7fff0000
237             faddd   %f22,%f60,%f22      !p[3]*tmp2 + p[2]
238           ldd     [%l4+WSIZE],%f14      !conlo1 = __vlibm_TBL_atan1[index+1]

240 /*13 */ sub     %o0,%l7,%o2             !intz - 0x3f900000
241         fsubd   %f10,%f56,%f10          !(f*z - (-1.0))
242           faddd   %f16,%f12,%f12        !((conup1 - ansu1) + f1) + poly1

244         cmp     %o0,%l6                 !(|f| > 64)
245         ble     .ELSE0                  !if(|f| > 64) then
246 /*15 */ sra       %o2,15,%o3            !index  = (intz - 0x3f900000) >> 15
247           mov     2,%o1                 !index == 2, point to conup, conlo = pi/
248           ba      .ENDIF0               !continue
249 /*16 */   fdivd   %f56,%f34,%f34        !f = -1.0/f (delay slot)
250         .ELSE0:                         !else f( |x| >= (1/64))
251         cmp     %o0,%l7                 !if intf >= 1/64
252         bl      .ENDIF0                 !if( |x| >= (1/64) ) then...
253         mov     0,%o1                   !index == 0 , point to conup,conlo = 0,0
254           add     %o3,4,%o1             !index = index + 4
255 /*16 */   fdivd   %f20,%f10,%f34        !f = (f - z)/(1.0 + f*z), reduced argume
256         .ENDIF0:

258 /*17*/  sll     %o1,3,%l3               !index0 = index
259         mov     %i3,%l0                 !yaddr0 = address of y
```

```
260           faddd   %f12,%f14,%f12        !ansl1 = (((conup1 - ansu)1 + f1) + poly
261             fmuld   %f22,%f24,%f22      !(p3*tmp2 + p2)*tmp2
262             fsubd   %f26,%f28,%f26      !conup2 - ansu2

264 /*20*/  add     %i1,%i2,%i1             !x     += stridex
265         add     %i3,%i4,%i3             !y     += stridey
266           faddd   %f18,%f12,%f36        !ans1 = ansu1 + ansl1
267             fmuld   %f38,%f24,%f24      !f*tmp2
268             faddd   %f22,%f62,%f22      !(p3*tmp2 + p2)*tmp2 + p1

270 /*23*/    for     %f36,%f42,%f36        !sign(ans1) = sign of argument
271           std     %f36,[%l1]            !*yaddr1 = ans1
272             add     %o4,%l5,%l5         !base addr + index2
273             fmuld   %f24,%f22,%f22      !poly2 = (f2*tmp2)*((p3*tmp2 + p2)*tmp2
274             faddd   %f26,%f38,%f26      !(conup2 - ansu2) + f2
275         cmp     %i5,0                   !if argcount =0, we are done
276         be      .RETURN
277           nop

279     /*---------------------------------------------------------------------
280     /*---------------------------------------------------------------------
281     /*---------------------------------------------------------------------

283 .LOOP1:
284 /*25*/  deccc   %i0                     !--n
285         bneg    1f
286         mov     %i1,%o5                 !xuse = x (delay slot)
287         ba      2f
288         nop                             !delay slot
289 1:
290         PIC_SET(g5,.COEFFS+8*WSIZE,o5)
291         dec     %i5                     !argcount--
292 2:

294 /*26*/  sethi   %hi(0x80000000),%o7     !mask for sign bit
295         sethi   %hi(0x43600000),%o1     !big = 0x43600000,0
296         ld      [%o5],%o0               !intf = pf[0] = f upper

298 /*28*/  sethi   %hi(0x3e300000),%o2     !small = 0x3e300000,0
299         andn    %o0,%o7,%o0             !intf = fabs(intf)
300         ldd     [%o5],%f36              !f = *x into f36

302 /*30*/  sub     %o1,%o0,%o1             !(-) if intf > big
303         sub     %o0,%o2,%o2             !(-) if intf < small
304         fand    %f36,%f32,%f42          !sign1 = sign bit

306 /*31*/  orcc    %o1,%o2,%g0             !(-) if either true
307         bneg,pn  %icc,.SPECIAL1         !if (-) goto special cases below
308         fabsd   %f36,%f36               !abs(f)  (delay slot)
309         !----------------------

311 /*32*/  fpadd32 %f36,%f52,%f0           !intf + 0x00008000 (again)
312           ldd     [%l5+WSIZE],%f24      !conlo2 = __vlibm_TBL_atan1[index2+1]

314 /*33*/  fand    %f0,%f54,%f0            !pz[0] = intz = (intf + 0x00008000) & 0x
315         sethi   %hi(0x8000),%o7         !rounding bit
316           faddd   %f26,%f22,%f22        !((conup2 - ansu2) + f2) + poly2

318 /*34*/  add     %o0,%o7,%o0             !intf + 0x00008000  (delay slot)
319         sethi   %hi(0x7fff0000),%o7     !mask for rounding argument
320         fmuld   %f36,%f0,%f10           !f*z
321         fsubd   %f36,%f0,%f20           !f - z

323 /*35*/  and     %o0,%o7,%o0             !intz = (intf + 0x00008000) & 0x7fff0000
324           faddd   %f22,%f24,%f22        !ansl2 = (((conup2 - ansu2) + f2) + poly
```



```
326 /*37*/  sub     %o0,%l7,%o2             !intz - 0x3f900000
327         fsubd   %f10,%f56,%f10          !(f*z - (-1.0))
328       ldd     [%o4+%l3],%f6             !conup0 = __vlibm_TBL_atan1[index0]

330         cmp     %o0,%l6                 !(|f| > 64)
331         ble     .ELSE1                  !if(|f| > 64) then
332 /*38*/  sra     %o2,15,%o3              !index  = (intz - 0x3f900000) >> 15
333           mov     2,%o1                 !index == 2, point to conup, conlo = pi/
334           ba      .ENDIF1               !continue
335 /*40*/    fdivd   %f56,%f36,%f36        !f = -1.0/f (delay slot)
336         .ELSE1:                         !else f( |x| >= (1/64))
337         cmp     %o0,%l7                 !if intf >= 1/64
338         bl      .ENDIF1                 !if( |x| >= (1/64) ) then...
339         mov     0,%o1                   !index == 0 , point to conup,conlo = 0,0
340           add     %o3,4,%o1             !index = index + 4
341 /*40*/    fdivd   %f20,%f10,%f36        !f = (f - z)/(1.0 + f*z), reduced argume
342         .ENDIF1:

344 /*41*/sll     %o1,3,%l4                 !index1 = index
345       mov     %i3,%l1                   !yaddr1 = address of y
346       fmuld   %f34,%f34,%f4             !tmp0= f0*f0
347           faddd   %f28,%f22,%f38        !ans2 = ansu2 + ansl2
348
349 /*44*/add       %i1,%i2,%i1             !x     += stridex
350       add       %i3,%i4,%i3             !y     += stridey
351     fmuld   %f58,%f4,%f2                !p[3]*tmp0
352     faddd   %f6,%f34,%f8                !ansu0 = conup0 + f0
353           for     %f38,%f44,%f38        !sign(ans2) = sign of argument
354           std     %f38,[%l2]            !*yaddr2 = ans2
355           cmp   %i5,0                   !if argcount =0, we are done
356           be    .RETURN
357           nop

359     /*---------------------------------------------------------------------
360     /*---------------------------------------------------------------------
361     /*---------------------------------------------------------------------

363 .LOOP2:
364 /*46*/  deccc   %i0                     !--n
365         bneg    1f
366         mov     %i1,%o5                 !xuse = x (delay slot)
367         ba      2f
368         nop                             !delay slot
369 1:
370         PIC_SET(g5,.COEFFS+8*WSIZE,o5)
371         dec     %i5                     !argcount--
372 2:

374 /*47*/  sethi   %hi(0x80000000),%o7     !mask for sign bit
375         sethi   %hi(0x43600000),%o1     !big = 0x43600000,0
376         ld      [%o5],%o0               !intf = pf[0] = f upper

378 /*49*/  sethi   %hi(0x3e300000),%o2     !small = 0x3e300000,0
379         andn    %o0,%o7,%o0             !intf = fabs(intf)
380         ldd     [%o5],%f38              !f = *x into f38

382 /*51*/  sub     %o1,%o0,%o1             !(-) if intf > big
383         sub     %o0,%o2,%o2             !(-) if intf < small
384         fand    %f38,%f32,%f44          !sign2 = sign bit

386 /*52*/  orcc    %o1,%o2,%g0             !(-) if either true
387         bneg,pn  %icc,.SPECIAL2         !if (-) goto special cases below
388         fabsd   %f38,%f38               !abs(f)  (delay slot)
389         !----------------------

391 /*53*/  fpadd32 %f38,%f52,%f0           !intf + 0x00008000 (again)
```

```
392       faddd   %f2,%f60,%f2              !p[3]*tmp0 + p[2]

394 /*54*/  sethi   %hi(0x8000),%o7         !rounding bit
395         fand    %f0,%f54,%f0            !pz[0] = intz = (intf + 0x00008000) & 0x

397 /*55*/  add     %o0,%o7,%o0             !intf + 0x00008000  (delay slot)
398         sethi   %hi(0x7fff0000),%o7     !mask for rounding argument
399         fmuld   %f38,%f0,%f10           !f*z
400         fsubd   %f38,%f0,%f20           !f - z

402 /*56*/  and     %o0,%o7,%o0             !intz = (intf + 0x00008000) & 0x7fff0000
403       fmuld   %f2,%f4,%f2               !(p3*tmp0 + p2)*tmp0
404       fsubd   %f6,%f8,%f6               !conup0 - ansu0

406 /*58*/  sub     %o0,%l7,%o2             !intz - 0x3f900000
407         fsubd   %f10,%f56,%f10          !(f*z - (-1.0))
408             ldd     [%o4+%l4],%f16      !conup1 = __vlibm_TBL_atan1[index1]

410         cmp     %o0,%l6                 !(|f| > 64)
411         ble     .ELSE2                  !if(|f| > 64) then
412 /*60*/  sra     %o2,15,%o3              !index  = (intz - 0x3f900000) >> 15
413           mov     2,%o1                 !index == 2, point to conup, conlo = pi/
414           ba      .ENDIF2               !continue
415 /*61*/    fdivd   %f56,%f38,%f38        !f = -1.0/f (delay slot)
416         .ELSE2:                         !else f( |x| >= (1/64))
417         cmp     %o0,%l7                 !if intf >= 1/64
418         bl      .ENDIF2                 !if( |x| >= (1/64) ) then...
419         mov     0,%o1                   !index == 0 , point to conup,conlo = 0,0
420           add     %o3,4,%o1             !index = index + 4
421 /*61*/    fdivd   %f20,%f10,%f38        !f = (f - z)/(1.0 + f*z), reduced argume
422         .ENDIF2:

424
425 /*62*/  sll     %o1,3,%l5               !index2 = index
426         mov     %i3,%l2                 !yaddr2 = address of y
427       fmuld   %f34,%f4,%f4              !f0*tmp0
428       faddd   %f2,%f62,%f2              !(p3*tmp0 + p2)*tmp0 + p1
429             fmuld   %f36,%f36,%f14      !tmp1= f1*f1

431 /*65*/add     %o4,%l3,%l3               !base addr + index0
432       fmuld   %f4,%f2,%f2               !poly0 = (f0*tmp0)*((p3*tmp0 + p2)*tmp0
433       faddd   %f6,%f34,%f6              !(conup0 - ansu0) + f0
434             fmuld   %f58,%f14,%f12      !p[3]*tmp1
435             faddd   %f16,%f36,%f18      !ansu1 = conup1 + f1
436       ldd     [%l3+WSIZE],%f4           !conlo0 = __vlibm_TBL_atan1[index0+1]

438 /*68*/  add     %i1,%i2,%i1             !x     += stridex
439         add     %i3,%i4,%i3             !y     += stridey
440       faddd   %f6,%f2,%f2               !((conup0 - ansu0) + f0) + poly0
441             faddd   %f12,%f60,%f12      !p[3]*tmp1 + p[2]

443 /*71*/faddd   %f2,%f4,%f2               !ansl0 = (((conup0 - ansu)0 + f0) + poly
444             fmuld   %f12,%f14,%f12      !(p3*tmp1 + p2)*tmp1
445             fsubd   %f16,%f18,%f16      !conup1 - ansu1

447 /*74*/faddd   %f8,%f2,%f34              !ans0 = ansu0 + ansl0
448           fmuld   %f36,%f14,%f14        !f1*tmp1
449           faddd   %f12,%f62,%f12        !(p3*tmp1 + p2)*tmp1 + p1

451 /*77*/  for     %f34,%f40,%f34          !sign(ans0) = sign of argument
452         std     %f34,[%l0]              !*yaddr0 = ans, always gets stored (dela
453         cmp     %i5,0                   !if argcount =0, we are done
454         bg      .MAINLOOP
455           nop

457     /*---------------------------------------------------------------------------
```



```
458     /*---------------------------------------------------------------------------
459     /*---------------------------------------------------------------------------

461 .RETURN:
462         ret
463         restore %g0,%g0,%g0

465     /*---------------------------------------------------------------------------
466     /*-----------SPECIAL CASE HANDLING FOR LOOP0 -----------------------------
467     /*---------------------------------------------------------------------------

469 /* at this point
470    %i1     x address
471    %o0     intf
472    %o2     intf - 0x3e300000
473    %f34,36,38     f0,f1,f2
474    %f40,42,44     sign0,sign1,sign2
475 */

477         .align  32                              !align on I-cache boundary
478 .SPECIAL0:
479         orcc    %o2,%g0,%g0                     !(-) if intf < 0x3e300000
480         bpos    1f                              !if >=...continue
481         sethi   %hi(0x7ff00000),%g1     !upper word of Inf (we use 64-bit wide i
482           ba      3f
483           faddd   %f34,%f50,%f30                !dummy op just to generate excep
484 1:
485         ld      [%o5+4],%o5                     !load x lower word
486         sllx    %o0,32,%o0                      !left justify intf
487         sllx    %g1,32,%g1              !left justify Inf
488         or      %o0,%o5,%o0                     !merge in lower intf
489         cmp     %o0,%g1                         !if intf > 0x7ff00000 00000000
490         ble,pt  %xcc,2f                         !pass thru if NaN
491           nop
492           fmuld   %f34,%f34,%f34                !...... (x*x) trigger invalid ex
493           ba      3f
494           nop
495 2:
496         faddd   %f46,%f48,%f34                  !ans = pi/2 upper + pi/2 lower
497 3:
498         add     %i1,%i2,%i1                     !x += stridex
499         for     %f34,%f40,%f34                  !sign(ans) = sign of argument
500         std     %f34,[%i3]                      !*y = ans
501         ba      .LOOP0                          !keep looping
502         add     %i3,%i4,%i3                     !y += stridey (delay slot)

504     /*---------------------------------------------------------------------------
505     /*-----------SPECIAL CASE HANDLING FOR LOOP1 -----------------------------
506     /*---------------------------------------------------------------------------

508         .align  32                              !align on I-cache boundary
509 .SPECIAL1:
510         orcc    %o2,%g0,%g0                     !(-) if intf < 0x3e300000
511         bpos    1f                              !if >=...continue
512         sethi   %hi(0x7ff00000),%g1     !upper word of Inf (we use 64-bit wide i
513           ba      3f
514           faddd   %f36,%f50,%f30                !dummy op just to generate excep
515 1:
516         ld      [%o5+4],%o5                     !load x lower word
517         sllx    %o0,32,%o0                      !left justify intf
518         sllx    %g1,32,%g1              !left justify Inf
519         or      %o0,%o5,%o0                     !merge in lower intf
520         cmp     %o0,%g1                         !if intf > 0x7ff00000 00000000
521         ble,pt  %xcc,2f                         !pass thru if NaN
522           nop
523           fmuld   %f36,%f36,%f36                !...... (x*x) trigger invalid ex
```

```
524           ba      3f
525           nop
526 2:
527         faddd   %f46,%f48,%f36                  !ans = pi/2 upper + pi/2 lower
528 3:
529         add     %i1,%i2,%i1                     !x += stridex
530         for     %f36,%f42,%f36                  !sign(ans) = sign of argument
531         std     %f36,[%i3]                      !*y = ans
532         ba      .LOOP1                          !keep looping
533         add     %i3,%i4,%i3                     !y += stridey (delay slot)

535     /*---------------------------------------------------------------------
536     /*------------SPECIAL CASE HANDLING FOR LOOP2 ----------------------------
537     /*---------------------------------------------------------------------

539         .align  32                              !align on I-cache boundary
540 .SPECIAL2:
541         orcc    %o2,%g0,%g0                     !(-) if intf < 0x3e300000
542         bpos    1f                              !if >=...continue
543         sethi   %hi(0x7ff00000),%g1     !upper word of Inf (we use 64-bit wide i
544           ba      3f
545           faddd   %f38,%f50,%f30                !dummy op just to generate excep
546 1:
547         ld      [%o5+4],%o5                     !load x lower word
548         sllx    %o0,32,%o0                      !left justify intf
549         sllx    %g1,32,%g1              !left justify Inf
550         or      %o0,%o5,%o0                     !merge in lower intf
551         cmp     %o0,%g1                         !if intf > 0x7ff00000 00000000
552         ble,pt  %xcc,2f                         !pass thru if NaN
553           nop
554           fmuld   %f38,%f38,%f38                !...... (x*x) trigger invalid ex
555           ba      3f
556           nop
557 2:
558         faddd   %f46,%f48,%f38                  !ans = pi/2 upper + pi/2 lower
559 3:
560         add     %i1,%i2,%i1                     !x += stridex
561         for     %f38,%f44,%f38                  !sign(ans) = sign of argument
562         std     %f38,[%i3]                      !*y = ans
563         ba      .LOOP2                          !keep looping
564         add     %i3,%i4,%i3                     !y += stridey

566     /*---------------------------------------------------------------------
567     /*---------------------------------------------------------------------
568     /*---------------------------------------------------------------------

570         SET_SIZE(__vatan)

572 !       .ident  "03-20-96 Sparc V9 3-way-unrolled version"
```

```
**********************************************************
   17550 Sat May 10 12:09:57 2014
new/usr/src/lib/libmvec/common/vis/__vatan2.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vatan2.S"

#include "libm.h"

        RO_DATA
        .align  64
constants:
        .word   0x3ff921fb,0x54442d18   ! pio2
        .word   0x3c91a626,0x33145c07   ! pio2_lo
        .word   0xbfd55555,0x555554ee   ! p1
        .word   0x3fc99999,0x997a1559   ! p2
        .word   0xbfc24923,0x158dfe02   ! p3
        .word   0x3fbc639d,0x0ed1347b   ! p4
        .word   0xffffffff,0x00000000   ! mask
        .word   0x3fc00000,0x00000000   ! twom3
        .word   0x46d00000,0x00000000   ! two110
        .word   0x3fe921fb,0x54442d18   ! pio4

! local storage indices

#define xscl            STACK_BIAS-0x8
#define yscl            STACK_BIAS-0x10
#define twom3           STACK_BIAS-0x18
#define two110          STACK_BIAS-0x20
#define pio4            STACK_BIAS-0x28
#define junk            STACK_BIAS-0x30
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x30

! register use

! i0  n
! i1  y
```



```
! i2  stridey
! i3  x
! i4  stridex
! i5  z

! l0  k0
! l1  k1
! l2  k2
! l3  hx
! l4  pz0
! l5  pz1
! l6  pz2
! l7  stridez

! the following are 64-bit registers in both V8+ and V9

! g1  __vlibm_TBL_atan2
! g5

! o0  hy
! o1  0x00004000
! o2  0x1420
! o3  0x7fe00000
! o4  0x03600000
! o5  0x00100000
! o7

! f0  y0
! f2  x0
! f4  t0
! f6  ah0
! f8  al0
! f10 y1
! f12 x1
! f14 t1
! f16 ah1
! f18 al1
! f20 y2
! f22 x2
! f24 t2
! f26 ah2
! f28 al2
! f30
! f32
! f34
! f36 sx0
! f38 sx1
! f40 sx2
! f42 sy0
! f44 sy1
! f46 sy2

#define mask    %f48
#define signbit %f50
#define pio2    %f52
#define pio2_lo %f54
#define p1      %f56
#define p2      %f58
#define p3      %f60
#define p4      %f62

        ENTRY(__vatan2)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,constants,o0)
        PIC_SET(l7,__vlibm_TBL_atan2,o1)
```

```
128         wr      %g0,0x82,%asi           ! set %asi for non-faulting loads
129         mov     %o1, %g1
130 #ifdef __sparcv9
131         ldx     [%fp+STACK_BIAS+0xb0],%l7
132 #else
133         ld      [%fp+0x5c],%l7
134 #endif
135         ldd     [%o0+0x00],pio2         ! load/set up constants
136         ldd     [%o0+0x08],pio2_lo
137         ldd     [%o0+0x10],p1
138         ldd     [%o0+0x18],p2
139         ldd     [%o0+0x20],p3
140         ldd     [%o0+0x28],p4
141         ldd     [%o0+0x30],mask
142         fzero   signbit
143         fnegd   signbit,signbit
144         sethi   %hi(0x00004000),%o1
145         sethi   %hi(0x1420),%o2
146         or      %o2,%lo(0x1420),%o2
147         sethi   %hi(0x7fe00000),%o3
148         sethi   %hi(0x03600000),%o4
149         sethi   %hi(0x00100000),%o5
150         ldd     [%o0+0x38],%f0          ! copy rarely used constants to stack
151         ldd     [%o0+0x40],%f2
152         ldd     [%o0+0x48],%f4
153         std     %f0,[%fp+twom3]
154         std     %f2,[%fp+two110]
155         std     %f4,[%fp+pio4]
156         sll     %i2,3,%i2               ! scale strides
157         sll     %i4,3,%i4
158         sll     %l7,3,%l7
159         fzero   %f20                    ! loop prologue
160         fzero   %f22
161         fzero   %f24
162         fzero   %f26
163         fzero   %f46
164         add     %fp,junk,%l6
165         ld      [%i1],%f0               ! *y
166         ld      [%i1+4],%f1
167         ld      [%i3],%f8               ! *x
168         ld      [%i3+4],%f9
169         ld      [%i1],%o0               ! hy
170         ba      .loop
171         ld      [%i3],%l3               ! hx

173 ! 16-byte aligned
174         .align  16
175 .loop:
176         fabsd   %f0,%f4
177         mov     %i5,%l4
178         add     %i1,%i2,%i1             ! y += stridey

180         fabsd   %f8,%f2
181         add     %i3,%i4,%i3             ! x += stridex
182         add     %i5,%l7,%i5             ! z += stridez

184         fand    %f0,signbit,%f42
185         sethi   %hi(0x80000000),%g5

187         fand    %f8,signbit,%f36
188         andn    %o0,%g5,%o0
189         andn    %l3,%g5,%l3

191         fcmpd   %fcc0,%f4,%f2

193         fmovd   %f4,%f0
```



```
195         fmovdg  %fcc0,%f2,%f0           ! swap if |y| > |x|

197         fmovdg  %fcc0,%f4,%f2
198         mov     %o0,%o7
199          lda    [%i1]%asi,%f10          ! preload next argument

201           faddd %f26,%f20,%f26
202          lda    [%i1+4]%asi,%f11

204           faddd %f22,%f24,%f22
205         movg    %fcc0,%l3,%o0

207         movg    %fcc0,%o7,%l3

209         fbu,pn  %fcc0,.nan0             ! if x or y is nan
210 ! delay slot
211          lda    [%i3]%asi,%f18

213         sub     %l3,%o0,%l0             ! hx - hy
214         sub     %l3,%o3,%g5
215          fabsd  %f10,%f14
216          lda    [%i3+4]%asi,%f19

218         sub     %l0,%o4,%o7
219           faddd %f22,%f26,%f26

221         andcc   %g5,%o7,%g0
222         bge,pn  %icc,.big0              ! if |x| or |x/y| is big
223 ! delay slot
224         nop

226          fabsd  %f18,%f12
227         cmp     %o0,%o5
228         bl,pn   %icc,.small0            ! if |y| is small
229 ! delay slot
230          lda    [%i1]%asi,%o0

232         add     %l0,%o1,%l0             ! k
233         addcc   %i0,-1,%i0
234         ble,pn  %icc,.last1
235 ! delay slot
236          lda    [%i3]%asi,%l3

238 .cont1:
239         srl     %l0,10,%l0
240          mov    %i5,%l5
241           fxor  %f26,%f46,%f26
242           st    %f26,[%l6]

244          fand   %f10,signbit,%f44
245         andn    %l0,0x1f,%l0
246          add    %i1,%i2,%i1
247           st    %f27,[%l6+4]

249          fand   %f18,signbit,%f38
250         cmp     %l0,%o2
251         movg    %icc,%o2,%l0

253          fcmpd  %fcc1,%f14,%f12
254          add    %i3,%i4,%i3
255          add    %i5,%l7,%i5

257          fmovd  %f14,%f10
258         add     %l0,%g1,%l0
259          sethi  %hi(0x80000000),%g5
```

```
261         ldd     [%l0+0x10],%f4
262         fand    %f2,mask,%f6
263          andn   %o0,%g5,%o0
264          andn   %l3,%g5,%l3

266          fmovdg %fcc1,%f12,%f10

268          fmovdg %fcc1,%f14,%f12
269          mov    %o0,%o7
270           lda   [%i1]%asi,%f20

272         fsubd   %f2,%f6,%f30
273         fmuld   %f6,%f4,%f6
274          movg   %fcc1,%l3,%o0

276         fmuld   %f0,%f4,%f8
277          movg   %fcc1,%o7,%l3

279           lda   [%i1+4]%asi,%f21
280          fbu,pn %fcc1,.nan1
281 ! delay slot
282          nop

284           lda   [%i3]%asi,%f28
285          sub    %l3,%o0,%l1
286          sub    %l3,%o3,%g5

288           lda   [%i3+4]%asi,%f29
289         fmuld   %f30,%f4,%f30
290         fsubd   %f0,%f6,%f4
291          sub    %l1,%o4,%o7

293           fabsd %f20,%f24
294          andcc  %g5,%o7,%g0
295          bge,pn %icc,.big1
296 ! delay slot
297          nop

299         faddd   %f2,%f8,%f8
300          cmp    %o0,%o5
301          bl,pn  %icc,.small1
302 ! delay slot
303           lda   [%i1]%asi,%o0

305           fabsd %f28,%f22
306          add    %l1,%o1,%l1
307          addcc  %i0,-1,%i0
308           lda   [%i3]%asi,%l3

310         fsubd   %f4,%f30,%f4
311          srl    %l1,10,%l1
312          ble,pn %icc,.last2
313 ! delay slot
314           mov   %i5,%l6

316 .cont2:
317           fand  %f20,signbit,%f46
318          andn   %l1,0x1f,%l1
319           add   %i1,%i2,%i1

321           fand  %f28,signbit,%f40
322          cmp    %l1,%o2
323          movg   %icc,%o2,%l1

325           fcmpd %fcc2,%f24,%f22
```



```
326           add   %i3,%i4,%i3
327           add   %i5,%l7,%i5

329         fdivd   %f4,%f8,%f4
330           fmovd %f24,%f20
331          add    %l1,%g1,%l1
332           sethi %hi(0x80000000),%g5

334          ldd    [%l1+0x10],%f14
335          fand   %f12,mask,%f16
336           andn  %o0,%g5,%o0
337           andn  %l3,%g5,%l3

339           fmovdg %fcc2,%f22,%f20

341           fmovdg %fcc2,%f24,%f22
342           mov   %o0,%o7

344          fsubd  %f12,%f16,%f32
345          fmuld  %f16,%f14,%f16
346           movg  %fcc2,%l3,%o0

348         fnegd   pio2_lo,%f8             ! al
349          fmuld  %f10,%f14,%f18
350           movg  %fcc2,%o7,%l3

352         fzero   %f0
353           fbu,pn %fcc2,.nan2
354 ! delay slot
355           nop

357         fmovdg  %fcc0,signbit,%f0
358           sub   %l3,%o0,%l2
359           sub   %l3,%o3,%g5

361          fmuld  %f32,%f14,%f32
362          fsubd  %f10,%f16,%f14
363           sub   %l2,%o4,%o7

365          faddd  %f12,%f18,%f18
366           andcc %g5,%o7,%g0
367           bge,pn %icc,.big2
368 ! delay slot
369           nop

371         fxor    %f36,%f0,%f36
372           cmp   %o0,%o5
373           bl,pn %icc,.small2
374 ! delay slot
375           nop

377 .cont3:
378         fmovdg  %fcc0,signbit,%f8
379           add   %l2,%o1,%l2

381          fsubd  %f14,%f32,%f14
382           srl   %l2,10,%l2

384         fxor    %f36,pio2_lo,%f30       ! al
385           andn  %l2,0x1f,%l2

387         fxor    %f36,pio2,%f0           ! ah
388           cmp   %l2,%o2
389           movg  %icc,%o2,%l2

391         fxor    %f42,%f36,%f42          ! sy
```

```
393         faddd   %f8,%f30,%f8
394         ldd     [%l0+0x8],%f30
395           add   %l2,%g1,%l2

397          fdivd  %f14,%f18,%f14
398          fzero  %f10

400           ldd   [%l2+0x10],%f24
401           fand  %f22,mask,%f26

403          fmovdg %fcc1,signbit,%f10

405         fmuld   %f4,%f4,%f36
406         faddd   %f8,%f30,%f8

408           fsubd %f22,%f26,%f34
409           fmuld %f26,%f24,%f26

411           fmuld %f20,%f24,%f28
412          fxor   %f38,%f10,%f38

414         fmuld   %f4,p3,%f6
415          fnegd  pio2_lo,%f18

417         fmuld   %f36,p2,%f2
418          fmovdg %fcc1,signbit,%f18

420         fmuld   %f36,%f4,%f36
421          fxor   %f38,pio2,%f10

423           fmuld %f34,%f24,%f34
424           fsubd %f20,%f26,%f24

426           faddd %f22,%f28,%f28

428         faddd   %f2,p1,%f2

430         fmuld   %f36,p4,%f30
431          fxor   %f38,pio2_lo,%f32

433           fsubd %f24,%f34,%f24

435          fxor   %f44,%f38,%f44

437         fmuld   %f36,%f2,%f2
438          faddd  %f18,%f32,%f18
439          ldd    [%l1+0x8],%f32

441         fmuld   %f36,%f36,%f36
442         faddd   %f6,%f30,%f30

444           fdivd %f24,%f28,%f24
445           fzero %f20

447           fmovdg %fcc2,signbit,%f20

449         faddd   %f2,%f8,%f2

451          fmuld  %f14,%f14,%f38
452          faddd  %f18,%f32,%f18

454         fmuld   %f36,%f30,%f36
455           fxor  %f40,%f20,%f40

457         fnegd   pio2,%f6                ! ah
```



```
458          fmuld  %f14,p3,%f16

460         fmovdg  %fcc0,signbit,%f6

462          fmuld  %f38,p2,%f12
463           fnegd pio2_lo,%f28

465         faddd   %f2,%f36,%f2
466          fmuld  %f38,%f14,%f38

468         faddd   %f6,%f0,%f6
469         ldd     [%l0],%f0

471           fmovdg %fcc2,signbit,%f28

473          faddd  %f12,p1,%f12

475          fmuld  %f38,p4,%f32
476           fxor  %f40,pio2_lo,%f34

478           fxor  %f40,pio2,%f20

480         faddd   %f2,%f4,%f2

482          fmuld  %f38,%f12,%f12
483           fxor  %f46,%f40,%f46

485          fmuld  %f38,%f38,%f38
486          faddd  %f16,%f32,%f32

488           faddd %f28,%f34,%f28
489           ldd   [%l2+0x8],%f34

491         faddd   %f6,%f0,%f6
492         lda     [%i1]%asi,%f0           ! preload next argument

494          faddd  %f12,%f18,%f12
495         lda     [%i1+4]%asi,%f1

497           fmuld %f24,%f24,%f40
498         lda     [%i3]%asi,%f8

500          fmuld  %f38,%f32,%f38
501           faddd %f28,%f34,%f28
502         lda     [%i3+4]%asi,%f9

504          fnegd  pio2,%f16
505           fmuld %f24,p3,%f26
506         lda     [%i1]%asi,%o0

508          fmovdg %fcc1,signbit,%f16
509         lda     [%i3]%asi,%l3

511           fmuld %f40,p2,%f22

513          faddd  %f12,%f38,%f12
514           fmuld %f40,%f24,%f40

516         faddd   %f2,%f6,%f6

518          faddd  %f16,%f10,%f16
519          ldd    [%l1],%f10

521           faddd %f22,p1,%f22

523          faddd  %f12,%f14,%f12
```

```
524           fmuld %f40,p4,%f34

526         fxor    %f6,%f42,%f6
527         st      %f6,[%l4]

529          faddd  %f16,%f10,%f16
530         st      %f7,[%l4+4]

532           fmuld %f40,%f22,%f22

534           fmuld %f40,%f40,%f40
535           faddd %f26,%f34,%f34

537           fnegd pio2,%f26

539          faddd  %f12,%f16,%f16

541           faddd %f22,%f28,%f22

543           fmuld %f40,%f34,%f40
544           fmovdg %fcc2,signbit,%f26

546 ! -

548          fxor   %f16,%f44,%f16
549          st     %f16,[%l5]

551           faddd %f26,%f20,%f26
552          st     %f17,[%l5+4]
553         addcc   %i0,-1,%i0

555           faddd %f22,%f40,%f22
556         bg,pt   %icc,.loop
557 ! delay slot
558           ldd   [%l2],%f20


561           faddd %f26,%f20,%f26
562           faddd %f22,%f24,%f22
563           faddd %f22,%f26,%f26
564 .done_from_special0:
565           fxor  %f26,%f46,%f26
566           st    %f26,[%l6]
567           st    %f27,[%l6+4]
568           ret
569           restore



573         .align  16
574 .last1:
575         fmovd   pio2,%f10               ! set up dummy arguments
576         fmovd   pio2,%f18
577         fabsd   %f10,%f14
578         fabsd   %f18,%f12
579         sethi   %hi(0x3ff921fb),%o0
580         or      %o0,%lo(0x3ff921fb),%o0
581         mov     %o0,%l3
582         ba,pt   %icc,.cont1
583 ! delay slot
584         add     %fp,junk,%i5



588         .align  16
589 .last2:
```



```
590         fmovd   pio2,%f20
591         fmovd   pio2,%f28
592         fabsd   %f20,%f24
593         fabsd   %f28,%f22
594         sethi   %hi(0x3ff921fb),%o0
595         or      %o0,%lo(0x3ff921fb),%o0
596         mov     %o0,%l3
597         ba,pt   %icc,.cont2
598 ! delay slot
599         add     %fp,junk,%l6



603         .align  16
604 .nan0:
605           faddd %f22,%f26,%f26
606 .nan0_from_special0:
607          fabsd  %f10,%f14
608          lda    [%i3+4]%asi,%f19
609          fabsd  %f18,%f12
610          lda    [%i1]%asi,%o0
611          lda    [%i3]%asi,%l3
612         ba,pt   %icc,.special0
613 ! delay slot
614         fmuld   %f0,%f2,%f6


617         .align  16
618 .big0:
619          fabsd  %f18,%f12
620          lda    [%i1]%asi,%o0
621          lda    [%i3]%asi,%l3
622         cmp     %g5,%o5
623         bge,pn  %icc,.return_ah0        ! if hx >= 0x7ff00000
624 ! delay slot
625         nop
626         cmp     %l0,%o4
627         bge,pn  %icc,1f                 ! if hx - hy >= 0x03600000
628 ! delay slot
629         nop
630         ldd     [%fp+twom3],%f6
631         fmuld   %f0,%f6,%f0
632         fmuld   %f2,%f6,%f2
633         add     %l0,%o1,%l0
634         addcc   %i0,-1,%i0
635         ble,pn  %icc,.last1
636 ! delay slot
637         nop
638         ba,pt   %icc,.cont1
639 ! delay slot
640         nop
641 1:
642         fbg,pn  %fcc0,.return_ah0
643 ! delay slot
644         nop
645         fcmpd   %fcc3,%f8,signbit
646         fbl,pn  %fcc3,.return_ah0
647 ! delay slot
648         nop
649         ba,pt   %icc,.special0
650 ! delay slot
651         fdivd   %f0,%f2,%f6


654         .align  16
655 .small0:
```

```
656           lda     [%i3]%asi,%l3
657         fcmpd   %fcc3,%f0,signbit
658         fbe,pt  %fcc3,.return_ah0
659 ! delay slot
660         nop
661         ldd     [%fp+two110],%f6
662         fmuld   %f0,%f6,%f0
663         fmuld   %f2,%f6,%f2
664         st      %f0,[%fp+yscl]
665         ld      [%fp+yscl],%o7
666         st      %f2,[%fp+xscl]
667         ld      [%fp+xscl],%l0
668         sub     %l0,%o7,%l0
669         add     %l0,%o1,%l0
670         addcc   %i0,-1,%i0
671         ble,pn  %icc,.last1
672 ! delay slot
673         nop
674         ba,pt   %icc,.cont1
675 ! delay slot
676         nop


679         .align  16
680 .return_ah0:
681         fzero   %f0
682         fmovdg  %fcc0,signbit,%f0
683         fxor    %f36,%f0,%f36
684         fxor    %f36,pio2,%f0
685         fxor    %f42,%f36,%f42
686         fnegd   pio2,%f6
687         fmovdg  %fcc0,signbit,%f6
688         faddd   %f6,%f0,%f6
689         sub     %g5,%l0,%o7
690         cmp     %o7,%o5
691         bl,pt   %icc,1f                 ! if hy < 0x7ff00000
692 ! delay slot
693         nop
694         ldd     [%fp+pio4],%f0
695         faddd   %f6,%f0,%f6
696 1:
697         fdtoi   %f6,%f4
698 .special0:
699         fxor    %f6,%f42,%f6
700         st      %f6,[%l4]
701         st      %f7,[%l4+4]
702         addcc   %i0,-1,%i0
703         ble,pn  %icc,.done_from_special0
704 ! delay slot
705         nop
706         fmovd   %f10,%f0
707         fmovd   %f18,%f8
708         fmovd   %f14,%f4
709         fmovd   %f12,%f2
710         mov     %i5,%l4
711         add     %i1,%i2,%i1
712         add     %i3,%i4,%i3
713         add     %i5,%l7,%i5
714         fand    %f0,signbit,%f42
715         sethi   %hi(0x80000000),%g5
716         fand    %f8,signbit,%f36
717         andn    %o0,%g5,%o0
718         andn    %l3,%g5,%l3
719         fcmpd   %fcc0,%f4,%f2
720         fmovd   %f4,%f0
721         fmovdg  %fcc0,%f2,%f0
```



```
722         fmovdg  %fcc0,%f4,%f2
723         mov     %o0,%o7
724         movg    %fcc0,%l3,%o0
725         movg    %fcc0,%o7,%l3
726          lda    [%i1]%asi,%f10
727          lda    [%i1+4]%asi,%f11
728         fbu,pn  %fcc0,.nan0_from_special0
729 ! delay slot
730          lda    [%i3]%asi,%f18
731          fabsd  %f10,%f14
732          lda    [%i3+4]%asi,%f19
733         sub     %l3,%o0,%l0
734         sub     %l3,%o3,%g5
735         sub     %l0,%o4,%o7
736         andcc   %g5,%o7,%g0
737         bge,pn  %icc,.big0
738 ! delay slot
739         nop
740          fabsd  %f18,%f12
741         cmp     %o0,%o5
742         bl,pn   %icc,.small0
743 ! delay slot
744          lda    [%i1]%asi,%o0
745         add     %l0,%o1,%l0
746         addcc   %i0,-1,%i0
747         ble,pn  %icc,.last1
748 ! delay slot
749          lda    [%i3]%asi,%l3
750         ba,pt   %icc,.cont1
751 ! delay slot
752         nop



756         .align  16
757 .nan1:
758         fmuld   %f30,%f4,%f30
759         fsubd   %f0,%f6,%f4
760         faddd   %f2,%f8,%f8
761         fsubd   %f4,%f30,%f4
762 .nan1_from_special1:
763          lda    [%i3]%asi,%f28
764          lda    [%i3+4]%asi,%f29
765          fabsd  %f20,%f24
766          lda    [%i1]%asi,%o0
767          fabsd  %f28,%f22
768          lda    [%i3]%asi,%l3
769          mov    %i5,%l6
770         ba,pt   %icc,.special1
771 ! delay slot
772         fmuld   %f10,%f12,%f16


775         .align  16
776 .big1:
777         faddd   %f2,%f8,%f8
778         fsubd   %f4,%f30,%f4
779 .big1_from_special1:
780          lda    [%i1]%asi,%o0
781          fabsd  %f28,%f22
782          lda    [%i3]%asi,%l3
783          mov    %i5,%l6
784         cmp     %g5,%o5
785         bge,pn  %icc,.return_ah1
786 ! delay slot
787         nop
```

```
788         cmp     %l1,%o4
789         bge,pn  %icc,1f
790 ! delay slot
791         nop
792         ldd     [%fp+twom3],%f16
793         fmuld   %f10,%f16,%f10
794         fmuld   %f12,%f16,%f12
795         add     %l1,%o1,%l1
796         srl     %l1,10,%l1
797         addcc   %i0,-1,%i0
798         ble,pn  %icc,.last2
799 ! delay slot
800         nop
801         ba,pt   %icc,.cont2
802 ! delay slot
803         nop
804 1:
805         fbg,pn  %fcc1,.return_ah1
806 ! delay slot
807         nop
808         fcmpd   %fcc3,%f18,signbit
809         fbl,pn  %fcc3,.return_ah1
810 ! delay slot
811         nop
812         ba,pt   %icc,.special1
813 ! delay slot
814         fdivd   %f10,%f12,%f16


817         .align  16
818 .small1:
819         fsubd   %f4,%f30,%f4
820 .small1_from_special1:
821          fabsd  %f28,%f22
822          lda    [%i3]%asi,%l3
823          mov    %i5,%l6
824         fcmpd   %fcc3,%f10,signbit
825         fbe,pt  %fcc3,.return_ah1
826 ! delay slot
827         nop
828         ldd     [%fp+two110],%f16
829         fmuld   %f10,%f16,%f10
830         fmuld   %f12,%f16,%f12
831         st      %f10,[%fp+yscl]
832         ld      [%fp+yscl],%o7
833         st      %f12,[%fp+xscl]
834         ld      [%fp+xscl],%l1
835         sub     %l1,%o7,%l1
836         add     %l1,%o1,%l1
837         srl     %l1,10,%l1
838         addcc   %i0,-1,%i0
839         ble,pn  %icc,.last2
840 ! delay slot
841         nop
842         ba,pt   %icc,.cont2
843 ! delay slot
844         nop


847         .align  16
848 .return_ah1:
849         fzero   %f10
850         fmovdg  %fcc1,signbit,%f10
851         fxor    %f38,%f10,%f38
852         fxor    %f38,pio2,%f10
853         fxor    %f44,%f38,%f44
```



```
854         fnegd   pio2,%f16
855         fmovdg  %fcc1,signbit,%f16
856         faddd   %f16,%f10,%f16
857         sub     %g5,%l1,%o7
858         cmp     %o7,%o5
859         bl,pt   %icc,1f
860 ! delay slot
861         nop
862         ldd     [%fp+pio4],%f10
863         faddd   %f16,%f10,%f16
864 1:
865         fdtoi   %f16,%f14
866 .special1:
867         fxor    %f16,%f44,%f16
868         st      %f16,[%l5]
869         st      %f17,[%l5+4]
870         addcc   %i0,-1,%i0
871         bg,pn   %icc,1f
872 ! delay slot
873         nop
874         fmovd   pio2,%f20               ! set up dummy argument
875         fmovd   pio2,%f28
876         fabsd   %f20,%f24
877         fabsd   %f28,%f22
878         sethi   %hi(0x3ff921fb),%o0
879         or      %o0,%lo(0x3ff921fb),%o0
880         mov     %o0,%l3
881         add     %fp,junk,%i5
882 1:
883         fmovd   %f20,%f10
884         fmovd   %f28,%f18
885         fmovd   %f24,%f14
886         fmovd   %f22,%f12
887         mov     %i5,%l5
888         add     %i1,%i2,%i1
889         add     %i3,%i4,%i3
890         add     %i5,%l7,%i5
891         fand    %f10,signbit,%f44
892         sethi   %hi(0x80000000),%g5
893         fand    %f18,signbit,%f38
894         andn    %o0,%g5,%o0
895         andn    %l3,%g5,%l3
896         fcmpd   %fcc1,%f14,%f12
897         fmovd   %f14,%f10
898         fmovdg  %fcc1,%f12,%f10
899         fmovdg  %fcc1,%f14,%f12
900         mov     %o0,%o7
901         movg    %fcc1,%l3,%o0
902         movg    %fcc1,%o7,%l3
903          lda    [%i1]%asi,%f20
904          lda    [%i1+4]%asi,%f21
905         fbu,pn  %fcc1,.nan1_from_special1
906 ! delay slot
907         nop
908          lda    [%i3]%asi,%f28
909          lda    [%i3+4]%asi,%f29
910          fabsd  %f20,%f24
911         sub     %l3,%o0,%l1
912         sub     %l3,%o3,%g5
913         sub     %l1,%o4,%o7
914         andcc   %g5,%o7,%g0
915         bge,pn  %icc,.big1_from_special1
916 ! delay slot
917         nop
918         cmp     %o0,%o5
919         bl,pn   %icc,.small1_from_special1
```

```
! delay slot
         lda    [%i1]%asi,%o0
         fabsd  %f28,%f22
         lda    [%i3]%asi,%l3
        add     %l1,%o1,%l1
        srl     %l1,10,%l1
        addcc   %i0,-1,%i0
        ble,pn  %icc,.last2
! delay slot
         mov    %i5,%l6
        ba,pt   %icc,.cont2
! delay slot
        nop



        .align  16
.nan2:
        fmovdg  %fcc0,signbit,%f0
         fmuld  %f32,%f14,%f32
         fsubd  %f10,%f16,%f14
         faddd  %f12,%f18,%f18
        fxor    %f36,%f0,%f36
.nan2_from_special2:
        ba,pt   %icc,.special2
! delay slot
        fmuld   %f20,%f22,%f26


        .align  16
.big2:
        fxor    %f36,%f0,%f36
.big2_from_special2:
        cmp     %g5,%o5
        bge,pn  %icc,.return_ah2
! delay slot
        nop
        cmp     %l2,%o4
        bge,pn  %icc,1f
! delay slot
        nop
        ldd     [%fp+twom3],%f26
        fmuld   %f20,%f26,%f20
        fmuld   %f22,%f26,%f22
        ba,pt   %icc,.cont3
! delay slot
        nop
1:
        fbg,pn  %fcc2,.return_ah2
! delay slot
        nop
        fcmpd   %fcc3,%f28,signbit
        fbl,pn  %fcc3,.return_ah2
! delay slot
        nop
        ba,pt   %icc,.special2
! delay slot
        fdivd   %f20,%f22,%f26


        .align  16
.small2:
        fcmpd   %fcc3,%f20,signbit
        fbe,pt  %fcc3,.return_ah2
! delay slot
        nop
```



```
        ldd     [%fp+two110],%f26
        fmuld   %f20,%f26,%f20
        fmuld   %f22,%f26,%f22
        st      %f20,[%fp+yscl]
        ld      [%fp+yscl],%o7
        st      %f22,[%fp+xscl]
        ld      [%fp+xscl],%l2
        sub     %l2,%o7,%l2
        ba,pt   %icc,.cont3
! delay slot
        nop


        .align  16
.return_ah2:
        fzero   %f20
        fmovdg  %fcc2,signbit,%f20
        fxor    %f40,%f20,%f40
        fxor    %f40,pio2,%f20
        fxor    %f46,%f40,%f46
        fnegd   pio2,%f26
        fmovdg  %fcc2,signbit,%f26
        faddd   %f26,%f20,%f26
        sub     %g5,%l2,%o7
        cmp     %o7,%o5
        bl,pt   %icc,1f
! delay slot
        nop
        ldd     [%fp+pio4],%f20
        faddd   %f26,%f20,%f26
1:
        fdtoi   %f26,%f24
.special2:
        fxor    %f26,%f46,%f26
        st      %f26,[%l6]
        st      %f27,[%l6+4]
        addcc   %i0,-1,%i0
        bg,pn   %icc,1f
! delay slot
        nop
        fmovd   pio2,%f20               ! set up dummy argument
        fmovd   pio2,%f22
        fzero   %f40
        fzero   %f46
        mov     0,%l2
        ba,pt   %icc,.cont3
! delay slot
        add     %fp,junk,%l6
1:
        lda     [%i1]%asi,%f20
        lda     [%i1+4]%asi,%f21
        lda     [%i3]%asi,%f28
        lda     [%i3+4]%asi,%f29
        fabsd   %f20,%f24
        lda     [%i1]%asi,%o0
        fabsd   %f28,%f22
        lda     [%i3]%asi,%l3
        mov     %i5,%l6
        fand    %f20,signbit,%f46
        add     %i1,%i2,%i1
        fand    %f28,signbit,%f40
        fcmpd   %fcc2,%f24,%f22
        add     %i3,%i4,%i3
        add     %i5,%l7,%i5
        fmovd   %f24,%f20
        sethi   %hi(0x80000000),%g5
```

```
1052         andn    %o0,%g5,%o0
1053         andn    %l3,%g5,%l3
1054         fmovdg  %fcc2,%f22,%f20
1055         fmovdg  %fcc2,%f24,%f22
1056         mov     %o0,%o7
1057         movg    %fcc2,%l3,%o0
1058         movg    %fcc2,%o7,%l3
1059         fbu,pn  %fcc2,.nan2_from_special2
1060 ! delay slot
1061         nop
1062         sub     %l3,%o0,%l2
1063         sub     %l3,%o3,%g5
1064         sub     %l2,%o4,%o7
1065         andcc   %g5,%o7,%g0
1066         bge,pn  %icc,.big2_from_special2
1067 ! delay slot
1068         nop
1069         cmp     %o0,%o5
1070         bl,pn   %icc,.small2
1071 ! delay slot
1072         nop
1073         ba,pt   %icc,.cont3
1074 ! delay slot
1075         nop

1077         SET_SIZE(__vatan2)
```

```
**********************************************************
   86305 Sat May 10 12:09:57 2014
new/usr/src/lib/libmvec/common/vis/__vatan2f.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vatan2f.S"

#include "libm.h"

        RO_DATA
        .align  64
.CONST_TBL:
        .word   0xbff921fb, 0x54442d18  ! -M_PI_2
        .word   0x3ff921fb, 0x54442d18  !  M_PI_2
        .word   0xbff921fb, 0x54442d18  ! -M_PI_2
        .word   0x3ff921fb, 0x54442d18  !  M_PI_2
        .word   0xc00921fb, 0x54442d18  ! -M_PI
        .word   0x400921fb, 0x54442d18  !  M_PI
        .word   0x80000000, 0x00000000  ! -0.0
        .word   0x00000000, 0x00000000  !  0.0

        .word   0xbff00000, 0x00000000  ! -1.0
        .word   0x3ff00000, 0x00000000  !  1.0

        .word   0x3feffffe, 0xfe79bf93  ! K0 =  9.99999997160545464888e-01
        .word   0xbfd55552, 0xf0db4320  ! K1 = -3.33332762919825514315e-01
        .word   0x3fc998f8, 0x2493d066  ! K2 =  1.99980752811487135558e-01
        .word   0xbfc240b8, 0xd994abf9  ! K3 = -1.42600160828209047720e-01
        .word   0x3fbbfc9e, 0x8c2b0243  ! K4 =  1.09323415013030928421e-01
        .word   0xbfb56013, 0x64b1cac3  ! K5 = -8.34972496830160174704e-02
        .word   0x3fad3ad7, 0x9f53e142  ! K6 =  5.70895559303061900411e-02
        .word   0xbf9f148f, 0x2a829af1  ! K7 = -3.03518647857811706139e-02
        .word   0x3f857a8c, 0x747ed314  ! K8 =  1.04876492549493055747e-02
        .word   0xbf5bdf39, 0x729124b6  ! K9 = -1.70117006406859722727e-03

        .word   0x3fe921fb, 0x54442d18  ! M_PI_4
        .word   0x36a00000, 0x00000000  ! 2^(-149)
```



```
#define counter         %o3
#define stridex         %i4
#define stridey         %i5
#define stridez         %l1
#define cmul_arr        %i0
#define cadd_arr        %i2
#define _0x7fffffff     %l0
#define _0x7f800000     %l2

#define K0              %f42
#define K1              %f44
#define K2              %f46
#define K3              %f48
#define K4              %f50
#define K5              %f52
#define K6              %f54
#define K7              %f56
#define K8              %f58
#define K9              %f60

#define tmp_counter     STACK_BIAS-32
#define tmp_py          STACK_BIAS-24
#define tmp_px          STACK_BIAS-16
#define tmp_pz          STACK_BIAS-8

! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x20

!--------------------------------------------------------------------
!               !!!!!   vatan2f algorithm       !!!!!
!       uy0 = *(int*)py;
!       ux0 = *(int*)px;
!       ay0 = uy0 & 0x7fffffff;
!       ax0 = ux0 & 0x7fffffff;
!       if ( ax0 >= 0x7f800000 || ay0 >= 0x7f800000 )
!       {
!               /* |X| or |Y| = Nan */
!               if ( ax0 > 0x7f800000 || ay0 > 0x7f800000 )
!               {
!                       ftmp0 = *(float*)&ax0 * *(float*)&ay0;
!                       *pz = ftmp0;
!               }
!               signx0 = (unsigned)ux0 >> 30;
!               signx0 &= 2;
!               signy0 = uy0 >> 31;
!               if (ay0 == 0x7f800000)
!                       signx0 = (ax0 == 0x7f800000) ? signx0 + 1 : 2;
!               else
!                       signx0 += signx0;
!               res = signx0 * M_PI_4;
!               signy0 <<= 3;
!               dtmp0 = *(double*)((char*)(cmul_arr + 1) + signy0);
!               res *= dtmp0;
!               ftmp0 = (float) res;
!               *pz = ftmp0;
!               goto next;
!       }
!       if ( ax0 == 0 && ay0 == 0 )
!       {
!               signy0 = uy0 >> 28;
!               signx0 = ux0 >> 27;
!               ldiff0 = ax0 - ay0;
!               ldiff0 >>= 31;
!               signx0 &= -16;
!               signy0 &= -8;
!               ldiff0 <<= 5;
```

```
128 !               signx0 += signy0;
129 !               res = *(double*)((char*)(cadd_arr + 7) + ldiff0 + signx0 + signy
130 !               ftmp0 = (float) res;
131 !               *pz = ftmp0;
132 !               goto next;
133 !       }
134 !       ldiff0 = ax0 - ay0;
135 !       ldiff0 >>= 31;
136 !       addrc0 = (char*)px - (char*)py;
137 !       addrc0 &= ldiff0;
138 !       fy0 = *(float*)((char*)py + addrc0);
139 !       fx0 = *(float*)((char*)px - addrc0);
140 !       itmp0 = *(int*)&fy0;
141 !       if((itmp0 & 0x7fffffff) < 0x00800000)
142 !       {
143 !               itmp0 >>= 28;
144 !               itmp0 &= -8;
145 !               fy0 = fabsf(fy0);
146 !               dtmp0 = (double) *(int*)&fy0;
147 !               dtmp0 *= C2ONM149;
148 !               dsign = *(double*)((char*)cmul_arr + itmp0);
149 !               dtmp0 *= dsign;
150 !               y0 = dtm0;
151 !       }
152 !       else
153 !               y0 = (double)fy0;
154 !       itmp0 = *(int*)&fx0;
155 !       if((itmp0 & 0x7fffffff) < 0x00800000)
156 !       {
157 !               itmp0 >>= 28;
158 !               itmp0 &= -8;
159 !               fx0 = fabsf(fx0);
160 !               dtmp0 = (double) *(int*)&fx0;
161 !               dtmp0 *= C2ONM149;
162 !               dsign = *(double*)((char*)cmul_arr + itmp0);
163 !               dtmp0 *= dsign;
164 !               x0 = dtmp0;
165 !       }
166 !       else
167 !               x0 = (double)fx0;
168 !       px += stridex;
169 !       py += stridey;
170 !       x0 = y0 / x0;
171 !       x20 = x0 * x0;
172 !       dtmp0 = K9 * x20;
173 !       dtmp0 += K8;
174 !       dtmp0 *= x20;
175 !       dtmp0 += K7;
176 !       dtmp0 *= x20;
177 !       dtmp0 += K6;
178 !       dtmp0 *= x20;
179 !       dtmp0 += K5;
180 !       dtmp0 *= x20;
181 !       dtmp0 += K4;
182 !       dtmp0 *= x20;
183 !       dtmp0 += K3;
184 !       dtmp0 *= x20;
185 !       dtmp0 += K2;
186 !       dtmp0 *= x20;
187 !       dtmp0 += K1;
188 !       dtmp0 *= x20;
189 !       dtmp0 += K0;
190 !       x0 = dtmp0 * x0;
191 !       signy0 = uy0 >> 28;
192 !       signy0 &= -8;
193 !       signx0 = ux0 >> 27;
```



```
194 !       signx0 &= -16;
195 !       ltmp0 = ldiff0 << 5;
196 !       ltmp0 += (char*)cadd_arr;
197 !       ltmp0 += signx0;
198 !       cadd0 = *(double*)(ltmp0 + signy0);
199 !       cmul0_ind = ldiff0 << 3;
200 !       cmul0 = *(double*)((char*)cmul_arr + cmul0_ind);
201 !       dtmp0 = cmul0 * x0;
202 !       dtmp0 = cadd0 + dtmp0;
203 !       ftmp0 = (float)dtmp0;
204 !       *pz = ftmp0;
205 !       pz += stridez;
206 !
207 !-----------------------------------------------------------------------

209         ENTRY(__vatan2f)
210         save    %sp,-SA(MINFRAME)-tmps,%sp
211         PIC_SETUP(l7)
212         PIC_SET(l7,.CONST_TBL,g5)

214 #ifdef __sparcv9
215         ldx     [%fp+STACK_BIAS+176],%l7
216 #else
217         ld      [%fp+STACK_BIAS+92],%l7
218 #endif

220         st      %i0,[%fp+tmp_counter]
221         sethi   %hi(0x7ffffc00),_0x7fffffff
222         add     _0x7fffffff,1023,_0x7fffffff
223         or      %g0,%i2,%o2
224         sll     %l7,2,stridez

226         sethi   %hi(0x7f800000),_0x7f800000
227         mov     %g5,%g1

229         or      %g0,stridey,%o4
230         add     %g1,56,cadd_arr

232         sll     %o2,2,stridey
233         add     %g1,72,cmul_arr

235         ldd     [%g1+80],K0
236         ldd     [%g1+80+8],K1
237         ldd     [%g1+80+16],K2
238         ldd     [%g1+80+24],K3
239         ldd     [%g1+80+32],K4
240         ldd     [%g1+80+40],K5
241         ldd     [%g1+80+48],K6
242         ldd     [%g1+80+56],K7
243         ldd     [%g1+80+64],K8
244         ldd     [%g1+80+72],K9

246         sll     stridex,2,stridex

248         stx     %i1,[%fp+tmp_py]
249         stx     %i3,[%fp+tmp_px]
250 .begin:
251         ld      [%fp+tmp_counter],counter
252         ldx     [%fp+tmp_py],%i1
253         ldx     [%fp+tmp_px],%i3
254         st      %g0,[%fp+tmp_counter]
255 .begin1:
256         subcc   counter,1,counter
257         bneg,pn %icc,.exit
258         nop
```

```
260         lda     [%i1]0x82,%l4           ! (0_0) uy0 = *(int*)py;

262         lda     [%i3]0x82,%l3           ! (0_0) ux0 = *(int*)px;

264         and     %l4,_0x7fffffff,%l7     ! (0_0) ay0 = uy0 & 0x7fffffff;

266         cmp     %l7,_0x7f800000
267         bge,pn  %icc,.spec0
268         and     %l3,_0x7fffffff,%l6     ! (0_0) ax0 = ux0 & 0x7fffffff;

270         cmp     %l6,_0x7f800000
271         bge,pn  %icc,.spec0
272         sethi   %hi(0x00800000),%o5

274         cmp     %l6,%o5
275         bl,pn   %icc,.spec1
276         sub     %l6,%l7,%o2             ! (0_0) ldiff0 = ax0 - ay0;

278         cmp     %l7,%o5
279         bl,pn   %icc,.spec1
280         nop

282         stx     %o4,[%fp+tmp_pz]
283         sra     %o2,31,%l7              ! (0_0) ldiff0 >>= 31;
284         sub     %i3,%i1,%l6             ! (0_0) addrc0 = (char*)px - (char*)py;

286         and     %l6,%l7,%o2             ! (0_0) addrc0 &= ldiff0;

288         lda     [%i1+%o2]0x82,%f0       ! (0_0) fy0 = *(float*)((char*)py + addr
289         sub     %i3,%o2,%o4             ! (0_0) (char*)px - addrc0

291         lda     [%o4]0x82,%f2           ! (0_0) fx0 = *(float*)((char*)px - addr
292         sll     %l7,5,%l6               ! (0_0) ltmp0 = ldiff0 << 5;

294         sra     %l3,27,%o5              ! (0_0) signx0 = ux0 >> 27;
295         add     %i1,stridey,%i1         ! py += stridey

297         add     %i3,stridex,%i3         ! px += stridex

299         lda     [%i1]0x82,%l3           ! (1_0) uy0 = *(int*)py;
300         sra     %l4,28,%o4              ! (0_0) signy0 = uy0 >> 28;

302         add     %l6,cadd_arr,%l6        ! (0_0) ltmp0 += (char*)cadd_arr;

304         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

306         fstod   %f2,%f2                 ! (0_0) x0 = (double)fx0;

308 .spec1_cont:
309         lda     [%i3]0x82,%l4           ! (1_0) ux0 = *(int*)px;
310         and     %o5,-16,%o5             ! (0_0) signx0 &= -16;

312         and     %o4,-8,%o4              ! (0_0) signy0 &= -8;

314         fdivd   %f40,%f2,%f12           ! (0_0) x0 = y0 / x0;

316         add     %l6,%o5,%o1             ! (0_0) ltmp0 += signx0;

318         and     %l4,_0x7fffffff,%l6     ! (1_0) ax0 = ux0 & 0x7fffffff;
319         sethi   %hi(0x00800000),%o5

321         cmp     %l6,%o5
322         bl,pn   %icc,.u0
323         and     %l3,_0x7fffffff,%g1     ! (1_0) ay0 = uy0 & 0x7fffffff;
324 .c0:
325         cmp     %g1,%o5
```



```
326         bl,pn   %icc,.u1
327         ldd     [%o1+%o4],%f34          ! (0_0) cadd0 = *(double*)(ltmp0 + signy
328 .c1:
329         cmp     %l6,_0x7f800000
330         bge,pn  %icc,.u2
331         sub     %l6,%g1,%o1             ! (1_0) ldiff0 = ax0 - ay0;
332 .c2:
333         cmp     %g1,_0x7f800000
334         bge,pn  %icc,.u3
335         nop
336 .c3:
337         sra     %o1,31,%g1              ! (1_0) ldiff0 >>= 31;
338         sub     %i3,%i1,%l6             ! (1_0) addrc0 = (char*)px - (char*)py;

340         and     %l6,%g1,%o1             ! (1_0) addrc0 &= ldiff0;

342         lda     [%i1+%o1]0x82,%f0       ! (1_0) fy0 = *(float*)((char*)py + addr
343         sub     %i3,%o1,%o4             ! (1_0) (char*)px - addrc0;

345         lda     [%o4]0x82,%f2           ! (1_0) fx0 = *(float*)((char*)px - addr
346         sll     %g1,5,%l6               ! (1_0) ltmp0 = ldiff0 << 5;

348         cmp     %o5,_0x7f800000         ! (1_0) b0 ? 0x7f800000
349         bge,pn  %icc,.update0           ! (1_0) if ( b0 > 0x7f800000 )
350         nop
351 .cont0:
352         add     %i1,stridey,%i1         ! py += stridey
353         fstod   %f0,%f40                ! (1_0) y0 = (double)fy0;

355         sra     %l4,27,%o5              ! (1_0) signx0 = ux0 >> 27;
356         add     %i3,stridex,%i3         ! px += stridex

358         sra     %l3,28,%o4              ! (1_0) signy0 = uy0 >> 28;
359         add     %l6,cadd_arr,%l6        ! (1_0) ltmp0 += (char*)cadd_arr;
360         fstod   %f2,%f2                 ! (1_0) x0 = (double)fx0;
361 .d0:
362         and     %o5,-16,%o5             ! (1_0) signx0 &= -16;
363         and     %o4,-8,%o4              ! (1_0) signy0 &= -8;

365         lda     [%i1]0x82,%l4           ! (2_0) uy0 = *(int*)py;

367         lda     [%i3]0x82,%l3           ! (2_0) ux0 = *(int*)px;
368         fdivd   %f40,%f2,%f10           ! (1_0) x0 = y0 / x0;

370         fmuld   %f12,%f12,%f20          ! (0_0) x20 = x0 * x0;

372         add     %l6,%o5,%o2             ! (1_0) ltmp0 += signx0;

374         and     %l3,_0x7fffffff,%l6     ! (2_0) ax0 = ux0 & 0x7fffffff;
375         sethi   %hi(0x00800000),%o5

377         cmp     %l6,%o5
378         bl,pn   %icc,.u4
379         and     %l4,_0x7fffffff,%g5     ! (2_0) ay0 = uy0 & 0x7fffffff;
380 .c4:
381         cmp     %g5,%o5
382         bl,pn   %icc,.u5
383         fmuld   K9,%f20,%f40            ! (0_0) dtmp0 = K9 * x20;
384 .c5:
385         cmp     %l6,_0x7f800000
386         bge,pn  %icc,.u6
387         ldd     [%o2+%o4],%f32          ! (1_0) cadd0 = *(double*)(ltmp0 + signy
388 .c6:
389         cmp     %g5,_0x7f800000
390         bge,pn  %icc,.u7
391         sub     %l6,%g5,%o2             ! (2_0) ldiff0 = ax0 - ay0;
```

```
.c7:
        sra     %o2,31,%g5              ! (2_0) ldiff0 >>= 31;
        sub     %i3,%i1,%l6             ! (2_0) addrc0 = (char*)px - (char*)py;

        faddd   %f40,K8,%f40            ! (0_0) dtmp0 += K8;
        and     %l6,%g5,%o2             ! (2_0) addrc0 &= ldiff0;

        lda     [%i1+%o2]0x82,%f0       ! (2_0) fy0 = *(float*)((char*)py + addr
        sub     %i3,%o2,%o4             ! (2_0) (char*)px - addrc0;

        lda     [%o4]0x82,%f2           ! (2_0) fx0 = *(float*)((char*)px - addr

        cmp     %o5,_0x7f800000         ! (2_0) b0 ? 0x7f800000
        bge,pn  %icc,.update1           ! (2_0) if ( b0 > 0x7f800000 )
        nop
.cont1:
        fmuld   %f40,%f20,%f30          ! (0_0) dtmp0 *= x20;
        sll     %g5,5,%l6               ! (2_0) ltmp0 = ldiff0 << 5;
        add     %i1,stridey,%i1         ! py += stridey
        fstod   %f0,%f40                ! (2_0) y0 = (double)fy0;

        sra     %l3,27,%o5              ! (2_0) signx0 = ux0 >> 27;
        add     %i3,stridex,%i3         ! px += stridex

        fstod   %f2,%f2                 ! (2_0) x0 = (double)fx0;
        sra     %l4,28,%o4              ! (2_0) signy0 = uy0 >> 28;
        add     %l6,cadd_arr,%l6        ! (2_0) ltmp0 += (char*)cadd_arr;
.d1:
        lda     [%i1]0x82,%l3           ! (3_0) uy0 = *(int*)py;
        and     %o5,-16,%o5             ! (2_0) signx0 &= -16;
        faddd   %f30,K7,%f30            ! (0_0) dtmp0 += K7;

        lda     [%i3]0x82,%l4           ! (3_0) ux0 = *(int*)px;

        fdivd   %f40,%f2,%f8            ! (2_0) x0 = y0 / x0;

        fmuld   %f10,%f10,%f18          ! (1_0) x20 = x0 * x0;

        add     %l6,%o5,%o1             ! (2_0) ltmp0 += signx0;
        and     %o4,-8,%o4              ! (2_0) signy0 &= -8;
        fmuld   %f30,%f20,%f30          ! (0_0) dtmp0 *= x20;

        and     %l4,_0x7fffffff,%l6     ! (3_0) ax0 = ux0 & 0x7fffffff;
        sethi   %hi(0x00800000),%o5

        cmp     %l6,%o5
        bl,pn   %icc,.u8
        and     %l3,_0x7fffffff,%o0     ! (3_0) ay0 = uy0 & 0x7fffffff;
.c8:
        cmp     %o0,%o5
        bl,pn   %icc,.u9
        fmuld   K9,%f18,%f40            ! (1_0) dtmp0 = K9 * x20;
.c9:
        cmp     %l6,_0x7f800000
        bge,pn  %icc,.u10
        faddd   %f30,K6,%f16            ! (0_0) dtmp0 += K6;
.c10:
        cmp     %o0,_0x7f800000
        bge,pn  %icc,.u11
        ldd     [%o1+%o4],%f30          ! (2_0) cadd0 = *(double*)(ltmp0 + signy
.c11:
        sub     %l6,%o0,%o1             ! (3_0) ldiff0 = ax0 - ay0;

        sra     %o1,31,%o0              ! (3_0) ldiff0 >>= 31;
        sub     %i3,%i1,%l6             ! (3_0) addrc0 = (char*)px - (char*)py;
```



```
        faddd   %f40,K8,%f40            ! (1_0) dtmp0 += K8;
        and     %l6,%o0,%o1             ! (3_0) addrc0 &= ldiff0;
        fmuld   %f16,%f20,%f16          ! (0_0) dtmp0 *= x20;

        lda     [%i1+%o1]0x82,%f0       ! (3_0) fy0 = *(float*)((char*)py + addr
        sub     %i3,%o1,%o4             ! (3_0) (char*)px - addrc0;

        lda     [%o4]0x82,%f1           ! (3_0) fx0 = *(float*)((char*)px - addr

        cmp     %o5,_0x7f800000         ! (3_0) b0 ? 0x7f800000
        bge,pn  %icc,.update2           ! (3_0) if ( b0 > 0x7f800000 )
        nop
.cont2:
        fmuld   %f40,%f18,%f28          ! (1_0) dtmp0 *= x20;
        sll     %o0,5,%l6               ! (3_0) ltmp0 = ldiff0 << 5;
        add     %i1,stridey,%i1         ! py += stridey
        fstod   %f0,%f40                ! (3_0) y0 = (double)fy0;

        faddd   %f16,K5,%f2             ! (0_0) dtmp0 += K5;
        sra     %l4,27,%o5              ! (3_0) signx0 = ux0 >> 27;
        add     %i3,stridex,%i3         ! px += stridex

        sra     %l3,28,%o4              ! (3_0) signy0 = uy0 >> 28;
        fstod   %f1,%f16                ! (3_0) x0 = (double)fx0;
.d2:
        faddd   %f28,K7,%f28            ! (1_0) dtmp0 += K7;
        add     %l6,cadd_arr,%l6        ! (3_0) ltmp0 += (char*)cadd_arr;
        and     %o5,-16,%o5             ! (3_0) signx0 &= -16;

        lda     [%i1]0x82,%l4           ! (4_0) uy0 = *(int*)py;
        fmuld   %f2,%f20,%f2            ! (0_0) dtmp0 *= x20;

        lda     [%i3]0x82,%l3           ! (4_0) ux0 = *(int*)px;
        fdivd   %f40,%f16,%f6           ! (3_0) x0 = y0 / x0;

        and     %o4,-8,%o4              ! (3_0) signy0 &= -8;
        fmuld   %f8,%f8,%f16            ! (2_0) x20 = x0 * x0;

        add     %l6,%o5,%o2             ! (3_0) ltmp0 += signx0;
        fmuld   %f28,%f18,%f28          ! (1_0) dtmp0 *= x20;

        and     %l3,_0x7fffffff,%l6     ! (4_0) ax0 = ux0 & 0x7fffffff;
        sethi   %hi(0x00800000),%o5
        faddd   %f2,K4,%f2              ! (0_0) dtmp0 += K4;

        cmp     %l6,%o5
        bl,pn   %icc,.u12
        and     %l4,_0x7fffffff,%l5     ! (4_0) ay0 = uy0 & 0x7fffffff;
.c12:
        cmp     %l5,%o5
        bl,pn   %icc,.u13
        fmuld   K9,%f16,%f40            ! (2_0) dtmp0 = K9 * x20;
.c13:
        cmp     %l6,_0x7f800000
        bge,pn  %icc,.u14
        faddd   %f28,K6,%f4             ! (1_0) dtmp0 += K6;
.c14:
        ldd     [%o2+%o4],%f28          ! (3_0) cadd0 = *(double*)(ltmp0 + signy
        cmp     %l5,_0x7f800000
        bge,pn  %icc,.u15
        fmuld   %f2,%f20,%f24           ! (0_0) dtmp0 *= x20;
.c15:
        sub     %l6,%l5,%o2             ! (4_0) ldiff0 = ax0 - ay0;

        sra     %o2,31,%l5              ! (4_0) ldiff0 >>= 31;
        sub     %i3,%i1,%l6             ! (4_0) addrc0 = (char*)px - (char*)py;
```

```
525         faddd   %f40,K8,%f40            ! (2_0) dtmp0 += K8;
526         and     %l6,%l5,%o2             ! (4_0) addrc0 &= ldiff0;
527         fmuld   %f4,%f18,%f4            ! (1_0) dtmp0 *= x20;

529         lda     [%i1+%o2]0x82,%f0       ! (4_0) fy0 = *(float*)((char*)py + addr
530         sub     %i3,%o2,%o4             ! (4_0) (char*)px - addrc0;
531         faddd   %f24,K3,%f24            ! (0_0) dtmp0 += K3;

533         lda     [%o4]0x82,%f2           ! (4_0) fx0 = *(float*)((char*)px - addr

535         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
536         bge,pn  %icc,.update3           ! (4_0) if ( b0 > 0x7f800000 )
537         nop
538 .cont3:
539         fmuld   %f40,%f16,%f26          ! (2_0) dtmp0 *= x20;
540         sll     %l5,5,%l6               ! (4_0) ltmp0 = ldiff0 << 5;
541         add     %i1,stridey,%i1         ! py += stridey
542         fstod   %f0,%f40                ! (4_0) y0 = (double)fy0;

544         faddd   %f4,K5,%f62             ! (1_0) dtmp0 += K5;
545         add     %i3,stridex,%i3         ! px += stridex
546         fmuld   %f24,%f20,%f24          ! (0_0) dtmp0 *= x20;

548         fstod   %f2,%f2                 ! (4_0) x0 = (double)fx0;
549         sra     %l3,27,%o5              ! (4_0) signx0 = ux0 >> 27;
550         sra     %l4,28,%o4              ! (4_0) signy0 = uy0 >> 28;
551 .d3:
552         lda     [%i1]0x82,%l3           ! (5_0) uy0 = *(int*)py;
553         add     %l6,cadd_arr,%l6        ! (4_0) ltmp0 += (char*)cadd_arr;
554         faddd   %f26,K7,%f26            ! (2_0) dtmp0 += K7;

556         fmuld   %f62,%f18,%f4           ! (1_0) dtmp0 *= x20;
557         and     %o5,-16,%o5             ! (4_0) signx0 &= -16;

559         lda     [%i3]0x82,%l4           ! (5_1) ux0 = *(int*)px;
560         fdivd   %f40,%f2,%f62           ! (4_1) x0 = y0 / x0;
561         faddd   %f24,K2,%f40            ! (0_1) dtmp0 += K2;

563         and     %o4,-8,%o4              ! (4_1) signy0 &= -8;
564         fmuld   %f6,%f6,%f24            ! (3_1) x20 = x0 * x0;

566         add     %l6,%o5,%o1             ! (4_1) ltmp0 += signx0;
567         fmuld   %f26,%f16,%f26          ! (2_1) dtmp0 *= x20;

569         and     %l4,_0x7fffffff,%l6     ! (5_1) ax0 = ux0 & 0x7fffffff;
570         sethi   %hi(0x00800000),%o5
571         faddd   %f4,K4,%f4              ! (1_1) dtmp0 += K4;

573         cmp     %l6,%o5
574         bl,pn   %icc,.u16
575         and     %l3,_0x7fffffff,%o7     ! (5_1) ay0 = uy0 & 0x7fffffff;
576 .c16:
577         cmp     %o7,%o5
578         bl,pn   %icc,.u17
579         fmuld   %f40,%f20,%f38          ! (0_1) dtmp0 *= x20;
580 .c17:
581         cmp     %l6,_0x7f800000
582         bge,pn  %icc,.u18
583         fmuld   K9,%f24,%f40            ! (3_1) dtmp0 = K9 * x20;
584 .c18:
585         cmp     %o7,_0x7f800000
586         bge,pn  %icc,.u19
587         faddd   %f26,K6,%f22            ! (2_1) dtmp0 += K6;
588 .c19:
589         ldd     [%o1+%o4],%f26          ! (4_1) cadd0 = *(double*)(ltmp0 + signy
```



```
590         fmuld   %f4,%f18,%f4            ! (1_1) dtmp0 *= x20;

592         sub     %l6,%o7,%o1             ! (5_1) ldiff0 = ax0 - ay0;

594         sra     %o1,31,%o7              ! (5_1) ldiff0 >>= 31;
595         sub     %i3,%i1,%l6             ! (5_1) addrc0 = (char*)px - (char*)py;
596         faddd   %f38,K1,%f38            ! (0_1) dtmp0 += K1;

598         faddd   %f40,K8,%f40            ! (3_1) dtmp0 += K8;
599         and     %l6,%o7,%o1             ! (5_1) addrc0 &= ldiff0;
600         fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;

602         lda     [%i1+%o1]0x82,%f0       ! (5_1) fy0 = *(float*)((char*)py + addr
603         sll     %o7,5,%l6               ! (5_1) ltmp0 = ldiff0 << 5;
604         sub     %i3,%o1,%o4             ! (5_1) (char*)px - addrc0;
605         faddd   %f4,K3,%f4              ! (1_1) dtmp0 += K3;

607         lda     [%o4]0x82,%f1           ! (5_1) fx0 = *(float*)((char*)px - addr

609         fmuld   %f38,%f20,%f38          ! (0_1) dtmp0 *= x20;
610         cmp     %o5,_0x7f800000         ! (5_1) b0 ? 0x7f800000
611         bge,pn  %icc,.update4           ! (5_1) if ( b0 > 0x7f800000 )
612         nop
613 .cont4:
614         fmuld   %f40,%f24,%f36          ! (3_1) dtmp0 *= x20;
615         fstod   %f0,%f40                ! (5_1) y0 = (double)fy0;

617         faddd   %f22,K5,%f14            ! (2_1) dtmp0 += K5;
618         fmuld   %f4,%f18,%f4            ! (1_1) dtmp0 *= x20;

620         add     %i3,stridex,%i3         ! px += stridex
621         sll     %l7,3,%l7               ! (0_1) cmul0_ind = ldiff0 << 3;
622         fstod   %f1,%f2                 ! (5_1) x0 = (double)fx0;
623 .d4:
624         sra     %l3,28,%o4              ! (5_1) signy0 = uy0 >> 28;
625         add     %i1,stridey,%i1         ! py += stridey

627         faddd   %f36,K7,%f36            ! (3_1) dtmp0 += K7;
628         sra     %l4,27,%o5              ! (5_1) signx0 = ux0 >> 27;

630         lda     [%i1]0x82,%l4           ! (0_0) uy0 = *(int*)py;
631         add     %l6,cadd_arr,%l6        ! (5_1) ltmp0 += (char*)cadd_arr;
632         fmuld   %f14,%f16,%f22          ! (2_1) dtmp0 *= x20;
633         faddd   %f38,K0,%f38            ! (0_1) dtmp0 += K0;

635         lda     [%i3]0x82,%l3           ! (0_0) ux0 = *(int*)px;
636         and     %o5,-16,%o5             ! (5_1) signx0 &= -16;
637         fdivd   %f40,%f2,%f14           ! (5_1) x0 = y0 / x0;
638         faddd   %f4,K2,%f40             ! (1_1) dtmp0 += K2;

640         fmuld   %f62,%f62,%f4           ! (4_1) x20 = x0 * x0;

642         ldd     [cmul_arr+%l7],%f0      ! (0_1) cmul0 = *(double*)((char*)cmul_a
643         add     %l6,%o5,%o2             ! (5_1) ltmp0 += signx0;
644         and     %o4,-8,%o4              ! (5_1) signy0 &= -8;
645         fmuld   %f36,%f24,%f36          ! (3_1) dtmp0 *= x20;

647         fmuld   %f38,%f12,%f12          ! (0_1) x0 = dtmp0 * x0;
648         and     %l4,_0x7fffffff,%l7     ! (0_0) ay0 = uy0 & 0x7fffffff;
649         sethi   %hi(0x00800000),%o5
650         faddd   %f22,K4,%f22            ! (2_1) dtmp0 += K4;

652         and     %l3,_0x7fffffff,%l6     ! (0_0) ax0 = ux0 & 0x7fffffff;
653         cmp     %l7,%o5
654         bl,pn   %icc,.u20
655         fmuld   %f40,%f18,%f38          ! (1_1) dtmp0 *= x20;
```

```
.c20:
        cmp     %l6,%o5
        bl,pn   %icc,.u21
        fmuld   K9,%f4,%f40             ! (4_1) dtmp0 = K9 * x20;
.c21:
        cmp     %l7,_0x7f800000
        bge,pn  %icc,.u22
        faddd   %f36,K6,%f20            ! (3_1) dtmp0 += K6;
.c22:
        ldd     [%o2+%o4],%f36          ! (5_1) cadd0 = *(double*)(ltmp0 + signy
        cmp     %l6,_0x7f800000
        bge,pn  %icc,.u23
        fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;
.c23:
        sub     %l6,%l7,%o2             ! (0_0) ldiff0 = ax0 - ay0;

        fmuld   %f0,%f12,%f12           ! (0_1) dtmp0 = cmul0 * x0;
        sra     %o2,31,%l7              ! (0_0) ldiff0 >>= 31;
        sub     %i3,%i1,%l6             ! (0_0) addrc0 = (char*)px - (char*)py;
        faddd   %f38,K1,%f38            ! (1_1) dtmp0 += K1;

        faddd   %f40,K8,%f40            ! (4_1) dtmp0 += K8;
        and     %l6,%l7,%o2             ! (0_0) addrc0 &= ldiff0;
        fmuld   %f20,%f24,%f20          ! (3_1) dtmp0 *= x20;

        lda     [%i1+%o2]0x82,%f0       ! (0_0) fy0 = *(float*)((char*)py + addr
        sll     %g1,3,%g1               ! (1_1) cmul0_ind = ldiff0 << 3;
        sub     %i3,%o2,%o4             ! (0_0) (char*)px - addrc0
        faddd   %f22,K3,%f22            ! (2_1) dtmp0 += K3;

        lda     [%o4]0x82,%f2           ! (0_0) fx0 = *(float*)((char*)px - addr
        sll     %l7,5,%l6               ! (0_0) ltmp0 = ldiff0 << 5;

        fmuld   %f38,%f18,%f38          ! (1_1) dtmp0 *= x20;
        cmp     %o5,_0x7f800000         ! (0_0) b0 ? 0x7f800000
        bge,pn  %icc,.update5           ! (0_0) if ( b0 > 0x7f800000 )
        faddd   %f34,%f12,%f18          ! (0_1) dtmp0 = cadd0 + dtmp0;
.cont5:
        fmuld   %f40,%f4,%f34           ! (4_1) dtmp0 *= x20;
        sra     %l3,27,%o5              ! (0_0) signx0 = ux0 >> 27;
        add     %i3,stridex,%i3         ! px += stridex
        fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

        faddd   %f20,K5,%f12            ! (3_1) dtmp0 += K5;
        add     %i1,stridey,%i1         ! py += stridey
        fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;

        lda     [%i1]0x82,%l3           ! (1_0) uy0 = *(int*)py;
        sra     %l4,28,%o4              ! (0_0) signy0 = uy0 >> 28;
        add     %l6,cadd_arr,%l6        ! (0_0) ltmp0 += (char*)cadd_arr;
        fstod   %f2,%f2                 ! (0_0) x0 = (double)fx0;
.d5:
        lda     [%i3]0x82,%l4           ! (1_0) ux0 = *(int*)px;
        and     %o5,-16,%o5             ! (0_0) signx0 &= -16;
        faddd   %f34,K7,%f34            ! (4_1) dtmp0 += K7;

        ldx     [%fp+tmp_pz],%o1
        fmuld   %f12,%f24,%f20          ! (3_1) dtmp0 *= x20;
        and     %o4,-8,%o4              ! (0_0) signy0 &= -8;
        faddd   %f38,K0,%f38            ! (1_1) dtmp0 += K0;

        fdivd   %f40,%f2,%f12           ! (0_0) x0 = y0 / x0;
        faddd   %f22,K2,%f40            ! (2_1) dtmp0 += K2;

        fdtos   %f18,%f2                ! (0_1) ftmp0 = (float)dtmp0;
        st      %f2,[%o1]               ! (0_1) *pz = ftmp0
```



```
        add     %o1,stridez,%o2
        fmuld   %f14,%f14,%f22          ! (5_1) x20 = x0 * x0;

        subcc   counter,1,counter
        bneg,a,pn       %icc,.begin
        or      %g0,%o2,%o4

        ldd     [cmul_arr+%g1],%f0      ! (1_1) cmul0 = *(double*)((char*)cmul_a
        add     %l6,%o5,%o1             ! (0_0) ltmp0 += signx0;
        fmuld   %f34,%f4,%f34           ! (4_1) dtmp0 *= x20;

        fmuld   %f38,%f10,%f10          ! (1_1) x0 = dtmp0 * x0;
        and     %l4,_0x7fffffff,%l6     ! (1_0) ax0 = ux0 & 0x7fffffff;
        sethi   %hi(0x00800000),%o5
        faddd   %f20,K4,%f20            ! (3_1) dtmp0 += K4;

        and     %l3,_0x7fffffff,%g1     ! (1_0) ay0 = uy0 & 0x7fffffff;
        cmp     %l6,%o5
        bl,pn   %icc,.u24
        fmuld   %f40,%f16,%f38          ! (2_1) dtmp0 *= x20;
.c24:
        cmp     %g1,%o5
        bl,pn   %icc,.u25
        fmuld   K9,%f22,%f40            ! (5_1) dtmp0 = K9 * x20;
.c25:
        cmp     %l6,_0x7f800000
        bge,pn  %icc,.u26
        faddd   %f34,K6,%f18            ! (4_1) dtmp0 += K6;
.c26:
        ldd     [%o1+%o4],%f34          ! (0_0) cadd0 = *(double*)(ltmp0 + signy
        cmp     %g1,_0x7f800000
        bge,pn  %icc,.u27
        fmuld   %f20,%f24,%f20          ! (3_1) dtmp0 *= x20;
.c27:
        sub     %l6,%g1,%o1             ! (1_0) ldiff0 = ax0 - ay0;

        fmuld   %f0,%f10,%f10           ! (1_1) dtmp0 = cmul0 * x0;
        sra     %o1,31,%g1              ! (1_0) ldiff0 >>= 31;
        sub     %i3,%i1,%l6             ! (1_0) addrc0 = (char*)px - (char*)py;
        faddd   %f38,K1,%f38            ! (2_1) dtmp0 += K1;

        faddd   %f40,K8,%f40            ! (5_1) dtmp0 += K8;
        and     %l6,%g1,%o1             ! (1_0) addrc0 &= ldiff0;
        fmuld   %f18,%f4,%f18           ! (4_1) dtmp0 *= x20;

        lda     [%i1+%o1]0x82,%f0       ! (1_0) fy0 = *(float*)((char*)py + addr
        sll     %g5,3,%g5               ! (2_1) cmul0_ind = ldiff0 << 3;
        sub     %i3,%o1,%o4             ! (1_0) (char*)px - addrc0;
        faddd   %f20,K3,%f20            ! (3_1) dtmp0 += K3;

        lda     [%o4]0x82,%f2           ! (1_0) fx0 = *(float*)((char*)px - addr
        sll     %g1,5,%l6               ! (1_0) ltmp0 = ldiff0 << 5;
        add     %o2,stridez,%o1         ! pz += stridez

        fmuld   %f38,%f16,%f38          ! (2_1) dtmp0 *= x20;
        cmp     %o5,_0x7f800000         ! (1_0) b0 ? 0x7f800000
        bge,pn  %icc,.update6           ! (1_0) if ( b0 > 0x7f800000 )
        faddd   %f32,%f10,%f16          ! (1_1) dtmp0 = cadd0 + dtmp0;
.cont6:
        fmuld   %f40,%f22,%f32          ! (5_1) dtmp0 *= x20;
        add     %i1,stridey,%i1         ! py += stridey
        fstod   %f0,%f40                ! (1_0) y0 = (double)fy0;

        faddd   %f18,K5,%f10            ! (4_1) dtmp0 += K5;
        sra     %l4,27,%o5              ! (1_0) signx0 = ux0 >> 27;
        add     %i3,stridex,%i3         ! px += stridex
```

```
788         fmuld   %f20,%f24,%f20          ! (3_1) dtmp0 *= x20;

790         sra     %l3,28,%o4              ! (1_0) signy0 = uy0 >> 28;
791         add     %l6,cadd_arr,%l6        ! (1_0) ltmp0 += (char*)cadd_arr;
792         fstod   %f2,%f2                 ! (1_0) x0 = (double)fx0;
793 .d6:
794         faddd   %f32,K7,%f32            ! (5_1) dtmp0 += K7;
795         and     %o5,-16,%o5             ! (1_0) signx0 &= -16;
796         and     %o4,-8,%o4              ! (1_0) signy0 &= -8;

798         lda     [%i1]0x82,%l4           ! (2_0) uy0 = *(int*)py;
799         fmuld   %f10,%f4,%f18           ! (4_1) dtmp0 *= x20;
800         faddd   %f38,K0,%f38            ! (2_1) dtmp0 += K0;

802         lda     [%i3]0x82,%l3           ! (2_0) ux0 = *(int*)px;
803         fdivd   %f40,%f2,%f10           ! (1_0) x0 = y0 / x0;
804         faddd   %f20,K2,%f40            ! (3_1) dtmp0 += K2;

806         fmuld   %f12,%f12,%f20          ! (0_0) x20 = x0 * x0;
807         fdtos   %f16,%f2                ! (1_1) ftmp0 = (float)dtmp0;
808         st      %f2,[%o2]               ! (1_1) *pz = ftmp0;

810         subcc   counter,1,counter
811         bneg,a,pn       %icc,.begin
812         or      %g0,%o1,%o4

814         ldd     [cmul_arr+%g5],%f0      ! (2_1) cmul0 = *(double*)((char*)cmul_a
815         add     %l6,%o5,%o2             ! (1_0) ltmp0 += signx0;
816         fmuld   %f32,%f22,%f32          ! (5_1) dtmp0 *= x20;

818         fmuld   %f38,%f8,%f8            ! (2_1) x0 = dtmp0 * x0;
819         and     %l3,_0x7fffffff,%l6     ! (2_0) ax0 = ux0 & 0x7fffffff;
820         sethi   %hi(0x00800000),%o5
821         faddd   %f18,K4,%f18            ! (4_1) dtmp0 += K4;

823         and     %l4,_0x7fffffff,%g5     ! (2_0) ay0 = uy0 & 0x7fffffff;
824         cmp     %l6,%o5
825         bl,pn   %icc,.u28
826         fmuld   %f40,%f24,%f38          ! (3_1) dtmp0 *= x20;
827 .c28:
828         cmp     %g5,%o5
829         bl,pn   %icc,.u29
830         fmuld   K9,%f20,%f40            ! (0_0) dtmp0 = K9 * x20;
831 .c29:
832         cmp     %l6,_0x7f800000
833         bge,pn  %icc,.u30
834         faddd   %f32,K6,%f16            ! (5_1) dtmp0 += K6;
835 .c30:
836         ldd     [%o2+%o4],%f32          ! (1_0) cadd0 = *(double*)(ltmp0 + signy
837         cmp     %g5,_0x7f800000
838         bge,pn  %icc,.u31
839         fmuld   %f18,%f4,%f18           ! (4_1) dtmp0 *= x20;
840 .c31:
841         sub     %l6,%g5,%o2             ! (2_0) ldiff0 = ax0 - ay0;

843         fmuld   %f0,%f8,%f8             ! (2_1) dtmp0 = cmul0 * x0;
844         sra     %o2,31,%g5              ! (2_0) ldiff0 >>= 31;
845         sub     %i3,%i1,%l6             ! (2_0) addrc0 = (char*)px - (char*)py;
846         faddd   %f38,K1,%f38            ! (3_1) dtmp0 += K1;

848         faddd   %f40,K8,%f40            ! (0_0) dtmp0 += K8;
849         and     %l6,%g5,%o2             ! (2_0) addrc0 &= ldiff0;
850         fmuld   %f16,%f22,%f16          ! (5_1) dtmp0 *= x20;

852         lda     [%i1+%o2]0x82,%f0       ! (2_0) fy0 = *(float*)((char*)py + addr
853         sub     %i3,%o2,%o4             ! (2_0) (char*)px - addrc0;
```



```
854         add     %o1,stridez,%o2         ! pz += stridez
855         faddd   %f18,K3,%f18            ! (4_1) dtmp0 += K3;

857         lda     [%o4]0x82,%f2           ! (2_0) fx0 = *(float*)((char*)px - addr
858         sll     %o0,3,%o0               ! (3_1) cmul0_ind = ldiff0 << 3;

860         fmuld   %f38,%f24,%f38          ! (3_1) dtmp0 *= x20;
861         cmp     %o5,_0x7f800000         ! (2_0) b0 ? 0x7f800000
862         bge,pn  %icc,.update7           ! (2_0) if ( b0 > 0x7f800000 )
863         faddd   %f30,%f8,%f24           ! (2_1) dtmp0 = cadd0 + dtmp0;
864 .cont7:
865         fmuld   %f40,%f20,%f30          ! (0_0) dtmp0 *= x20;
866         sll     %g5,5,%l6               ! (2_0) ltmp0 = ldiff0 << 5;
867         add     %i1,stridey,%i1         ! py += stridey
868         fstod   %f0,%f40                ! (2_0) y0 = (double)fy0;

870         faddd   %f16,K5,%f8             ! (5_1) dtmp0 += K5;
871         sra     %l3,27,%o5              ! (2_0) signx0 = ux0 >> 27;
872         add     %i3,stridex,%i3         ! px += stridex
873         fmuld   %f18,%f4,%f18           ! (4_1) dtmp0 *= x20;

875         fstod   %f2,%f2                 ! (2_0) x0 = (double)fx0;
876         sra     %l4,28,%o4              ! (2_0) signy0 = uy0 >> 28;
877         add     %l6,cadd_arr,%l6        ! (2_0) ltmp0 += (char*)cadd_arr;
878 .d7:
879         lda     [%i1]0x82,%l3           ! (3_0) uy0 = *(int*)py;
880         and     %o5,-16,%o5             ! (2_0) signx0 &= -16;
881         faddd   %f30,K7,%f30            ! (0_0) dtmp0 += K7;

883         lda     [%i3]0x82,%l4           ! (3_0) ux0 = *(int*)px;
884         fmuld   %f8,%f22,%f16           ! (5_1) dtmp0 *= x20;
885         faddd   %f38,K0,%f38            ! (3_1) dtmp0 += K0;

887         fdivd   %f40,%f2,%f8            ! (2_0) x0 = y0 / x0;
888         faddd   %f18,K2,%f40            ! (4_1) dtmp0 += K2;

890         fmuld   %f10,%f10,%f18          ! (1_0) x20 = x0 * x0;
891         fdtos   %f24,%f1                ! (2_1) ftmp0 = (float)dtmp0;
892         st      %f1,[%o1]               ! (2_1) *pz = ftmp0;

894         subcc   counter,1,counter
895         bneg,a,pn       %icc,.begin
896         or      %g0,%o2,%o4

898         ldd     [cmul_arr+%o0],%f2      ! (3_1) cmul0 = *(double*)((char*)cmul_a
899         add     %l6,%o5,%o1             ! (2_0) ltmp0 += signx0;
900         and     %o4,-8,%o4              ! (2_0) signy0 &= -8;
901         fmuld   %f30,%f20,%f30          ! (0_0) dtmp0 *= x20;

903         fmuld   %f38,%f6,%f6            ! (3_1) x0 = dtmp0 * x0;
904         and     %l4,_0x7fffffff,%l6     ! (3_0) ax0 = ux0 & 0x7fffffff;
905         sethi   %hi(0x00800000),%o5
906         faddd   %f16,K4,%f24            ! (5_1) dtmp0 += K4;

908         and     %l3,_0x7fffffff,%o0     ! (3_0) ay0 = uy0 & 0x7fffffff;
909         cmp     %l6,%o5
910         bl,pn   %icc,.u32
911         fmuld   %f40,%f4,%f38           ! (4_1) dtmp0 *= x20;
912 .c32:
913         cmp     %o0,%o5
914         bl,pn   %icc,.u33
915         fmuld   K9,%f18,%f40            ! (1_0) dtmp0 = K9 * x20;
916 .c33:
917         cmp     %l6,_0x7f800000
918         bge,pn  %icc,.u34
919         faddd   %f30,K6,%f16            ! (0_0) dtmp0 += K6;
```

```
.c34:
        ldd     [%o1+%o4],%f30          ! (2_0) cadd0 = *(double*)(ltmp0 + signy
        cmp     %o0,_0x7f800000
        bge,pn  %icc,.u35
        fmuld   %f24,%f22,%f24          ! (5_1) dtmp0 *= x20;
.c35:
        sub     %l6,%o0,%o1             ! (3_0) ldiff0 = ax0 - ay0;

        fmuld   %f2,%f6,%f6             ! (3_1) dtmp0 = cmul0 * x0;
        sra     %o1,31,%o0              ! (3_0) ldiff0 >>= 31;
        sub     %i3,%i1,%l6             ! (3_0) addrc0 = (char*)px - (char*)py;
        faddd   %f38,K1,%f38            ! (4_1) dtmp0 += K1;

        faddd   %f40,K8,%f40            ! (1_0) dtmp0 += K8;
        and     %l6,%o0,%o1             ! (3_0) addrc0 &= ldiff0;
        fmuld   %f16,%f20,%f16          ! (0_0) dtmp0 *= x20;

        lda     [%i1+%o1]0x82,%f0       ! (3_0) fy0 = *(float*)((char*)py + addr
        sub     %i3,%o1,%o4             ! (3_0) (char*)px - addrc0;
        add     %o2,stridez,%o1         ! pz += stridez
        faddd   %f24,K3,%f24            ! (5_1) dtmp0 += K3;

        lda     [%o4]0x82,%f1           ! (3_0) fx0 = *(float*)((char*)px - addr
        sll     %l5,3,%l5               ! (4_1) cmul0_ind = ldiff0 << 3;

        fmuld   %f38,%f4,%f38           ! (4_1) dtmp0 *= x20;
        cmp     %o5,_0x7f800000         ! (3_0) b0 ? 0x7f800000
        bge,pn  %icc,.update8           ! (3_0) if ( b0 > 0x7f800000 )
        faddd   %f28,%f6,%f4            ! (3_1) dtmp0 = cadd0 + dtmp0;
.cont8:
        fmuld   %f40,%f18,%f28          ! (1_0) dtmp0 *= x20;
        sll     %o0,5,%l6               ! (3_0) ltmp0 = ldiff0 << 5;
        add     %i1,stridey,%i1         ! py += stridey
        fstod   %f0,%f40                ! (3_0) y0 = (double)fy0;

        faddd   %f16,K5,%f2             ! (0_0) dtmp0 += K5;
        sra     %l4,27,%o5              ! (3_0) signx0 = ux0 >> 27;
        add     %i3,stridex,%i3         ! px += stridex
        fmuld   %f24,%f22,%f24          ! (5_1) dtmp0 *= x20;

        sra     %l3,28,%o4              ! (3_0) signy0 = uy0 >> 28;
        fstod   %f1,%f16                ! (3_0) x0 = (double)fx0;
.d8:
        faddd   %f28,K7,%f28            ! (1_0) dtmp0 += K7;
        add     %l6,cadd_arr,%l6        ! (3_0) ltmp0 += (char*)cadd_arr;
        and     %o5,-16,%o5             ! (3_0) signx0 &= -16;

        lda     [%i1]0x82,%l4           ! (4_0) uy0 = *(int*)py;
        fmuld   %f2,%f20,%f2            ! (0_0) dtmp0 *= x20;
        faddd   %f38,K0,%f38            ! (4_1) dtmp0 += K0;

        lda     [%i3]0x82,%l3           ! (4_0) ux0 = *(int*)px;
        fdivd   %f40,%f16,%f6           ! (3_0) x0 = y0 / x0;
        faddd   %f24,K2,%f24            ! (5_1) dtmp0 += K2;

        fdtos   %f4,%f1                 ! (3_1) ftmp0 = (float)dtmp0;
        and     %o4,-8,%o4              ! (3_0) signy0 &= -8;
        st      %f1,[%o2]               ! (3_1) *pz = ftmp0;
        fmuld   %f8,%f8,%f16            ! (2_0) x20 = x0 * x0;

        subcc   counter,1,counter
        bneg,a,pn       %icc,.begin
        or      %g0,%o1,%o4

        ldd     [cmul_arr+%l5],%f0      ! (4_1) cmul0 = *(double*)((char*)cmul_a
        add     %l6,%o5,%o2             ! (3_0) ltmp0 += signx0;
```



```
        fmuld   %f28,%f18,%f28          ! (1_0) dtmp0 *= x20;

        fmuld   %f38,%f62,%f62          ! (4_1) x0 = dtmp0 * x0;
        and     %l3,_0x7fffffff,%l6     ! (4_0) ax0 = ux0 & 0x7fffffff;
        sethi   %hi(0x00800000),%o5
        faddd   %f2,K4,%f2              ! (0_0) dtmp0 += K4;

        and     %l4,_0x7fffffff,%l5     ! (4_0) ay0 = uy0 & 0x7fffffff;
        cmp     %l6,%o5
        bl,pn   %icc,.u36
        fmuld   %f24,%f22,%f38          ! (5_1) dtmp0 *= x20;
.c36:
        cmp     %l5,%o5
        bl,pn   %icc,.u37
        fmuld   K9,%f16,%f40            ! (2_0) dtmp0 = K9 * x20;
.c37:
        cmp     %l6,_0x7f800000
        bge,pn  %icc,.u38
        faddd   %f28,K6,%f4             ! (1_0) dtmp0 += K6;
.c38:
        ldd     [%o2+%o4],%f28          ! (3_0) cadd0 = *(double*)(ltmp0 + signy
        cmp     %l5,_0x7f800000
        bge,pn  %icc,.u39
        fmuld   %f2,%f20,%f24           ! (0_0) dtmp0 *= x20;
.c39:
        sub     %l6,%l5,%o2             ! (4_0) ldiff0 = ax0 - ay0;

        fmuld   %f0,%f62,%f62           ! (4_1) dtmp0 = cmul0 * x0;
        sra     %o2,31,%l5              ! (4_0) ldiff0 >>= 31;
        sub     %i3,%i1,%l6             ! (4_0) addrc0 = (char*)px - (char*)py;
        faddd   %f38,K1,%f38            ! (5_1) dtmp0 += K1;

        faddd   %f40,K8,%f40            ! (2_0) dtmp0 += K8;
        and     %l6,%l5,%o2             ! (4_0) addrc0 &= ldiff0;
        fmuld   %f4,%f18,%f4            ! (1_0) dtmp0 *= x20;

        lda     [%i1+%o2]0x82,%f0       ! (4_0) fy0 = *(float*)((char*)py + addr
        sub     %i3,%o2,%o4             ! (4_0) (char*)px - addrc0;
        add     %o1,stridez,%o2         ! pz += stridez
        faddd   %f24,K3,%f24            ! (0_0) dtmp0 += K3;

        lda     [%o4]0x82,%f2           ! (4_0) fx0 = *(float*)((char*)px - addr
        sll     %o7,3,%o7               ! (5_1) cmul0_ind = ldiff0 << 3;

        fmuld   %f38,%f22,%f38          ! (5_1) dtmp0 *= x20;
        cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
        bge,pn  %icc,.update9           ! (4_0) if ( b0 > 0x7f800000 )
        faddd   %f26,%f62,%f22          ! (4_1) dtmp0 = cadd0 + dtmp0;
.cont9:
        fmuld   %f40,%f16,%f26          ! (2_0) dtmp0 *= x20;
        sll     %l5,5,%l6               ! (4_0) ltmp0 = ldiff0 << 5;
        add     %i1,stridey,%i1         ! py += stridey
        fstod   %f0,%f40                ! (4_0) y0 = (double)fy0;

        faddd   %f4,K5,%f62             ! (1_0) dtmp0 += K5;
        sra     %l3,27,%o5              ! (4_0) signx0 = ux0 >> 27;
        add     %i3,stridex,%i3         ! px += stridex
        fmuld   %f24,%f20,%f24          ! (0_0) dtmp0 *= x20;

        fstod   %f2,%f2                 ! (4_0) x0 = (double)fx0;
        sra     %l4,28,%o4              ! (4_0) signy0 = uy0 >> 28;
.d9:
        lda     [%i1]0x82,%l3           ! (5_0) uy0 = *(int*)py;
        add     %l6,cadd_arr,%l6        ! (4_0) ltmp0 += (char*)cadd_arr;
        faddd   %f26,K7,%f26            ! (2_0) dtmp0 += K7;
```

```
1052         fmuld   %f62,%f18,%f4           ! (1_0) dtmp0 *= x20;
1053         and     %o5,-16,%o5             ! (4_0) signx0 &= -16;
1054         faddd   %f38,K0,%f38            ! (5_1) dtmp0 += K0;

1056         subcc   counter,5,counter
1057         bneg,pn %icc,.tail
1058         nop

1060         ba      .main_loop
1061         nop

1063         .align  16
1064 .main_loop:
1065         lda     [%i3]0x82,%l4           ! (5_1) ux0 = *(int*)px;
1066         nop
1067         fdivd   %f40,%f2,%f62           ! (4_1) x0 = y0 / x0;
1068         faddd   %f24,K2,%f40            ! (0_1) dtmp0 += K2;

1070         fdtos   %f22,%f22               ! (4_2) ftmp0 = (float)dtmp0;
1071         and     %o4,-8,%o4              ! (4_1) signy0 &= -8;
1072         st      %f22,[%o1]              ! (4_2) *pz = ftmp0;
1073         fmuld   %f6,%f6,%f24            ! (3_1) x20 = x0 * x0;

1075         ldd     [cmul_arr+%o7],%f0      ! (5_2) cmul0 = *(double*)((char*)cmul_a
1076         add     %l6,%o5,%o1             ! (4_1) ltmp0 += signx0;
1077         fmuld   %f26,%f16,%f26          ! (2_1) dtmp0 *= x20;

1079         fmuld   %f38,%f14,%f14          ! (5_2) x0 = dtmp0 * x0;
1080         and     %l4,_0x7fffffff,%l6     ! (5_1) ax0 = ux0 & 0x7fffffff;
1081         sethi   %hi(0x00800000),%o5
1082         faddd   %f4,K4,%f4              ! (1_1) dtmp0 += K4;

1084         and     %l3,_0x7fffffff,%o7     ! (5_1) ay0 = uy0 & 0x7fffffff;
1085         fmuld   %f40,%f20,%f38          ! (0_1) dtmp0 *= x20;

1087         cmp     %l6,%o5
1088         bl,pn   %icc,.up0
1089         fmuld   K9,%f24,%f40            ! (3_1) dtmp0 = K9 * x20;
1090 .co0:
1091         nop
1092         cmp     %o7,%o5
1093         bl,pn   %icc,.up1
1094         faddd   %f26,K6,%f22            ! (2_1) dtmp0 += K6;
1095 .co1:
1096         ldd     [%o1+%o4],%f26          ! (4_1) cadd0 = *(double*)(ltmp0 + signy
1097         cmp     %l6,_0x7f800000
1098         bge,pn  %icc,.up2
1099         fmuld   %f4,%f18,%f4            ! (1_1) dtmp0 *= x20;
1100 .co2:
1101         sub     %l6,%o7,%o1             ! (5_1) ldiff0 = ax0 - ay0;
1102         cmp     %o7,_0x7f800000
1103         bge,pn  %icc,.up3

1105         fmuld   %f0,%f14,%f14           ! (5_2) dtmp0 = cmul0 * x0;
1106 .co3:
1107         sra     %o1,31,%o7              ! (5_1) ldiff0 >>= 31;
1108         sub     %i3,%i1,%l6             ! (5_1) addrc0 = (char*)px - (char*)py;
1109         faddd   %f38,K1,%f38            ! (0_1) dtmp0 += K1;

1111         faddd   %f40,K8,%f40            ! (3_1) dtmp0 += K8;
1112         and     %l6,%o7,%o1             ! (5_1) addrc0 &= ldiff0;
1113         fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;

1115         lda     [%i1+%o1]0x82,%f0       ! (5_1) fy0 = *(float*)((char*)py + addr
1116         sll     %o7,5,%l6               ! (5_1) ltmp0 = ldiff0 << 5;
1117         sub     %i3,%o1,%o4             ! (5_1) (char*)px - addrc0;
```



```
1118         faddd   %f4,K3,%f4              ! (1_1) dtmp0 += K3;

1120         lda     [%o4]0x82,%f2           ! (5_1) fx0 = *(float*)((char*)px - addr

1122         fmuld   %f38,%f20,%f38          ! (0_1) dtmp0 *= x20;
1123         cmp     %o5,_0x7f800000         ! (5_1) b0 ? 0x7f800000
1124         bge,pn  %icc,.update10          ! (5_1) if ( b0 > 0x7f800000 )
1125         faddd   %f36,%f14,%f20          ! (5_2) dtmp0 = cadd0 + dtmp0;
1126 .cont10:
1127         fmuld   %f40,%f24,%f36          ! (3_1) dtmp0 *= x20;
1128         nop
1129         fstod   %f0,%f40                ! (5_1) y0 = (double)fy0;

1131         faddd   %f22,K5,%f14            ! (2_1) dtmp0 += K5;
1132         add     %o2,stridez,%o1         ! pz += stridez
1133         fmuld   %f4,%f18,%f4            ! (1_1) dtmp0 *= x20;

1135         sll     %l7,3,%l7               ! (0_1) cmul0_ind = ldiff0 << 3;
1136         add     %i3,stridex,%i3         ! px += stridex
1137         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;
1138 .den0:
1139         sra     %l3,28,%o4              ! (5_1) signy0 = uy0 >> 28;
1140         add     %i1,stridey,%i1         ! py += stridey

1142         faddd   %f36,K7,%f36            ! (3_1) dtmp0 += K7;
1143         sra     %l4,27,%o5              ! (5_1) signx0 = ux0 >> 27;

1145         lda     [%i1]0x82,%l4           ! (0_0) uy0 = *(int*)py;
1146         add     %l6,cadd_arr,%l6        ! (5_1) ltmp0 += (char*)cadd_arr;
1147         fmuld   %f14,%f16,%f22          ! (2_1) dtmp0 *= x20;
1148         faddd   %f38,K0,%f38            ! (0_1) dtmp0 += K0;

1150         lda     [%i3]0x82,%l3           ! (0_0) ux0 = *(int*)px;
1151         and     %o5,-16,%o5             ! (5_1) signx0 &= -16;
1152         fdivd   %f40,%f2,%f14           ! (5_1) x0 = y0 / x0;
1153         faddd   %f4,K2,%f40             ! (1_1) dtmp0 += K2;

1155         fdtos   %f20,%f2                ! (5_2) ftmp0 = (float)dtmp0;
1156         st      %f2,[%o2]               ! (5_2) *pz = ftmp0;
1157         fmuld   %f62,%f62,%f4           ! (4_1) x20 = x0 * x0;

1159         ldd     [cmul_arr+%l7],%f0      ! (0_1) cmul0 = *(double*)((char*)cmul_a
1160         add     %l6,%o5,%o2             ! (5_1) ltmp0 += signx0;
1161         and     %o4,-8,%o4              ! (5_1) signy0 &= -8;
1162         fmuld   %f36,%f24,%f36          ! (3_1) dtmp0 *= x20;

1164         fmuld   %f38,%f12,%f12          ! (0_1) x0 = dtmp0 * x0;
1165         and     %l4,_0x7fffffff,%l7     ! (0_0) ay0 = uy0 & 0x7fffffff;
1166         sethi   %hi(0x00800000),%o5
1167         faddd   %f22,K4,%f22            ! (2_1) dtmp0 += K4;

1169         and     %l3,_0x7fffffff,%l6     ! (0_0) ax0 = ux0 & 0x7fffffff;
1170         fmuld   %f40,%f18,%f38          ! (1_1) dtmp0 *= x20;

1172         cmp     %l7,%o5
1173         bl,pn   %icc,.up4
1174         fmuld   K9,%f4,%f40             ! (4_1) dtmp0 = K9 * x20;
1175 .co4:
1176         nop
1177         cmp     %l6,%o5
1178         bl,pn   %icc,.up5
1179         faddd   %f36,K6,%f20            ! (3_1) dtmp0 += K6;
1180 .co5:
1181         ldd     [%o2+%o4],%f36          ! (5_1) cadd0 = *(double*)(ltmp0 + signy
1182         cmp     %l7,_0x7f800000
1183         bge,pn  %icc,.up6
```

```
1184         fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;
1185 .co6:
1186         sub     %l6,%l7,%o2             ! (0_0) ldiff0 = ax0 - ay0;
1187         cmp     %l6,_0x7f800000
1188         bge,pn  %icc,.up7

1190         fmuld   %f0,%f12,%f12           ! (0_1) dtmp0 = cmul0 * x0;
1191 .co7:
1192         sra     %o2,31,%l7              ! (0_0) ldiff0 >>= 31;
1193         sub     %i3,%i1,%l6             ! (0_0) addrc0 = (char*)px - (char*)py;
1194         faddd   %f38,K1,%f38            ! (1_1) dtmp0 += K1;

1196         faddd   %f40,K8,%f40            ! (4_1) dtmp0 += K8;
1197         and     %l6,%l7,%o2             ! (0_0) addrc0 &= ldiff0;
1198         fmuld   %f20,%f24,%f20          ! (3_1) dtmp0 *= x20;

1200         lda     [%i1+%o2]0x82,%f0       ! (0_0) fy0 = *(float*)((char*)py + addr
1201         sll     %g1,3,%g1               ! (1_1) cmul0_ind = ldiff0 << 3;
1202         sub     %i3,%o2,%o4             ! (0_0) (char*)px - addrc0
1203         faddd   %f22,K3,%f22            ! (2_1) dtmp0 += K3;

1205         lda     [%o4]0x82,%f2           ! (0_0) fx0 = *(float*)((char*)px - addr
1206         sll     %l7,5,%l6               ! (0_0) ltmp0 = ldiff0 << 5;
1207         add     %o1,stridez,%o2         ! pz += stridez

1209         fmuld   %f38,%f18,%f38          ! (1_1) dtmp0 *= x20;
1210         cmp     %o5,_0x7f800000         ! (0_0) b0 ? 0x7f800000
1211         bge,pn  %icc,.update11          ! (0_0) if ( b0 > 0x7f800000 )
1212         faddd   %f34,%f12,%f18          ! (0_1) dtmp0 = cadd0 + dtmp0;
1213 .cont11:
1214         fmuld   %f40,%f4,%f34           ! (4_1) dtmp0 *= x20;
1215         sra     %l3,27,%o5              ! (0_0) signx0 = ux0 >> 27;
1216         add     %i3,stridex,%i3         ! px += stridex
1217         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

1219         faddd   %f20,K5,%f12            ! (3_1) dtmp0 += K5;
1220         add     %i1,stridey,%i1         ! py += stridey
1221         fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;

1223         lda     [%i1]0x82,%l3           ! (1_0) uy0 = *(int*)py;
1224         sra     %l4,28,%o4              ! (0_0) signy0 = uy0 >> 28;
1225         add     %l6,cadd_arr,%l6        ! (0_0) ltmp0 += (char*)cadd_arr;
1226         fstod   %f2,%f2                 ! (0_0) x0 = (double)fx0;
1227 .den1:
1228         lda     [%i3]0x82,%l4           ! (1_0) ux0 = *(int*)px;
1229         and     %o5,-16,%o5             ! (0_0) signx0 &= -16;
1230         faddd   %f34,K7,%f34            ! (4_1) dtmp0 += K7;

1232         fmuld   %f12,%f24,%f20          ! (3_1) dtmp0 *= x20;
1233         and     %o4,-8,%o4              ! (0_0) signy0 &= -8;
1234         faddd   %f38,K0,%f38            ! (1_1) dtmp0 += K0;

1236         fdivd   %f40,%f2,%f12           ! (0_0) x0 = y0 / x0;
1237         faddd   %f22,K2,%f40            ! (2_1) dtmp0 += K2;

1239         fdtos   %f18,%f2                ! (0_1) ftmp0 = (float)dtmp0;
1240         nop
1241         st      %f2,[%o1]               ! (0_1) *pz = ftmp0
1242         fmuld   %f14,%f14,%f22          ! (5_1) x20 = x0 * x0;

1244         ldd     [cmul_arr+%g1],%f0      ! (1_1) cmul0 = *(double*)((char*)cmul_a
1245         add     %l6,%o5,%o1             ! (0_0) ltmp0 += signx0;
1246         fmuld   %f34,%f4,%f34           ! (4_1) dtmp0 *= x20;

1248         fmuld   %f38,%f10,%f10          ! (1_1) x0 = dtmp0 * x0;
1249         and     %l4,_0x7fffffff,%l6     ! (1_0) ax0 = ux0 & 0x7fffffff;
```



```
1250         sethi   %hi(0x00800000),%o5
1251         faddd   %f20,K4,%f20            ! (3_1) dtmp0 += K4;

1253         and     %l3,_0x7fffffff,%g1     ! (1_0) ay0 = uy0 & 0x7fffffff;
1254         fmuld   %f40,%f16,%f38          ! (2_1) dtmp0 *= x20;

1256         cmp     %l6,%o5
1257         bl,pn   %icc,.up8
1258         fmuld   K9,%f22,%f40            ! (5_1) dtmp0 = K9 * x20;
1259 .co8:
1260         nop
1261         cmp     %g1,%o5
1262         bl,pn   %icc,.up9
1263         faddd   %f34,K6,%f18            ! (4_1) dtmp0 += K6;
1264 .co9:
1265         ldd     [%o1+%o4],%f34          ! (0_0) cadd0 = *(double*)(ltmp0 + signy
1266         cmp     %l6,_0x7f800000
1267         bge,pn  %icc,.up10
1268         fmuld   %f20,%f24,%f20          ! (3_1) dtmp0 *= x20;
1269 .co10:
1270         sub     %l6,%g1,%o1             ! (1_0) ldiff0 = ax0 - ay0;
1271         cmp     %g1,_0x7f800000
1272         bge,pn  %icc,.up11

1274         fmuld   %f0,%f10,%f10           ! (1_1) dtmp0 = cmul0 * x0;
1275 .co11:
1276         sra     %o1,31,%g1              ! (1_0) ldiff0 >>= 31;
1277         sub     %i3,%i1,%l6             ! (1_0) addrc0 = (char*)px - (char*)py;
1278         faddd   %f38,K1,%f38            ! (2_1) dtmp0 += K1;

1280         faddd   %f40,K8,%f40            ! (5_1) dtmp0 += K8;
1281         and     %l6,%g1,%o1             ! (1_0) addrc0 &= ldiff0;
1282         fmuld   %f18,%f4,%f18           ! (4_1) dtmp0 *= x20;

1284         lda     [%i1+%o1]0x82,%f0       ! (1_0) fy0 = *(float*)((char*)py + addr
1285         sll     %g5,3,%g5               ! (2_1) cmul0_ind = ldiff0 << 3;
1286         sub     %i3,%o1,%o4             ! (1_0) (char*)px - addrc0;
1287         faddd   %f20,K3,%f20            ! (3_1) dtmp0 += K3;

1289         lda     [%o4]0x82,%f2           ! (1_0) fx0 = *(float*)((char*)px - addr
1290         sll     %g1,5,%l6               ! (1_0) ltmp0 = ldiff0 << 5;
1291         add     %o2,stridez,%o1         ! pz += stridez

1293         fmuld   %f38,%f16,%f38          ! (2_1) dtmp0 *= x20;
1294         cmp     %o5,_0x7f800000         ! (1_0) b0 ? 0x7f800000
1295         bge,pn  %icc,.update12          ! (1_0) if ( b0 > 0x7f800000 )
1296         faddd   %f32,%f10,%f16          ! (1_1) dtmp0 = cadd0 + dtmp0;
1297 .cont12:
1298         fmuld   %f40,%f22,%f32          ! (5_1) dtmp0 *= x20;
1299         add     %i1,stridey,%i1         ! py += stridey
1300         nop
1301         fstod   %f0,%f40                ! (1_0) y0 = (double)fy0;

1303         faddd   %f18,K5,%f10            ! (4_1) dtmp0 += K5;
1304         sra     %l4,27,%o5              ! (1_0) signx0 = ux0 >> 27;
1305         add     %i3,stridex,%i3         ! px += stridex
1306         fmuld   %f20,%f24,%f20          ! (3_1) dtmp0 *= x20;

1308         sra     %l3,28,%o4              ! (1_0) signy0 = uy0 >> 28;
1309         add     %l6,cadd_arr,%l6        ! (1_0) ltmp0 += (char*)cadd_arr;
1310         fstod   %f2,%f2                 ! (1_0) x0 = (double)fx0;
1311 .den2:
1312         faddd   %f32,K7,%f32            ! (5_1) dtmp0 += K7;
1313         and     %o5,-16,%o5             ! (1_0) signx0 &= -16;
1314         and     %o4,-8,%o4              ! (1_0) signy0 &= -8;
```

```
1316         lda     [%i1]0x82,%l4           ! (2_0) uy0 = *(int*)py;
1317         fmuld   %f10,%f4,%f18           ! (4_1) dtmp0 *= x20;
1318         faddd   %f38,K0,%f38            ! (2_1) dtmp0 += K0;

1320         lda     [%i3]0x82,%l3           ! (2_0) ux0 = *(int*)px;
1321         fdivd   %f40,%f2,%f10           ! (1_0) x0 = y0 / x0;
1322         faddd   %f20,K2,%f40            ! (3_1) dtmp0 += K2;

1324         fdtos   %f16,%f2                ! (1_1) ftmp0 = (float)dtmp0;
1325         nop
1326         st      %f2,[%o2]               ! (1_1) *pz = ftmp0;
1327         fmuld   %f12,%f12,%f20          ! (0_0) x20 = x0 * x0;

1329         ldd     [cmul_arr+%g5],%f0      ! (2_1) cmul0 = *(double*)((char*)cmul_a
1330         add     %l6,%o5,%o2             ! (1_0) ltmp0 += signx0;
1331         fmuld   %f32,%f22,%f32          ! (5_1) dtmp0 *= x20;

1333         fmuld   %f38,%f8,%f8            ! (2_1) x0 = dtmp0 * x0;
1334         and     %l3,_0x7fffffff,%l6     ! (2_0) ax0 = ux0 & 0x7fffffff;
1335         sethi   %hi(0x00800000),%o5
1336         faddd   %f18,K4,%f18            ! (4_1) dtmp0 += K4;

1338         and     %l4,_0x7fffffff,%g5     ! (2_0) ay0 = uy0 & 0x7fffffff;
1339         fmuld   %f40,%f24,%f38          ! (3_1) dtmp0 *= x20;

1341         cmp     %l6,%o5
1342         bl,pn   %icc,.up12
1343         fmuld   K9,%f20,%f40            ! (0_0) dtmp0 = K9 * x20;
1344 .co12:
1345         nop
1346         cmp     %g5,%o5
1347         bl,pn   %icc,.up13
1348         faddd   %f32,K6,%f16            ! (5_1) dtmp0 += K6;
1349 .co13:
1350         ldd     [%o2+%o4],%f32          ! (1_0) cadd0 = *(double*)(ltmp0 + signy
1351         cmp     %l6,_0x7f800000
1352         bge,pn  %icc,.up14
1353         fmuld   %f18,%f4,%f18           ! (4_1) dtmp0 *= x20;
1354 .co14:
1355         sub     %l6,%g5,%o2             ! (2_0) ldiff0 = ax0 - ay0;
1356         cmp     %g5,_0x7f800000
1357         bge,pn  %icc,.up15

1359         fmuld   %f0,%f8,%f8             ! (2_1) dtmp0 = cmul0 * x0;
1360 .co15:
1361         sra     %o2,31,%g5              ! (2_0) ldiff0 >>= 31;
1362         sub     %i3,%i1,%l6             ! (2_0) addrc0 = (char*)px - (char*)py;
1363         faddd   %f38,K1,%f38            ! (3_1) dtmp0 += K1;

1365         faddd   %f40,K8,%f40            ! (0_0) dtmp0 += K8;
1366         and     %l6,%g5,%o2             ! (2_0) addrc0 &= ldiff0;
1367         fmuld   %f16,%f22,%f16          ! (5_1) dtmp0 *= x20;

1369         lda     [%i1+%o2]0x82,%f0       ! (2_0) fy0 = *(float*)((char*)py + addr
1370         sub     %i3,%o2,%o4             ! (2_0) (char*)px - addrc0;
1371         add     %o1,stridez,%o2         ! pz += stridez
1372         faddd   %f18,K3,%f18            ! (4_1) dtmp0 += K3;

1374         lda     [%o4]0x82,%f2           ! (2_0) fx0 = *(float*)((char*)px - addr
1375         sll     %o0,3,%o0               ! (3_1) cmul0_ind = ldiff0 << 3;
1376         add     %i3,stridex,%i3         ! px += stridex

1378         fmuld   %f38,%f24,%f38          ! (3_1) dtmp0 *= x20;
1379         cmp     %o5,_0x7f800000         ! (2_0) b0 ? 0x7f800000
1380         bge,pn  %icc,.update13          ! (2_0) if ( b0 > 0x7f800000 )
1381         faddd   %f30,%f8,%f24           ! (2_1) dtmp0 = cadd0 + dtmp0;
```



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1382 .cont13:
1383         fmuld   %f40,%f20,%f30          ! (0_0) dtmp0 *= x20;
1384         sll     %g5,5,%l6               ! (2_0) ltmp0 = ldiff0 << 5;
1385         add     %i1,stridey,%i1         ! py += stridey
1386         fstod   %f0,%f40                ! (2_0) y0 = (double)fy0;

1388         faddd   %f16,K5,%f8             ! (5_1) dtmp0 += K5;
1389         sra     %l3,27,%o5              ! (2_0) signx0 = ux0 >> 27;
1390         fmuld   %f18,%f4,%f18           ! (4_1) dtmp0 *= x20;

1392         fstod   %f2,%f2                 ! (2_0) x0 = (double)fx0;
1393         sra     %l4,28,%o4              ! (2_0) signy0 = uy0 >> 28;
1394         add     %l6,cadd_arr,%l6        ! (2_0) ltmp0 += (char*)cadd_arr;
1395 .den3:
1396         lda     [%i1]0x82,%l3           ! (3_0) uy0 = *(int*)py;
1397         and     %o5,-16,%o5             ! (2_0) signx0 &= -16;
1398         faddd   %f30,K7,%f30            ! (0_0) dtmp0 += K7;

1400         lda     [%i3]0x82,%l4           ! (3_0) ux0 = *(int*)px;
1401         fmuld   %f8,%f22,%f16           ! (5_1) dtmp0 *= x20;
1402         faddd   %f38,K0,%f38            ! (3_1) dtmp0 += K0;

1404         fdivd   %f40,%f2,%f8            ! (2_0) x0 = y0 / x0;
1405         faddd   %f18,K2,%f40            ! (4_1) dtmp0 += K2;

1407         fdtos   %f24,%f1                ! (2_1) ftmp0 = (float)dtmp0;
1408         st      %f1,[%o1]               ! (2_1) *pz = ftmp0;
1409         fmuld   %f10,%f10,%f18          ! (1_0) x20 = x0 * x0;

1411         ldd     [cmul_arr+%o0],%f2      ! (3_1) cmul0 = *(double*)((char*)cmul_a
1412         add     %l6,%o5,%o1             ! (2_0) ltmp0 += signx0;
1413         and     %o4,-8,%o4              ! (2_0) signy0 &= -8;
1414         fmuld   %f30,%f20,%f30          ! (0_0) dtmp0 *= x20;

1416         fmuld   %f38,%f6,%f6            ! (3_1) x0 = dtmp0 * x0;
1417         and     %l4,_0x7fffffff,%l6     ! (3_0) ax0 = ux0 & 0x7fffffff;
1418         sethi   %hi(0x00800000),%o5
1419         faddd   %f16,K4,%f24            ! (5_1) dtmp0 += K4;

1421         and     %l3,_0x7fffffff,%o0     ! (3_0) ay0 = uy0 & 0x7fffffff;
1422         fmuld   %f40,%f4,%f38           ! (4_1) dtmp0 *= x20;

1424         cmp     %l6,%o5
1425         bl,pn   %icc,.up16
1426         fmuld   K9,%f18,%f40            ! (1_0) dtmp0 = K9 * x20;
1427 .co16:
1428         nop
1429         cmp     %o0,%o5
1430         bl,pn   %icc,.up17
1431         faddd   %f30,K6,%f16            ! (0_0) dtmp0 += K6;
1432 .co17:
1433         ldd     [%o1+%o4],%f30          ! (2_0) cadd0 = *(double*)(ltmp0 + signy
1434         cmp     %l6,_0x7f800000
1435         bge,pn  %icc,.up18
1436         fmuld   %f24,%f22,%f24          ! (5_1) dtmp0 *= x20;
1437 .co18:
1438         sub     %l6,%o0,%o1             ! (3_0) ldiff0 = ax0 - ay0;
1439         cmp     %o0,_0x7f800000
1440         bge,pn  %icc,.up19

1442         fmuld   %f2,%f6,%f6             ! (3_1) dtmp0 = cmul0 * x0;
1443 .co19:
1444         sra     %o1,31,%o0              ! (3_0) ldiff0 >>= 31;
1445         sub     %i3,%i1,%l6             ! (3_0) addrc0 = (char*)px - (char*)py;
1446         faddd   %f38,K1,%f38            ! (4_1) dtmp0 += K1;
```

```
1448         faddd   %f40,K8,%f40            ! (1_0) dtmp0 += K8;
1449         and     %l6,%o0,%o1             ! (3_0) addrc0 &= ldiff0;
1450         fmuld   %f16,%f20,%f16          ! (0_0) dtmp0 *= x20;

1452         lda     [%i1+%o1]0x82,%f0       ! (3_0) fy0 = *(float*)((char*)py + addr
1453         sub     %i3,%o1,%o4             ! (3_0) (char*)px - addrc0;
1454         add     %o2,stridez,%o1         ! pz += stridez
1455         faddd   %f24,K3,%f24            ! (5_1) dtmp0 += K3;

1457         lda     [%o4]0x82,%f1           ! (3_0) fx0 = *(float*)((char*)px - addr
1458         sll     %l5,3,%l5               ! (4_1) cmul0_ind = ldiff0 << 3;
1459         add     %i3,stridex,%i3         ! px += stridex

1461         fmuld   %f38,%f4,%f38           ! (4_1) dtmp0 *= x20;
1462         cmp     %o5,_0x7f800000         ! (3_0) b0 ? 0x7f800000
1463         bge,pn  %icc,.update14          ! (3_0) if ( b0 > 0x7f800000 )
1464         faddd   %f28,%f6,%f4            ! (3_1) dtmp0 = cadd0 + dtmp0;
1465 .cont14:
1466         fmuld   %f40,%f18,%f28          ! (1_0) dtmp0 *= x20;
1467         sll     %o0,5,%l6               ! (3_0) ltmp0 = ldiff0 << 5;
1468         add     %i1,stridey,%i1         ! py += stridey
1469         fstod   %f0,%f40                ! (3_0) y0 = (double)fy0;

1471         faddd   %f16,K5,%f2             ! (0_0) dtmp0 += K5;
1472         sra     %l4,27,%o5              ! (3_0) signx0 = ux0 >> 27;
1473         fmuld   %f24,%f22,%f24          ! (5_1) dtmp0 *= x20;

1475         sra     %l3,28,%o4              ! (3_0) signy0 = uy0 >> 28;
1476         fstod   %f1,%f16                ! (3_0) x0 = (double)fx0;
1477 .den4:
1478         faddd   %f28,K7,%f28            ! (1_0) dtmp0 += K7;
1479         add     %l6,cadd_arr,%l6        ! (3_0) ltmp0 += (char*)cadd_arr;
1480         and     %o5,-16,%o5             ! (3_0) signx0 &= -16;

1482         lda     [%i1]0x82,%l4           ! (4_0) uy0 = *(int*)py;
1483         fmuld   %f2,%f20,%f2            ! (0_0) dtmp0 *= x20;
1484         faddd   %f38,K0,%f38            ! (4_1) dtmp0 += K0;

1486         lda     [%i3]0x82,%l3           ! (4_0) ux0 = *(int*)px;
1487         fdivd   %f40,%f16,%f6           ! (3_0) x0 = y0 / x0;
1488         faddd   %f24,K2,%f24            ! (5_1) dtmp0 += K2;

1490         fdtos   %f4,%f1                 ! (3_1) ftmp0 = (float)dtmp0;
1491         and     %o4,-8,%o4              ! (3_0) signy0 &= -8;
1492         st      %f1,[%o2]               ! (3_1) *pz = ftmp0;
1493         fmuld   %f8,%f8,%f16            ! (2_0) x20 = x0 * x0;

1495         ldd     [cmul_arr+%l5],%f0      ! (4_1) cmul0 = *(double*)((char*)cmul_a
1496         add     %l6,%o5,%o2             ! (3_0) ltmp0 += signx0;
1497         fmuld   %f28,%f18,%f28          ! (1_0) dtmp0 *= x20;

1499         fmuld   %f38,%f62,%f62          ! (4_1) x0 = dtmp0 * x0;
1500         and     %l3,_0x7fffffff,%l6     ! (4_0) ax0 = ux0 & 0x7fffffff;
1501         sethi   %hi(0x00800000),%o5
1502         faddd   %f2,K4,%f2              ! (0_0) dtmp0 += K4;

1504         and     %l4,_0x7fffffff,%l5     ! (4_0) ay0 = uy0 & 0x7fffffff;
1505         fmuld   %f24,%f22,%f38          ! (5_1) dtmp0 *= x20;

1507         cmp     %l6,%o5
1508         bl,pn   %icc,.up20
1509         fmuld   K9,%f16,%f40            ! (2_0) dtmp0 = K9 * x20;
1510 .co20:
1511         nop
1512         cmp     %l5,%o5
1513         bl,pn   %icc,.up21
```



```
1514         faddd   %f28,K6,%f4             ! (1_0) dtmp0 += K6;
1515 .co21:
1516         ldd     [%o2+%o4],%f28          ! (3_0) cadd0 = *(double*)(ltmp0 + signy
1517         cmp     %l6,_0x7f800000
1518         bge,pn  %icc,.up22
1519         fmuld   %f2,%f20,%f24           ! (0_0) dtmp0 *= x20;
1520 .co22:
1521         sub     %l6,%l5,%o2             ! (4_0) ldiff0 = ax0 - ay0;
1522         cmp     %l5,_0x7f800000
1523         bge,pn  %icc,.up23

1525         fmuld   %f0,%f62,%f62           ! (4_1) dtmp0 = cmul0 * x0;
1526 .co23:
1527         sra     %o2,31,%l5              ! (4_0) ldiff0 >>= 31;
1528         sub     %i3,%i1,%l6             ! (4_0) addrc0 = (char*)px - (char*)py;
1529         faddd   %f38,K1,%f38            ! (5_1) dtmp0 += K1;

1531         faddd   %f40,K8,%f40            ! (2_0) dtmp0 += K8;
1532         and     %l6,%l5,%o2             ! (4_0) addrc0 &= ldiff0;
1533         fmuld   %f4,%f18,%f4            ! (1_0) dtmp0 *= x20;

1535         lda     [%i1+%o2]0x82,%f0       ! (4_0) fy0 = *(float*)((char*)py + addr
1536         sub     %i3,%o2,%o4             ! (4_0) (char*)px - addrc0;
1537         add     %o1,stridez,%o2         ! pz += stridez
1538         faddd   %f24,K3,%f24            ! (0_0) dtmp0 += K3;

1540         lda     [%o4]0x82,%f2           ! (4_0) fx0 = *(float*)((char*)px - addr
1541         sll     %o7,3,%o7               ! (5_1) cmul0_ind = ldiff0 << 3;
1542         add     %i3,stridex,%i3         ! px += stridex

1544         fmuld   %f38,%f22,%f38          ! (5_1) dtmp0 *= x20;
1545         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
1546         bge,pn  %icc,.update15          ! (4_0) if ( b0 > 0x7f800000 )
1547         faddd   %f26,%f62,%f22          ! (4_1) dtmp0 = cadd0 + dtmp0;
1548 .cont15:
1549         fmuld   %f40,%f16,%f26          ! (2_0) dtmp0 *= x20;
1550         sll     %l5,5,%l6               ! (4_0) ltmp0 = ldiff0 << 5;
1551         add     %i1,stridey,%i1         ! py += stridey
1552         fstod   %f0,%f40                ! (4_0) y0 = (double)fy0;

1554         faddd   %f4,K5,%f62             ! (1_0) dtmp0 += K5;
1555         sra     %l3,27,%o5              ! (4_0) signx0 = ux0 >> 27;
1556         fmuld   %f24,%f20,%f24          ! (0_0) dtmp0 *= x20;

1558         fstod   %f2,%f2                 ! (4_0) x0 = (double)fx0;
1559         sra     %l4,28,%o4              ! (4_0) signy0 = uy0 >> 28;
1560 .den5:
1561         lda     [%i1]0x82,%l3           ! (5_0) uy0 = *(int*)py;
1562         subcc   counter,6,counter       ! counter?
1563         add     %l6,cadd_arr,%l6        ! (4_0) ltmp0 += (char*)cadd_arr;
1564         faddd   %f26,K7,%f26            ! (2_0) dtmp0 += K7;

1566         fmuld   %f62,%f18,%f4           ! (1_0) dtmp0 *= x20;
1567         and     %o5,-16,%o5             ! (4_0) signx0 &= -16;
1568         bpos,pt %icc,.main_loop
1569         faddd   %f38,K0,%f38            ! (5_1) dtmp0 += K0;

1571 .tail:
1572         addcc   counter,5,counter
1573         bneg,a,pn       %icc,.begin
1574         or      %g0,%o1,%o4

1576         faddd   %f24,K2,%f40            ! (0_1) dtmp0 += K2;

1578         fdtos   %f22,%f22               ! (4_2) ftmp0 = (float)dtmp0;
1579         st      %f22,[%o1]              ! (4_2) *pz = ftmp0;
```

```
1581         subcc   counter,1,counter
1582         bneg,a,pn       %icc,.begin
1583         or      %g0,%o2,%o4

1585         ldd     [cmul_arr+%o7],%f0      ! (5_2) cmul0 = *(double*)((char*)cmul_a
1586         fmuld   %f26,%f16,%f26          ! (2_1) dtmp0 *= x20;

1588         fmuld   %f38,%f14,%f14          ! (5_2) x0 = dtmp0 * x0;
1589         faddd   %f4,K4,%f4              ! (1_1) dtmp0 += K4;

1591         fmuld   %f40,%f20,%f38          ! (0_1) dtmp0 *= x20;


1594         faddd   %f26,K6,%f22            ! (2_1) dtmp0 += K6;

1596         fmuld   %f4,%f18,%f4            ! (1_1) dtmp0 *= x20;

1598         fmuld   %f0,%f14,%f14           ! (5_2) dtmp0 = cmul0 * x0;
1599         faddd   %f38,K1,%f38            ! (0_1) dtmp0 += K1;

1601         fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;

1603         faddd   %f4,K3,%f4              ! (1_1) dtmp0 += K3;

1605         fmuld   %f38,%f20,%f38          ! (0_1) dtmp0 *= x20;
1606         faddd   %f36,%f14,%f20          ! (5_2) dtmp0 = cadd0 + dtmp0;

1608         faddd   %f22,K5,%f14            ! (2_1) dtmp0 += K5;
1609         add     %o2,stridez,%o1         ! pz += stridez
1610         fmuld   %f4,%f18,%f4            ! (1_1) dtmp0 *= x20;

1612         sll     %l7,3,%l7               ! (0_1) cmul0_ind = ldiff0 << 3;

1614         fmuld   %f14,%f16,%f22          ! (2_1) dtmp0 *= x20;
1615         faddd   %f38,K0,%f38            ! (0_1) dtmp0 += K0;

1617         faddd   %f4,K2,%f40             ! (1_1) dtmp0 += K2;

1619         fdtos   %f20,%f2                ! (5_2) ftmp0 = (float)dtmp0;
1620         st      %f2,[%o2]               ! (5_2) *pz = ftmp0;

1622         subcc   counter,1,counter
1623         bneg,a,pn       %icc,.begin
1624         or      %g0,%o1,%o4

1626         ldd     [cmul_arr+%l7],%f0      ! (0_1) cmul0 = *(double*)((char*)cmul_a

1628         fmuld   %f38,%f12,%f12          ! (0_1) x0 = dtmp0 * x0;
1629         faddd   %f22,K4,%f22            ! (2_1) dtmp0 += K4;

1631         fmuld   %f40,%f18,%f38          ! (1_1) dtmp0 *= x20;

1633         fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;

1635         fmuld   %f0,%f12,%f12           ! (0_1) dtmp0 = cmul0 * x0;
1636         faddd   %f38,K1,%f38            ! (1_1) dtmp0 += K1;

1638         sll     %g1,3,%g1               ! (1_1) cmul0_ind = ldiff0 << 3;
1639         faddd   %f22,K3,%f22            ! (2_1) dtmp0 += K3;

1641         add     %o1,stridez,%o2         ! pz += stridez

1643         fmuld   %f38,%f18,%f38          ! (1_1) dtmp0 *= x20;
1644         faddd   %f34,%f12,%f18          ! (0_1) dtmp0 = cadd0 + dtmp0;
```



```
1646         fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;

1648         faddd   %f38,K0,%f38            ! (1_1) dtmp0 += K0;

1650         faddd   %f22,K2,%f40            ! (2_1) dtmp0 += K2;

1652         fdtos   %f18,%f2                ! (0_1) ftmp0 = (float)dtmp0;
1653         st      %f2,[%o1]               ! (0_1) *pz = ftmp0

1655         subcc   counter,1,counter
1656         bneg,a,pn       %icc,.begin
1657         or      %g0,%o2,%o4

1659         ldd     [cmul_arr+%g1],%f0      ! (1_1) cmul0 = *(double*)((char*)cmul_a

1661         fmuld   %f38,%f10,%f10          ! (1_1) x0 = dtmp0 * x0;

1663         fmuld   %f40,%f16,%f38          ! (2_1) dtmp0 *= x20;

1665         fmuld   %f0,%f10,%f10           ! (1_1) dtmp0 = cmul0 * x0;
1666         faddd   %f38,K1,%f38            ! (2_1) dtmp0 += K1;

1668         sll     %g5,3,%g5               ! (2_1) cmul0_ind = ldiff0 << 3;

1670         add     %o2,stridez,%o1         ! pz += stridez

1672         fmuld   %f38,%f16,%f38          ! (2_1) dtmp0 *= x20;
1673         faddd   %f32,%f10,%f16          ! (1_1) dtmp0 = cadd0 + dtmp0;

1675         faddd   %f38,K0,%f38            ! (2_1) dtmp0 += K0;

1677         fdtos   %f16,%f2                ! (1_1) ftmp0 = (float)dtmp0;
1678         st      %f2,[%o2]               ! (1_1) *pz = ftmp0;

1680         subcc   counter,1,counter
1681         bneg,a,pn       %icc,.begin
1682         or      %g0,%o1,%o4

1684         ldd     [cmul_arr+%g5],%f0      ! (2_1) cmul0 = *(double*)((char*)cmul_a

1686         fmuld   %f38,%f8,%f8            ! (2_1) x0 = dtmp0 * x0;

1688         fmuld   %f0,%f8,%f8             ! (2_1) dtmp0 = cmul0 * x0;

1690         add     %o1,stridez,%o2         ! pz += stridez

1692         faddd   %f30,%f8,%f24           ! (2_1) dtmp0 = cadd0 + dtmp0;

1694         fdtos   %f24,%f1                ! (2_1) ftmp0 = (float)dtmp0;
1695         st      %f1,[%o1]               ! (2_1) *pz = ftmp0;

1697         ba      .begin
1698         or      %g0,%o2,%o4

1700         .align  16
1701 .spec0:
1702         cmp     %l6,_0x7f800000         ! ax0 ? 0x7f800000
1703         bg      2f                      ! if ( ax0 >= 0x7f800000 )
1704         srl     %l3,30,%l3              ! signx0 = (unsigned)ux0 >> 30;

1706         cmp     %l7,_0x7f800000         ! ay0 ? 0x7f800000
1707         bg      2f                      ! if ( ay0 >= 0x7f800000 )
1708         and     %l3,2,%l3               ! signx0 &= 2;

1710         sra     %l4,31,%l4              ! signy0 = uy0 >> 31;
1711         bne,a   1f                      ! if (ay0 != 0x7f800000)
```

```
1712         add     %l3,%l3,%l3             ! signx0 += signx0;

1714         cmp     %l6,_0x7f800000         ! ax0 ? 0x7f800000
1715         bne,a   1f                      ! if ( ax0 != 0x7f800000 )
1716         add     %g0,2,%l3               ! signx0 = 2

1718         add     %l3,1,%l3               ! signx0 ++;
1719 1:
1720         sll     %l4,3,%l4               ! signy0 <<= 3;
1721         st      %l3,[%fp+tmp_pz]        ! STORE signx0

1723         ldd     [cmul_arr+88],%f0       ! LOAD M_PI_4

1725         ld      [%fp+tmp_pz],%f2        ! LOAD signx0

1727         ldd     [cmul_arr+%l4],%f4      ! dtmp0 = *(double*)((char*)(cmul_arr +

1729         add     %i1,stridey,%i1         ! py += stridey;
1730         fitod   %f2,%f2                 ! dtmp1 = (double)signx0;

1732         add     %i3,stridex,%i3         ! px += stridex;

1734         fmuld   %f2,%f0,%f0             ! res = signx0 * M_PI_4;

1736         fmuld   %f0,%f4,%f0             ! res *= dtmp0;
1737         fdtos   %f0,%f0                 ! ftmp0 = (float) res;
1738         st      %f0,[%o4]               ! *pz = ftmp0;

1740         ba      .begin1
1741         add     %o4,stridez,%o4         ! pz += stridez;
1742 2:
1743         std     %l6,[%fp+tmp_pz]        ! *(float*)&ax0, *(float*)&ay0
1744         ldd     [%fp+tmp_pz],%f0        ! *(float*)&ax0, *(float*)&ay0

1746         add     %i1,stridey,%i1         ! py += stridey;

1748         fmuls   %f0,%f1,%f0             ! ftmp0 = *(float*)&ax0 * *(float*)&ay0;
1749         add     %i3,stridex,%i3         ! pz += stridex;
1750         st      %f0,[%o4]               ! *pz = ftmp0;

1752         ba      .begin1
1753         add     %o4,stridez,%o4         ! pz += stridez;

1755         .align  16
1756 .spec1:
1757         cmp     %l6,0
1758         bne,pn  %icc,1f
1759         nop

1761         cmp     %l7,0
1762         bne,pn  %icc,1f
1763         nop

1765         sra     %l4,28,%l4              ! signy0 = uy0 >> 28;

1767         sra     %l3,27,%l3              ! signx0 = ux0 >> 27;
1768         and     %l4,-8,%l4              ! signy0 &= -8;

1770         sra     %o2,31,%o2              ! ldiff0 >>= 31;
1771         and     %l3,-16,%l3             ! signx0 &= -16;

1773         sll     %o2,5,%o2               ! ldiff0 <<= 5;
1774         add     %l4,%l3,%l3             ! signx0 += signy0;

1776         add     %o2,%l3,%l3             ! signx0 += ldiff0;
1777         add     %i1,stridey,%i1         ! py += stridey;
```



```
1779         ldd     [cadd_arr+%l3],%f0      ! res = *(double*)((char*)(cadd_arr + 7)
1780         add     %i3,stridex,%i3         ! px += stridex;

1782         fdtos   %f0,%f0                 ! ftmp0 = (float) res;
1783         st      %f0,[%o4]               ! *pz = ftmp0;

1785         ba      .begin1
1786         add     %o4,stridez,%o4         ! pz += stridez;
1787 1:
1788         stx     %o4,[%fp+tmp_pz]
1789         sra     %o2,31,%l7              ! (0_0) ldiff0 >>= 31;
1790         sub     %i3,%i1,%l6             ! (0_0) addrc0 = (char*)px - (char*)py;

1792         and     %l6,%l7,%o2             ! (0_0) addrc0 &= ldiff0;

1794         lda     [%i1+%o2]0x82,%f0       ! (0_0) fy0 = *(float*)((char*)py + addr
1795         sub     %i3,%o2,%o4             ! (0_0) (char*)px - addrc0

1797         lda     [%i1+%o2]0x82,%l5       ! (0_0) fy0 = *(float*)((char*)py + addr

1799         lda     [%o4]0x82,%f2           ! (0_0) fx0 = *(float*)((char*)px - addr
1800         sll     %l7,5,%l6               ! (0_0) ltmp0 = ldiff0 << 5;

1802         lda     [%o4]0x82,%g5           ! (0_0) fx0 = *(float*)((char*)px - addr

1804         sra     %l3,27,%o5              ! (0_0) signx0 = ux0 >> 27;
1805         add     %i1,stridey,%i1         ! py += stridey

1807         add     %i3,stridex,%i3         ! px += stridex

1809         lda     [%i1]0x82,%l3           ! (1_0) uy0 = *(int*)py;
1810         sra     %l4,28,%o4              ! (0_0) signy0 = uy0 >> 28;

1812         add     %l6,cadd_arr,%l6        ! (0_0) ltmp0 += (char*)cadd_arr;

1814         and     %l5,_0x7fffffff,%l4
1815         sethi   %hi(0x00800000),%g1

1817         cmp     %l4,%g1
1818         bge,a   %icc,1f
1819         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

1821         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);
1822         ldd     [cmul_arr+96],%f40
1823         sra     %l5,28,%l4              ! itmp0 >>= 28;

1825         and     %l4,-8,%l4
1826         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

1828         fmuld   %f40,%f0,%f40           ! dtmp0 *= C2ONM149;
1829         ldd     [cmul_arr+%l4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

1831         fmuld   %f40,%f0,%f40           ! dtmp0 *= dsign;
1832 1:
1833         and     %g5,_0x7fffffff,%l4
1834         cmp     %l4,%g1
1835         bge,a   %icc,.spec1_cont
1836         fstod   %f2,%f2                 ! (0_0) x0 = (double)fx0;

1838         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);
1839         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
1840         sra     %g5,28,%l4              ! itmp0 >>= 28;

1842         and     %l4,-8,%l4              ! itmp0 = -8;
1843         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;
```

```
1845         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
1846         ldd     [cmul_arr+%l4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

1848         ba      .spec1_cont
1849         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;

1851         .align  16
1852 .update0:
1853         cmp     counter,0
1854         bg,pn   %icc,1f
1855         nop

1857         ld      [cmul_arr],%f2
1858         ba      .cont0
1859         fzero   %f0
1860 1:
1861         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
1862         bg,pt   %icc,1f
1863         nop
1864 2:
1865         sub     counter,0,counter
1866         st      counter,[%fp+tmp_counter]
1867         stx     %i1,[%fp+tmp_py]
1868         stx     %i3,[%fp+tmp_px]

1870         ld      [cmul_arr],%f2
1871         or      %g0,0,counter
1872         ba      .cont0
1873         fzero   %f0
1874 1:
1875         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
1876         bne,pn  %icc,1f
1877         sethi   %hi(0x00800000),%o5

1879         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
1880         be,pn   %icc,2b
1881         nop
1882 1:
1883         st      %f0,[%fp+tmp_px]
1884         st      %f2,[%fp+tmp_px+4]
1885         ld      [%fp+tmp_px],%o4

1887         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
1888         cmp     %l5,%o5
1889         bge,a   1f
1890         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

1892         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
1893         sra     %o4,28,%o4              ! itmp0 >>= 28;
1894         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

1896         and     %o4,-8,%o4              ! itmp0 = -8;
1897         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

1899         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
1900         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

1902         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
1903 1:
1904         add     %i3,stridex,%i3         ! px += stridex
1905         add     %i1,stridey,%i1         ! py += stridey

1907         ld      [%fp+tmp_px+4],%o4
1908         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
1909         cmp     %l5,%o5
```



```
1910         bge,a   1f
1911         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

1913         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
1914         sra     %o4,28,%o4              ! itmp0 >>= 28;
1915         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);

1917         and     %o4,-8,%o4              ! itmp0 = -8;
1918         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

1920         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
1921         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

1923         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
1924 1:
1925         sra     %l4,27,%o5              ! (1_0) signx0 = ux0 >> 27;

1927         sra     %l3,28,%o4              ! (1_0) signy0 = uy0 >> 28;
1928         ba      .d0
1929         add     %l6,cadd_arr,%l6        ! (1_0) ltmp0 += (char*)cadd_arr;

1931         .align  16
1932 .update1:
1933         cmp     counter,1
1934         bg,pn   %icc,1f
1935         nop

1937         fzero   %f0
1938         ba      .cont1
1939         ld      [cmul_arr],%f2
1940 1:
1941         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
1942         bg,pt   %icc,1f
1943         nop
1944 2:
1945         sub     counter,1,counter
1946         st      counter,[%fp+tmp_counter]
1947         stx     %i1,[%fp+tmp_py]
1948         stx     %i3,[%fp+tmp_px]

1950         ld      [cmul_arr],%f2
1951         or      %g0,1,counter
1952         ba      .cont1
1953         fzero   %f0
1954 1:
1955         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
1956         bne,pn  %icc,1f
1957         sethi   %hi(0x00800000),%o5

1959         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
1960         be,pn   %icc,2b
1961         nop
1962 1:
1963         st      %f0,[%fp+tmp_px]
1964         st      %f2,[%fp+tmp_px+4]
1965         ld      [%fp+tmp_px],%o4
1966         fmuld   %f40,%f20,%f30          ! (0_0) dtmp0 *= x20;

1968         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
1969         cmp     %l6,%o5
1970         bge,a   1f
1971         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

1973         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
1974         sra     %o4,28,%o4              ! itmp0 >>= 28;
1975         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);
```

```
1977         and     %o4,-8,%o4              ! itmp0 = -8;
1978         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

1980         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
1981         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

1983         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
1984 1:

1986         add     %i1,stridey,%i1         ! py += stridey

1988         ld      [%fp+tmp_px+4],%o4
1989         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
1990         cmp     %l6,%o5
1991         bge,a   1f
1992         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

1994         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
1995         sra     %o4,28,%o4              ! itmp0 >>= 28;
1996         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);

1998         and     %o4,-8,%o4              ! itmp0 = -8;
1999         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

2001         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
2002         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2004         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
2005 1:
2006         sll     %g5,5,%l6               ! (2_0) ltmp0 = ldiff0 << 5;
2007         sra     %l3,27,%o5              ! (2_0) signx0 = ux0 >> 27;
2008         add     %i3,stridex,%i3         ! px += stridex

2010         sra     %l4,28,%o4              ! (2_0) signy0 = uy0 >> 28;
2011         ba      .d1
2012         add     %l6,cadd_arr,%l6        ! (2_0) ltmp0 += (char*)cadd_arr;

2014         .align  16
2015 .update2:
2016         cmp     counter,2
2017         bg,pn   %icc,1f
2018         nop

2020         ld      [cmul_arr],%f1
2021         ba      .cont2
2022         fzeros  %f0
2023 1:
2024         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2025         bg,pt   %icc,1f
2026         nop
2027 2:
2028         sub     counter,2,counter
2029         st      counter,[%fp+tmp_counter]
2030         stx     %i1,[%fp+tmp_py]
2031         stx     %i3,[%fp+tmp_px]

2033         ld      [cmul_arr],%f1
2034         or      %g0,2,counter
2035         ba      .cont2
2036         fzeros  %f0
2037 1:
2038         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2039         bne,pn  %icc,1f
2040         sethi   %hi(0x00800000),%o5
```



```
2042         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2043         be,pn   %icc,2b
2044         nop
2045 1:
2046         std     %f0,[%fp+tmp_px]
2047         ld      [%fp+tmp_px],%o4
2048         fmuld   %f40,%f18,%f28          ! (1_0) dtmp0 *= x20;

2050         faddd   %f16,K5,%f2             ! (0_0) dtmp0 += K5;

2052         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
2053         cmp     %l6,%o5
2054         bge,a   1f
2055         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2057         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2058         sra     %o4,28,%o4              ! itmp0 >>= 28;
2059         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2061         and     %o4,-8,%o4              ! itmp0 = -8;
2062         fitod   %f0,%f16                ! dtmp0 = (double) *(int*)&fy0;

2064         fmuld   %f16,%f40,%f40          ! dtmp0 *= C2ONM149;
2065         ldd     [cmul_arr+%o4],%f16     ! dsign = *(double*)((char*)cmul_arr + i

2067         fmuld   %f16,%f40,%f40          ! dtmp0 *= dsign;
2068 1:
2069         add     %i1,stridey,%i1         ! py += stridey

2071         ld      [%fp+tmp_px+4],%o4
2072         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
2073         cmp     %l6,%o5
2074         bge,a   1f
2075         fstod   %f1,%f16                ! (5_1) x0 = (double)fx0;

2077         fabss   %f1,%f16                ! fx0 = fabsf(fx0);
2078         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2079         sra     %o4,28,%o4              ! itmp0 >>= 28;

2081         and     %o4,-8,%o4              ! itmp0 = -8;
2082         fitod   %f16,%f16               ! dtmp0 = (double) *(int*)&fx0;

2084         fmuld   %f16,%f0,%f16           ! dtmp0 *= C2ONM149;
2085         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2087         fmuld   %f16,%f0,%f16           ! dtmp0 *= dsign;
2088 1:
2089         sll     %o0,5,%l6               ! (3_0) ltmp0 = ldiff0 << 5;
2090         sra     %l4,27,%o5              ! (3_0) signx0 = ux0 >> 27;

2092         add     %i3,stridex,%i3         ! px += stridex
2093         ba      .d2
2094         sra     %l3,28,%o4              ! (3_0) signy0 = uy0 >> 28;

2096         .align  16
2097 .update3:
2098         cmp     counter,3
2099         bg,pn   %icc,1f
2100         nop

2102         fzero   %f0
2103         ba      .cont3
2104         ld      [cmul_arr],%f2
2105 1:
2106         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2107         bg,pt   %icc,1f
```

```
2108         nop
2109 2:
2110         sub     counter,3,counter
2111         st      counter,[%fp+tmp_counter]
2112         stx     %i1,[%fp+tmp_py]
2113         stx     %i3,[%fp+tmp_px]

2115         ld      [cmul_arr],%f2
2116         or      %g0,3,counter
2117         ba      .cont3
2118         fzero   %f0
2119 1:
2120         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2121         bne,pn  %icc,1f
2122         sethi   %hi(0x00800000),%o5

2124         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2125         be,pn   %icc,2b
2126         nop
2127 1:
2128         st      %f0,[%fp+tmp_px]
2129         st      %f2,[%fp+tmp_px+4]
2130         ld      [%fp+tmp_px],%o4
2131         fmuld   %f40,%f16,%f26          ! (2_0) dtmp0 *= x20;

2133         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
2134         cmp     %l6,%o5
2135         bge,a   1f
2136         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2138         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2139         sra     %o4,28,%o4              ! itmp0 >>= 28;
2140         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2142         and     %o4,-8,%o4              ! itmp0 = -8;
2143         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

2145         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
2146         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2148         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
2149 1:
2150         add     %i1,stridey,%i1         ! py += stridey
2151         faddd   %f4,K5,%f62             ! (1_0) dtmp0 += K5;
2152         fmuld   %f24,%f20,%f24          ! (0_0) dtmp0 *= x20;

2154         ld      [%fp+tmp_px+4],%o4
2155         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
2156         cmp     %l6,%o5
2157         bge,a   1f
2158         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

2160         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);
2161         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2162         sra     %o4,28,%o4              ! itmp0 >>= 28;

2164         and     %o4,-8,%o4              ! itmp0 = -8;
2165         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

2167         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
2168         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2170         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
2171 1:
2172         sll     %l5,5,%l6               ! (4_0) ltmp0 = ldiff0 << 5;
2173         sra     %l3,27,%o5              ! (4_0) signx0 = ux0 >> 27;
```



```
2175         add     %i3,stridex,%i3         ! px += stridex
2176         ba      .d3
2177         sra     %l4,28,%o4              ! (4_0) signy0 = uy0 >> 28;

2179         .align  16
2180 .update4:
2181         cmp     counter,4
2182         bg,pn   %icc,1f
2183         nop

2185         ld      [cmul_arr],%f1
2186         ba      .cont4
2187         fzeros  %f0
2188 1:
2189         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2190         bg,pt   %icc,1f
2191         nop
2192 2:
2193         sub     counter,4,counter
2194         st      counter,[%fp+tmp_counter]
2195         stx     %i1,[%fp+tmp_py]
2196         stx     %i3,[%fp+tmp_px]

2198         ld      [cmul_arr],%f1
2199         or      %g0,4,counter
2200         ba      .cont4
2201         fzeros  %f0
2202 1:
2203         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2204         bne,pn  %icc,1f
2205         sethi   %hi(0x00800000),%o5

2207         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2208         be,pn   %icc,2b
2209         nop
2210 1:
2211         std     %f0,[%fp+tmp_px]
2212         ld      [%fp+tmp_px],%o4
2213         fmuld   %f40,%f24,%f36          ! (3_1) dtmp0 *= x20;

2215         and     %o4,_0x7fffffff,%o1     ! itmp0 & 0x7fffffff
2216         cmp     %o1,%o5
2217         bge,a   1f
2218         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2220         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2221         sra     %o4,28,%o4              ! itmp0 >>= 28;
2222         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2224         and     %o4,-8,%o4              ! itmp0 = -8;
2225         fitod   %f0,%f14                ! dtmp0 = (double) *(int*)&fy0;

2227         fmuld   %f14,%f40,%f40          ! dtmp0 *= C2ONM149;
2228         ldd     [cmul_arr+%o4],%f14     ! dsign = *(double*)((char*)cmul_arr + i

2230         fmuld   %f14,%f40,%f40          ! dtmp0 *= dsign;
2231 1:
2232         faddd   %f22,K5,%f14            ! (2_1) dtmp0 += K5;
2233         fmuld   %f4,%f18,%f4            ! (1_1) dtmp0 *= x20;

2235         ld      [%fp+tmp_px+4],%o4
2236         and     %o4,_0x7fffffff,%o1     ! itmp0 & 0x7fffffff
2237         cmp     %o1,%o5
2238         bge,a   1f
2239         fstod   %f1,%f2                 ! (5_1) x0 = (double)fx0;
```

```
2241         fabss   %f1,%f22                ! fx0 = fabsf(fx0);
2242         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2243         sra     %o4,28,%o4              ! itmp0 >>= 28;

2245         and     %o4,-8,%o4              ! itmp0 = -8;
2246         fitod   %f22,%f22               ! dtmp0 = (double) *(int*)&fx0;

2248         fmuld   %f22,%f0,%f22           ! dtmp0 *= C2ONM149;
2249         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2251         fmuld   %f22,%f0,%f2            ! dtmp0 *= dsign;
2252 1:
2253         sll     %l7,3,%l7               ! (0_1) cmul0_ind = ldiff0 << 3;
2254         ba      .d4
2255         add     %i3,stridex,%i3         ! px += stridex

2257         .align  16
2258 .update5:
2259         cmp     counter,5
2260         bg,pn   %icc,1f
2261         nop

2263         ld      [cmul_arr],%f2
2264         ba      .cont5
2265         fzero   %f0
2266 1:
2267         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2268         bg,pt   %icc,1f
2269         nop
2270 2:
2271         sub     counter,5,counter
2272         st      counter,[%fp+tmp_counter]
2273         stx     %i1,[%fp+tmp_py]
2274         stx     %i3,[%fp+tmp_px]

2276         ld      [cmul_arr],%f2
2277         or      %g0,5,counter
2278         ba      .cont5
2279         fzero   %f0
2280 1:
2281         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2282         bne,pn  %icc,1f
2283         sethi   %hi(0x00800000),%o5

2285         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2286         be,pn   %icc,2b
2287         nop
2288 1:
2289         st      %f0,[%fp+tmp_px]
2290         st      %f2,[%fp+tmp_px+4]
2291         ld      [%fp+tmp_px],%o4
2292         fmuld   %f40,%f4,%f34           ! (4_1) dtmp0 *= x20;

2294         stx     %l5,[%fp+tmp_py]
2295         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
2296         cmp     %l5,%o5
2297         bge,a   1f
2298         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2300         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2301         sra     %o4,28,%o4              ! itmp0 >>= 28;
2302         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2304         and     %o4,-8,%o4              ! itmp0 = -8;
2305         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;
```



```
2307         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
2308         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2310         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
2311 1:
2312         faddd   %f20,K5,%f12            ! (3_1) dtmp0 += K5;
2313         add     %i1,stridey,%i1         ! py += stridey
2314         fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;

2316         ld      [%fp+tmp_px+4],%o4
2317         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
2318         cmp     %l5,%o5
2319         bge,a   1f
2320         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

2322         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2323         sra     %o4,28,%o4              ! itmp0 >>= 28;
2324         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);

2326         and     %o4,-8,%o4              ! itmp0 = -8;
2327         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

2329         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
2330         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2332         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
2333 1:
2334         ldx     [%fp+tmp_py],%l5
2335         sra     %l3,27,%o5              ! (0_0) signx0 = ux0 >> 27;
2336         add     %i3,stridex,%i3         ! px += stridex

2338         lda     [%i1]0x82,%l3           ! (1_0) uy0 = *(int*)py;
2339         sra     %l4,28,%o4              ! (0_0) signy0 = uy0 >> 28;
2340         ba      .d5
2341         add     %l6,cadd_arr,%l6        ! (0_0) ltmp0 += (char*)cadd_arr;

2343         .align  16
2344 .update6:
2345         cmp     counter,5
2346         bg,pn   %icc,1f
2347         nop

2349         ld      [cmul_arr],%f2
2350         ba      .cont6
2351         fzero   %f0
2352 1:
2353         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2354         bg,pt   %icc,1f
2355         nop
2356 2:
2357         sub     counter,5,counter
2358         st      counter,[%fp+tmp_counter]
2359         stx     %i1,[%fp+tmp_py]
2360         stx     %i3,[%fp+tmp_px]

2362         ld      [cmul_arr],%f2
2363         or      %g0,5,counter
2364         ba      .cont6
2365         fzero   %f0
2366 1:
2367         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2368         bne,pn  %icc,1f
2369         sethi   %hi(0x00800000),%o5

2371         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
```

```
2372         be,pn   %icc,2b
2373         nop
2374 1:
2375         st      %f0,[%fp+tmp_pz]
2376         st      %f2,[%fp+tmp_pz+4]
2377         ld      [%fp+tmp_pz],%o4
2378         fmuld   %f40,%f22,%f32          ! (5_1) dtmp0 *= x20;

2380         stx     %l5,[%fp+tmp_px]
2381         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
2382         cmp     %l5,%o5
2383         bge,a   1f
2384         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2386         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2387         sra     %o4,28,%o4              ! itmp0 >>= 28;
2388         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2390         and     %o4,-8,%o4              ! itmp0 = -8;
2391         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

2393         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
2394         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2396         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
2397 1:
2398         faddd   %f18,K5,%f10            ! (4_1) dtmp0 += K5;
2399         add     %i3,stridex,%i3         ! px += stridex
2400         add     %i1,stridey,%i1         ! py += stridey
2401         fmuld   %f20,%f24,%f20          ! (3_1) dtmp0 *= x20;

2403         ld      [%fp+tmp_pz+4],%o4
2404         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
2405         cmp     %l5,%o5
2406         bge,a   1f
2407         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

2409         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2410         sra     %o4,28,%o4              ! itmp0 >>= 28;
2411         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);

2413         and     %o4,-8,%o4              ! itmp0 = -8;
2414         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

2416         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
2417         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2419         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
2420 1:
2421         ldx     [%fp+tmp_px],%l5

2423         sra     %l4,27,%o5              ! (1_0) signx0 = ux0 >> 27;

2425         sra     %l3,28,%o4              ! (1_0) signy0 = uy0 >> 28;
2426         ba      .d6
2427         add     %l6,cadd_arr,%l6        ! (1_0) ltmp0 += (char*)cadd_arr;

2429         .align  16
2430 .update7:
2431         cmp     counter,5
2432         bg,pn   %icc,1f
2433         nop

2435         ld      [cmul_arr],%f2
2436         ba      .cont7
2437         fzero   %f0
```



```
2438 1:
2439         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2440         bg,pt   %icc,1f
2441         nop
2442 2:
2443         sub     counter,5,counter
2444         st      counter,[%fp+tmp_counter]
2445         stx     %i1,[%fp+tmp_py]
2446         stx     %i3,[%fp+tmp_px]

2448         ld      [cmul_arr],%f2
2449         or      %g0,5,counter
2450         ba      .cont7
2451         fzero   %f0
2452 1:
2453         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2454         bne,pn  %icc,1f
2455         sethi   %hi(0x00800000),%o5

2457         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2458         be,pn   %icc,2b
2459         nop
2460 1:
2461         st      %f0,[%fp+tmp_pz]
2462         st      %f2,[%fp+tmp_pz+4]
2463         ld      [%fp+tmp_pz],%o4
2464         fmuld   %f40,%f20,%f30          ! (0_0) dtmp0 *= x20;

2466         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
2467         cmp     %l6,%o5
2468         bge,a   1f
2469         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2471         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2472         sra     %o4,28,%o4              ! itmp0 >>= 28;
2473         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2475         and     %o4,-8,%o4              ! itmp0 = -8;
2476         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

2478         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
2479         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2481         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
2482 1:
2483         faddd   %f16,K5,%f8             ! (5_1) dtmp0 += K5;
2484         add     %i1,stridey,%i1         ! py += stridey
2485         fmuld   %f18,%f4,%f18           ! (4_1) dtmp0 *= x20;

2487         ld      [%fp+tmp_pz+4],%o4
2488         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
2489         cmp     %l6,%o5
2490         bge,a   1f
2491         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

2493         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2494         sra     %o4,28,%o4              ! itmp0 >>= 28;
2495         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);

2497         and     %o4,-8,%o4              ! itmp0 = -8;
2498         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

2500         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
2501         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2503         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
```

```
1:
        sll     %g5,5,%l6               ! (2_0) ltmp0 = ldiff0 << 5;
        sra     %l3,27,%o5              ! (2_0) signx0 = ux0 >> 27;
        add     %i3,stridex,%i3         ! px += stridex

        sra     %l4,28,%o4              ! (2_0) signy0 = uy0 >> 28;
        ba      .d7
        add     %l6,cadd_arr,%l6        ! (2_0) ltmp0 += (char*)cadd_arr;

        .align  16
.update8:
        cmp     counter,5
        bg,pn   %icc,1f
        nop

        ld      [cmul_arr],%f1
        ba      .cont8
        fzeros  %f0
1:
        cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
        bg,pt   %icc,1f
        nop
2:
        sub     counter,5,counter
        st      counter,[%fp+tmp_counter]
        stx     %i1,[%fp+tmp_py]
        stx     %i3,[%fp+tmp_px]

        ld      [cmul_arr],%f1
        or      %g0,5,counter
        ba      .cont8
        fzeros  %f0
1:
        andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
        bne,pn  %icc,1f
        sethi   %hi(0x00800000),%o5

        andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
        be,pn   %icc,2b
        nop
1:
        std     %f0,[%fp+tmp_pz]
        ld      [%fp+tmp_pz],%o4
        fmuld   %f40,%f18,%f28          ! (1_0) dtmp0 *= x20;

        faddd   %f16,K5,%f2             ! (0_0) dtmp0 += K5;

        and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
        cmp     %l6,%o5
        bge,a   1f
        fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

        ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
        sra     %o4,28,%o4              ! itmp0 >>= 28;
        fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

        and     %o4,-8,%o4              ! itmp0 = -8;
        fitod   %f0,%f16                ! dtmp0 = (double) *(int*)&fy0;

        fmuld   %f16,%f40,%f40          ! dtmp0 *= C2ONM149;
        ldd     [cmul_arr+%o4],%f16     ! dsign = *(double*)((char*)cmul_arr + i

        fmuld   %f16,%f40,%f40          ! dtmp0 *= dsign;
1:
        add     %i1,stridey,%i1         ! py += stridey
        fmuld   %f24,%f22,%f24          ! (5_1) dtmp0 *= x20;
```



```
        ld      [%fp+tmp_pz+4],%o4
        and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
        cmp     %l6,%o5
        bge,a   1f
        fstod   %f1,%f16                ! (5_1) x0 = (double)fx0;

        fabss   %f1,%f16                ! fx0 = fabsf(fx0);
        ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
        sra     %o4,28,%o4              ! itmp0 >>= 28;

        and     %o4,-8,%o4              ! itmp0 = -8;
        fitod   %f16,%f16               ! dtmp0 = (double) *(int*)&fx0;

        fmuld   %f16,%f0,%f16           ! dtmp0 *= C2ONM149;
        ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

        fmuld   %f16,%f0,%f16           ! dtmp0 *= dsign;
1:
        sll     %o0,5,%l6               ! (3_0) ltmp0 = ldiff0 << 5;
        sra     %l4,27,%o5              ! (3_0) signx0 = ux0 >> 27;

        add     %i3,stridex,%i3         ! px += stridex
        ba      .d8
        sra     %l3,28,%o4              ! (3_0) signy0 = uy0 >> 28;

        .align  16
.update9:
        cmp     counter,5
        bg,pn   %icc,1f
        nop

        ld      [cmul_arr],%f2
        ba      .cont9
        fzero   %f0
1:
        cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
        bg,pt   %icc,1f
        nop
2:
        sub     counter,5,counter
        st      counter,[%fp+tmp_counter]
        stx     %i1,[%fp+tmp_py]
        stx     %i3,[%fp+tmp_px]

        ld      [cmul_arr],%f2
        or      %g0,5,counter
        ba      .cont9
        fzero   %f0
1:
        andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
        bne,pn  %icc,1f
        sethi   %hi(0x00800000),%o5

        andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
        be,pn   %icc,2b
        nop
1:
        st      %f0,[%fp+tmp_pz]
        st      %f2,[%fp+tmp_pz+4]
        ld      [%fp+tmp_pz],%o4
        fmuld   %f40,%f16,%f26          ! (2_0) dtmp0 *= x20;

        and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
        cmp     %l6,%o5
        bge,a   1f
```

```
2636         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2638         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2639         sra     %o4,28,%o4              ! itmp0 >>= 28;
2640         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2642         and     %o4,-8,%o4              ! itmp0 = -8;
2643         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

2645         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
2646         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2648         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
2649 1:
2650         add     %i1,stridey,%i1         ! py += stridey
2651         faddd   %f4,K5,%f62             ! (1_0) dtmp0 += K5;
2652         fmuld   %f24,%f20,%f24          ! (0_0) dtmp0 *= x20;

2654         ld      [%fp+tmp_pz+4],%o4
2655         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
2656         cmp     %l6,%o5
2657         bge,a   1f
2658         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

2660         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);
2661         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2662         sra     %o4,28,%o4              ! itmp0 >>= 28;

2664         and     %o4,-8,%o4              ! itmp0 = -8;
2665         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

2667         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
2668         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2670         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
2671 1:
2672         sll     %l5,5,%l6               ! (4_0) ltmp0 = ldiff0 << 5;
2673         sra     %l3,27,%o5              ! (4_0) signx0 = ux0 >> 27;

2675         add     %i3,stridex,%i3         ! px += stridex
2676         ba      .d9
2677         sra     %l4,28,%o4              ! (4_0) signy0 = uy0 >> 28;

2679         .align  16
2680 .update10:
2681         cmp     counter,1
2682         bg,pn   %icc,1f
2683         nop

2685         ld      [cmul_arr],%f2
2686         ba      .cont10
2687         fzero   %f0
2688 1:
2689         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2690         bg,pt   %icc,1f
2691         nop
2692 2:
2693         sub     counter,1,counter
2694         st      counter,[%fp+tmp_counter]
2695         stx     %i1,[%fp+tmp_py]
2696         stx     %i3,[%fp+tmp_px]

2698         ld      [cmul_arr],%f2
2699         or      %g0,1,counter
2700         ba      .cont10
2701         fzero   %f0
```



```
2702 1:
2703         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2704         bne,pn  %icc,1f
2705         sethi   %hi(0x00800000),%o5

2707         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2708         be,pn   %icc,2b
2709         nop
2710 1:
2711         st      %f0,[%fp+tmp_pz]
2712         st      %f2,[%fp+tmp_pz+4]
2713         ld      [%fp+tmp_pz],%o1
2714         fmuld   %f40,%f24,%f36          ! (3_1) dtmp0 *= x20;

2716         and     %o1,_0x7fffffff,%o4     ! itmp0 & 0x7fffffff
2717         cmp     %o4,%o5
2718         bge,a   1f
2719         fstod   %f0,%f40                ! (5_1) y0 = (double)fy0;

2721         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2722         sra     %o1,28,%o1              ! itmp0 >>= 28;
2723         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2725         and     %o1,-8,%o1              ! itmp0 = -8;
2726         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

2728         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
2729         ldd     [cmul_arr+%o1],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2731         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
2732 1:
2733         faddd   %f22,K5,%f14            ! (2_1) dtmp0 += K5;
2734         fmuld   %f4,%f18,%f4            ! (1_1) dtmp0 *= x20;

2736         sll     %l7,3,%l7               ! (0_1) cmul0_ind = ldiff0 << 3;
2737         add     %i3,stridex,%i3         ! px += stridex

2739         ld      [%fp+tmp_pz+4],%o1
2740         and     %o1,_0x7fffffff,%o4     ! itmp0 & 0x7fffffff
2741         cmp     %o4,%o5
2742         bge,a   1f
2743         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

2745         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2746         sra     %o1,28,%o1              ! itmp0 >>= 28;
2747         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);

2749         and     %o1,-8,%o1              ! itmp0 = -8;
2750         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

2752         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
2753         ldd     [cmul_arr+%o1],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2755         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
2756 1:
2757         ba      .den0
2758         add     %o2,stridez,%o1         ! pz += stridez

2760         .align  16
2761 .update11:
2762         cmp     counter,2
2763         bg,pn   %icc,1f
2764         nop

2766         ld      [cmul_arr],%f2
2767         ba      .cont11
```

```
2768         fzero   %f0
2769 1:
2770         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2771         bg,pt   %icc,1f
2772         nop
2773 2:
2774         sub     counter,2,counter
2775         st      counter,[%fp+tmp_counter]
2776         stx     %i1,[%fp+tmp_py]
2777         stx     %i3,[%fp+tmp_px]

2779         ld      [cmul_arr],%f2
2780         or      %g0,2,counter
2781         ba      .cont11
2782         fzero   %f0
2783 1:
2784         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2785         bne,pn  %icc,1f
2786         sethi   %hi(0x00800000),%o5

2788         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2789         be,pn   %icc,2b
2790         nop
2791 1:
2792         st      %f0,[%fp+tmp_pz]
2793         st      %f2,[%fp+tmp_pz+4]
2794         ld      [%fp+tmp_pz],%o4
2795         fmuld   %f40,%f4,%f34           ! (4_1) dtmp0 *= x20;

2797         stx     %l5,[%fp+tmp_px]
2798         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
2799         cmp     %l5,%o5
2800         bge,a   1f
2801         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2803         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2804         sra     %o4,28,%o4              ! itmp0 >>= 28;
2805         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2807         and     %o4,-8,%o4              ! itmp0 = -8;
2808         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

2810         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
2811         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2813         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
2814 1:
2815         faddd   %f20,K5,%f12            ! (3_1) dtmp0 += K5;
2816         add     %i1,stridey,%i1         ! py += stridey
2817         fmuld   %f22,%f16,%f22          ! (2_1) dtmp0 *= x20;

2819         ld      [%fp+tmp_pz+4],%o4
2820         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
2821         cmp     %l5,%o5
2822         bge,a   1f
2823         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

2825         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2826         sra     %o4,28,%o4              ! itmp0 >>= 28;
2827         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);

2829         and     %o4,-8,%o4              ! itmp0 = -8;
2830         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

2832         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
2833         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i
```



```
2835         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
2836 1:
2837         ldx     [%fp+tmp_px],%l5
2838         sra     %l3,27,%o5              ! (0_0) signx0 = ux0 >> 27;
2839         add     %i3,stridex,%i3         ! px += stridex

2841         lda     [%i1]0x82,%l3           ! (1_0) uy0 = *(int*)py;
2842         sra     %l4,28,%o4              ! (0_0) signy0 = uy0 >> 28;
2843         ba      .den1
2844         add     %l6,cadd_arr,%l6        ! (0_0) ltmp0 += (char*)cadd_arr;

2846         .align  16
2847 .update12:
2848         cmp     counter,3
2849         bg,pn   %icc,1f
2850         nop

2852         ld      [cmul_arr],%f2
2853         ba      .cont12
2854         fzero   %f0
2855 1:
2856         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2857         bg,pt   %icc,1f
2858         nop
2859 2:
2860         sub     counter,3,counter
2861         st      counter,[%fp+tmp_counter]
2862         stx     %i1,[%fp+tmp_py]
2863         stx     %i3,[%fp+tmp_px]

2865         ld      [cmul_arr],%f2
2866         or      %g0,3,counter
2867         ba      .cont12
2868         fzero   %f0
2869 1:
2870         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2871         bne,pn  %icc,1f
2872         sethi   %hi(0x00800000),%o5

2874         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2875         be,pn   %icc,2b
2876         nop
2877 1:
2878         st      %f0,[%fp+tmp_pz]
2879         st      %f2,[%fp+tmp_pz+4]
2880         ld      [%fp+tmp_pz],%o4
2881         fmuld   %f40,%f22,%f32          ! (5_1) dtmp0 *= x20;

2883         stx     %l5,[%fp+tmp_px]
2884         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
2885         cmp     %l5,%o5
2886         bge,a   1f
2887         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2889         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2890         sra     %o4,28,%o4              ! itmp0 >>= 28;
2891         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2893         and     %o4,-8,%o4              ! itmp0 = -8;
2894         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

2896         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
2897         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2899         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
```

```
2900 1:
2901         faddd   %f18,K5,%f10            ! (4_1) dtmp0 += K5;
2902         add     %i3,stridex,%i3         ! px += stridex
2903         add     %i1,stridey,%i1         ! py += stridey
2904         fmuld   %f20,%f24,%f20          ! (3_1) dtmp0 *= x20;

2906         ld      [%fp+tmp_pz+4],%o4
2907         and     %o4,_0x7fffffff,%l5     ! itmp0 & 0x7fffffff
2908         cmp     %l5,%o5
2909         bge,a   1f
2910         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

2912         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2913         sra     %o4,28,%o4              ! itmp0 >>= 28;
2914         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);

2916         and     %o4,-8,%o4              ! itmp0 = -8;
2917         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

2919         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
2920         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2922         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
2923 1:
2924         ldx     [%fp+tmp_px],%l5

2926         sra     %l4,27,%o5              ! (1_0) signx0 = ux0 >> 27;

2928         sra     %l3,28,%o4              ! (1_0) signy0 = uy0 >> 28;
2929         ba      .den2
2930         add     %l6,cadd_arr,%l6        ! (1_0) ltmp0 += (char*)cadd_arr;

2932         .align  16
2933 .update13:
2934         cmp     counter,4
2935         bg,pn   %icc,1f
2936         nop

2938         ld      [cmul_arr],%f2
2939         ba      .cont13
2940         fzero   %f0
2941 1:
2942         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
2943         bg,pt   %icc,1f
2944         nop
2945 2:
2946         sub     counter,4,counter
2947         st      counter,[%fp+tmp_counter]
2948         stx     %i1,[%fp+tmp_py]
2949         sub     %i3,stridex,%o5
2950         stx     %o5,[%fp+tmp_px]

2952         ld      [cmul_arr],%f2
2953         or      %g0,4,counter
2954         ba      .cont13
2955         fzero   %f0
2956 1:
2957         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2958         bne,pn  %icc,1f
2959         sethi   %hi(0x00800000),%o5

2961         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
2962         be,pn   %icc,2b
2963         nop
2964 1:
2965         st      %f0,[%fp+tmp_pz]
```



```
2966         st      %f2,[%fp+tmp_pz+4]
2967         ld      [%fp+tmp_pz],%o4
2968         fmuld   %f40,%f20,%f30          ! (0_0) dtmp0 *= x20;

2970         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
2971         cmp     %l6,%o5
2972         bge,a   1f
2973         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

2975         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
2976         sra     %o4,28,%o4              ! itmp0 >>= 28;
2977         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

2979         and     %o4,-8,%o4              ! itmp0 = -8;
2980         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

2982         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
2983         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

2985         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
2986 1:
2987         faddd   %f16,K5,%f8             ! (5_1) dtmp0 += K5;
2988         add     %i1,stridey,%i1         ! py += stridey
2989         fmuld   %f18,%f4,%f18           ! (4_1) dtmp0 *= x20;

2991         ld      [%fp+tmp_pz+4],%o4
2992         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
2993         cmp     %l6,%o5
2994         bge,a   1f
2995         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;

2997         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
2998         sra     %o4,28,%o4              ! itmp0 >>= 28;
2999         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);

3001         and     %o4,-8,%o4              ! itmp0 = -8;
3002         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

3004         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
3005         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

3007         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
3008 1:
3009         sll     %g5,5,%l6               ! (2_0) ltmp0 = ldiff0 << 5;
3010         sra     %l3,27,%o5              ! (2_0) signx0 = ux0 >> 27;

3012         sra     %l4,28,%o4              ! (2_0) signy0 = uy0 >> 28;
3013         ba      .den3
3014         add     %l6,cadd_arr,%l6        ! (2_0) ltmp0 += (char*)cadd_arr;

3016         .align  16
3017 .update14:
3018         cmp     counter,5
3019         bg,pn   %icc,1f
3020         nop

3022         ld      [cmul_arr],%f1
3023         ba      .cont14
3024         fzeros  %f0
3025 1:
3026         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
3027         bg,pt   %icc,1f
3028         nop
3029 2:
3030         sub     counter,5,counter
3031         st      counter,[%fp+tmp_counter]
```

```
3032         stx     %i1,[%fp+tmp_py]
3033         sub     %i3,stridex,%o5
3034         stx     %o5,[%fp+tmp_px]

3036         ld      [cmul_arr],%f1
3037         or      %g0,5,counter
3038         ba      .cont14
3039         fzeros  %f0
3040 1:
3041         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
3042         bne,pn  %icc,1f
3043         sethi   %hi(0x00800000),%o5

3045         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
3046         be,pn   %icc,2b
3047         nop
3048 1:
3049         std     %f0,[%fp+tmp_pz]
3050         ld      [%fp+tmp_pz],%o4
3051         fmuld   %f40,%f18,%f28          ! (1_0) dtmp0 *= x20;

3053         faddd   %f16,K5,%f2             ! (0_0) dtmp0 += K5;

3055         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
3056         cmp     %l6,%o5
3057         bge,a   1f
3058         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

3060         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
3061         sra     %o4,28,%o4              ! itmp0 >>= 28;
3062         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

3064         and     %o4,-8,%o4              ! itmp0 = -8;
3065         fitod   %f0,%f16                ! dtmp0 = (double) *(int*)&fy0;

3067         fmuld   %f16,%f40,%f40          ! dtmp0 *= C2ONM149;
3068         ldd     [cmul_arr+%o4],%f16     ! dsign = *(double*)((char*)cmul_arr + i

3070         fmuld   %f16,%f40,%f40          ! dtmp0 *= dsign;
3071 1:
3072         add     %i1,stridey,%i1         ! py += stridey
3073         fmuld   %f24,%f22,%f24          ! (5_1) dtmp0 *= x20;

3075         ld      [%fp+tmp_pz+4],%o4
3076         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
3077         cmp     %l6,%o5
3078         bge,a   1f
3079         fstod   %f1,%f16                ! (5_1) x0 = (double)fx0;

3081         fabss   %f1,%f16                ! fx0 = fabsf(fx0);
3082         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
3083         sra     %o4,28,%o4              ! itmp0 >>= 28;

3085         and     %o4,-8,%o4              ! itmp0 = -8;
3086         fitod   %f16,%f16               ! dtmp0 = (double) *(int*)&fx0;

3088         fmuld   %f16,%f0,%f16           ! dtmp0 *= C2ONM149;
3089         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

3091         fmuld   %f16,%f0,%f16           ! dtmp0 *= dsign;
3092 1:
3093         sll     %o0,5,%l6               ! (3_0) ltmp0 = ldiff0 << 5;
3094         sra     %l4,27,%o5              ! (3_0) signx0 = ux0 >> 27;

3096         ba      .den4
3097         sra     %l3,28,%o4              ! (3_0) signy0 = uy0 >> 28;
```



```
3099         .align  16
3100 .update15:
3101         cmp     counter,6
3102         bg,pn   %icc,1f
3103         nop

3105         ld      [cmul_arr],%f2
3106         ba      .cont15
3107         fzero   %f0
3108 1:
3109         cmp     %o5,_0x7f800000         ! (4_0) b0 ? 0x7f800000
3110         bg,pt   %icc,1f
3111         nop
3112 2:
3113         sub     counter,6,counter
3114         st      counter,[%fp+tmp_counter]
3115         stx     %i1,[%fp+tmp_py]
3116         sub     %i3,stridex,%o5
3117         stx     %o5,[%fp+tmp_px]

3119         ld      [cmul_arr],%f2
3120         or      %g0,6,counter
3121         ba      .cont15
3122         fzero   %f0
3123 1:
3124         andcc   %l3,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
3125         bne,pn  %icc,1f
3126         sethi   %hi(0x00800000),%o5

3128         andcc   %l4,_0x7fffffff,%g0     ! itmp0 & 0x7fffffff
3129         be,pn   %icc,2b
3130         nop
3131 1:
3132         st      %f0,[%fp+tmp_pz]
3133         st      %f2,[%fp+tmp_pz+4]
3134         ld      [%fp+tmp_pz],%o4
3135         fmuld   %f40,%f16,%f26          ! (2_0) dtmp0 *= x20;

3137         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
3138         cmp     %l6,%o5
3139         bge,a   1f
3140         fstod   %f0,%f40                ! (0_0) y0 = (double)fy0;

3142         ldd     [cmul_arr+96],%f40      ! LOAD C2ONM149
3143         sra     %o4,28,%o4              ! itmp0 >>= 28;
3144         fabss   %f0,%f0                 ! fy0 = fabsf(fy0);

3146         and     %o4,-8,%o4              ! itmp0 = -8;
3147         fitod   %f0,%f0                 ! dtmp0 = (double) *(int*)&fy0;

3149         fmuld   %f0,%f40,%f40           ! dtmp0 *= C2ONM149;
3150         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

3152         fmuld   %f0,%f40,%f40           ! dtmp0 *= dsign;
3153 1:
3154         add     %i1,stridey,%i1         ! py += stridey
3155         faddd   %f4,K5,%f62             ! (1_0) dtmp0 += K5;
3156         fmuld   %f24,%f20,%f24          ! (0_0) dtmp0 *= x20;

3158         ld      [%fp+tmp_pz+4],%o4
3159         and     %o4,_0x7fffffff,%l6     ! itmp0 & 0x7fffffff
3160         cmp     %l6,%o5
3161         bge,a   1f
3162         fstod   %f2,%f2                 ! (5_1) x0 = (double)fx0;
```

```
3164         fabss   %f2,%f2                 ! fx0 = fabsf(fx0);
3165         ldd     [cmul_arr+96],%f0       ! LOAD C2ONM149
3166         sra     %o4,28,%o4              ! itmp0 >>= 28;

3168         and     %o4,-8,%o4              ! itmp0 = -8;
3169         fitod   %f2,%f2                 ! dtmp0 = (double) *(int*)&fx0;

3171         fmuld   %f2,%f0,%f2             ! dtmp0 *= C2ONM149;
3172         ldd     [cmul_arr+%o4],%f0      ! dsign = *(double*)((char*)cmul_arr + i

3174         fmuld   %f2,%f0,%f2             ! dtmp0 *= dsign;
3175 1:
3176         sll     %l5,5,%l6               ! (4_0) ltmp0 = ldiff0 << 5;
3177         sra     %l3,27,%o5              ! (4_0) signx0 = ux0 >> 27;

3179         ba      .den5
3180         sra     %l4,28,%o4              ! (4_0) signy0 = uy0 >> 28;

3182         .align  16
3183 .u0:
3184         ba      .c0
3185         or      %g0,_0x7fffffff,%o5
3186 .u1:
3187         ba      .c1
3188         or      %g0,_0x7fffffff,%o5
3189 .u2:
3190         ba      .c2
3191         or      %g0,_0x7f800000,%o5
3192 .u3:
3193         ba      .c3
3194         or      %g0,_0x7f800000,%o5
3195 .u4:
3196         ba      .c4
3197         or      %g0,_0x7fffffff,%o5
3198 .u5:
3199         ba      .c5
3200         or      %g0,_0x7fffffff,%o5
3201 .u6:
3202         ba      .c6
3203         or      %g0,_0x7f800000,%o5
3204 .u7:
3205         ba      .c7
3206         or      %g0,_0x7f800000,%o5
3207 .u8:
3208         ba      .c8
3209         or      %g0,_0x7fffffff,%o5
3210 .u9:
3211         ba      .c9
3212         or      %g0,_0x7fffffff,%o5
3213 .u10:
3214         ba      .c10
3215         or      %g0,_0x7f800000,%o5
3216 .u11:
3217         ba      .c11
3218         or      %g0,_0x7f800000,%o5
3219 .u12:
3220         ba      .c12
3221         or      %g0,_0x7fffffff,%o5
3222 .u13:
3223         ba      .c13
3224         or      %g0,_0x7fffffff,%o5
3225 .u14:
3226         ba      .c14
3227         or      %g0,_0x7f800000,%o5
3228 .u15:
3229         ba      .c15
```



```
3230         or      %g0,_0x7f800000,%o5
3231 .u16:
3232         ba      .c16
3233         or      %g0,_0x7fffffff,%o5
3234 .u17:
3235         ba      .c17
3236         or      %g0,_0x7fffffff,%o5
3237 .u18:
3238         ba      .c18
3239         or      %g0,_0x7f800000,%o5
3240 .u19:
3241         ba      .c19
3242         or      %g0,_0x7f800000,%o5
3243 .u20:
3244         ba      .c20
3245         or      %g0,_0x7fffffff,%o5
3246 .u21:
3247         ba      .c21
3248         or      %g0,_0x7fffffff,%o5
3249 .u22:
3250         ba      .c22
3251         or      %g0,_0x7f800000,%o5
3252 .u23:
3253         ba      .c23
3254         or      %g0,_0x7f800000,%o5
3255 .u24:
3256         ba      .c24
3257         or      %g0,_0x7fffffff,%o5
3258 .u25:
3259         ba      .c25
3260         or      %g0,_0x7fffffff,%o5
3261 .u26:
3262         ba      .c26
3263         or      %g0,_0x7f800000,%o5
3264 .u27:
3265         ba      .c27
3266         or      %g0,_0x7f800000,%o5
3267 .u28:
3268         ba      .c28
3269         or      %g0,_0x7fffffff,%o5
3270 .u29:
3271         ba      .c29
3272         or      %g0,_0x7fffffff,%o5
3273 .u30:
3274         ba      .c30
3275         or      %g0,_0x7f800000,%o5
3276 .u31:
3277         ba      .c31
3278         or      %g0,_0x7f800000,%o5
3279 .u32:
3280         ba      .c32
3281         or      %g0,_0x7fffffff,%o5
3282 .u33:
3283         ba      .c33
3284         or      %g0,_0x7fffffff,%o5
3285 .u34:
3286         ba      .c34
3287         or      %g0,_0x7f800000,%o5
3288 .u35:
3289         ba      .c35
3290         or      %g0,_0x7f800000,%o5
3291 .u36:
3292         ba      .c36
3293         or      %g0,_0x7fffffff,%o5
3294 .u37:
3295         ba      .c37
```

```
3296         or      %g0,_0x7fffffff,%o5
3297 .u38:
3298         ba      .c38
3299         or      %g0,_0x7f800000,%o5
3300 .u39:
3301         ba      .c39
3302         or      %g0,_0x7f800000,%o5
3303 .up0:
3304         ba      .co0
3305         or      %g0,_0x7fffffff,%o5
3306 .up1:
3307         ba      .co1
3308         or      %g0,_0x7fffffff,%o5
3309 .up2:
3310         ba      .co2
3311         or      %g0,_0x7f800000,%o5
3312 .up3:
3313         ba      .co3
3314         or      %g0,_0x7f800000,%o5
3315 .up4:
3316         ba      .co4
3317         or      %g0,_0x7fffffff,%o5
3318 .up5:
3319         ba      .co5
3320         or      %g0,_0x7fffffff,%o5
3321 .up6:
3322         ba      .co6
3323         or      %g0,_0x7f800000,%o5
3324 .up7:
3325         ba      .co7
3326         or      %g0,_0x7f800000,%o5
3327 .up8:
3328         ba      .co8
3329         or      %g0,_0x7fffffff,%o5
3330 .up9:
3331         ba      .co9
3332         or      %g0,_0x7fffffff,%o5
3333 .up10:
3334         ba      .co10
3335         or      %g0,_0x7f800000,%o5
3336 .up11:
3337         ba      .co11
3338         or      %g0,_0x7f800000,%o5
3339 .up12:
3340         ba      .co12
3341         or      %g0,_0x7fffffff,%o5
3342 .up13:
3343         ba      .co13
3344         or      %g0,_0x7fffffff,%o5
3345 .up14:
3346         ba      .co14
3347         or      %g0,_0x7f800000,%o5
3348 .up15:
3349         ba      .co15
3350         or      %g0,_0x7f800000,%o5
3351 .up16:
3352         ba      .co16
3353         or      %g0,_0x7fffffff,%o5
3354 .up17:
3355         ba      .co17
3356         or      %g0,_0x7fffffff,%o5
3357 .up18:
3358         ba      .co18
3359         or      %g0,_0x7f800000,%o5
3360 .up19:
3361         ba      .co19
```



```
3362         or      %g0,_0x7f800000,%o5
3363 .up20:
3364         ba      .co20
3365         or      %g0,_0x7fffffff,%o5
3366 .up21:
3367         ba      .co21
3368         or      %g0,_0x7fffffff,%o5
3369 .up22:
3370         ba      .co22
3371         or      %g0,_0x7f800000,%o5
3372 .up23:
3373         ba      .co23
3374         or      %g0,_0x7f800000,%o5
3375 .exit:
3376         ret
3377         restore
3378         SET_SIZE(__vatan2f)
```

```
**********************************************************
   54394 Sat May 10 12:09:57 2014
new/usr/src/lib/libmvec/common/vis/__vatanf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vatanf.S"

#include "libm.h"

        RO_DATA
        .align  64

.CONST_TBL:
        .word   0x3feffffc, 0xfffccbbc  ! K0 =  9.99999999976686608841e-01
        .word   0xbfd55554, 0x51c6b90f  ! K1 = -3.33333091601972730504e-01
        .word   0x3fc98d6d, 0x926596cc  ! K2 =  1.99628540499523379702e-01
        .word   0x00020000, 0x00000000  ! DC1
        .word   0xfffc0000, 0x00000000  ! DC2
        .word   0x7ff00000, 0x00000000  ! DC3
        .word   0x3ff00000, 0x00000000  ! DONE = 1.0
        .word   0x40000000, 0x00000000  ! DTWO = 2.0

! parr0 = *(int*)&(1.0 / *(double*)&(((long long)i << 45) | 0x3ff0100000000000UL

        .word   0x7fdfe01f, 0x7fdfa11c, 0x7fdf6310, 0x7fdf25f6
        .word   0x7fdee9c7, 0x7fdeae80, 0x7fde741a, 0x7fde3a91
        .word   0x7fde01e0, 0x7fddca01, 0x7fdd92f2, 0x7fdd5cac
        .word   0x7fdd272c, 0x7fdcf26e, 0x7fdcbe6d, 0x7fdc8b26
        .word   0x7fdc5894, 0x7fdc26b5, 0x7fdbf583, 0x7fdbc4fd
        .word   0x7fdb951e, 0x7fdb65e2, 0x7fdb3748, 0x7fdb094b
        .word   0x7fdadbe8, 0x7fdaaf1d, 0x7fda82e6, 0x7fda5741
        .word   0x7fda2c2a, 0x7fda01a0, 0x7fd9d79f, 0x7fd9ae24
        .word   0x7fd9852f, 0x7fd95cbb, 0x7fd934c6, 0x7fd90d4f
        .word   0x7fd8e652, 0x7fd8bfce, 0x7fd899c0, 0x7fd87427
        .word   0x7fd84f00, 0x7fd82a4a, 0x7fd80601, 0x7fd7e225
        .word   0x7fd7beb3, 0x7fd79baa, 0x7fd77908, 0x7fd756ca
        .word   0x7fd734f0, 0x7fd71378, 0x7fd6f260, 0x7fd6d1a6
        .word   0x7fd6b149, 0x7fd69147, 0x7fd6719f, 0x7fd6524f
```



```
        .word   0x7fd63356, 0x7fd614b3, 0x7fd5f664, 0x7fd5d867
        .word   0x7fd5babc, 0x7fd59d61, 0x7fd58056, 0x7fd56397
        .word   0x7fd54725, 0x7fd52aff, 0x7fd50f22, 0x7fd4f38f
        .word   0x7fd4d843, 0x7fd4bd3e, 0x7fd4a27f, 0x7fd48805
        .word   0x7fd46dce, 0x7fd453d9, 0x7fd43a27, 0x7fd420b5
        .word   0x7fd40782, 0x7fd3ee8f, 0x7fd3d5d9, 0x7fd3bd60
        .word   0x7fd3a524, 0x7fd38d22, 0x7fd3755b, 0x7fd35dce
        .word   0x7fd34679, 0x7fd32f5c, 0x7fd31877, 0x7fd301c8
        .word   0x7fd2eb4e, 0x7fd2d50a, 0x7fd2bef9, 0x7fd2a91c
        .word   0x7fd29372, 0x7fd27dfa, 0x7fd268b3, 0x7fd2539d
        .word   0x7fd23eb7, 0x7fd22a01, 0x7fd21579, 0x7fd20120
        .word   0x7fd1ecf4, 0x7fd1d8f5, 0x7fd1c522, 0x7fd1b17c
        .word   0x7fd19e01, 0x7fd18ab0, 0x7fd1778a, 0x7fd1648d
        .word   0x7fd151b9, 0x7fd13f0e, 0x7fd12c8b, 0x7fd11a30
        .word   0x7fd107fb, 0x7fd0f5ed, 0x7fd0e406, 0x7fd0d244
        .word   0x7fd0c0a7, 0x7fd0af2f, 0x7fd09ddb, 0x7fd08cab
        .word   0x7fd07b9f, 0x7fd06ab5, 0x7fd059ee, 0x7fd04949
        .word   0x7fd038c6, 0x7fd02864, 0x7fd01824, 0x7fd00804

        .word   0x3ff00000, 0x00000000  !  1.0
        .word   0xbff00000, 0x00000000  ! -1.0

! parr1[i] = atan((double)*(float*)&((i + 460) << 21)), i = [0, 155]

        .word   0x3f2fffff, 0xf555555c, 0x3f33ffff, 0xf595555f
        .word   0x3f37ffff, 0xee000018, 0x3f3bffff, 0xe36aaadf
        .word   0x3f3fffff, 0xd55555bc, 0x3f43ffff, 0xd65555f2
        .word   0x3f47ffff, 0xb8000185, 0x3f4bffff, 0x8daaadf3
        .word   0x3f4fffff, 0x55555bbc, 0x3f53ffff, 0x59555f19
        .word   0x3f57fffe, 0xe000184d, 0x3f5bfffe, 0x36aadf30
        .word   0x3f5ffffd, 0x5555bbbc, 0x3f63fffd, 0x6555f195
        .word   0x3f67fffb, 0x800184cc, 0x3f6bfff8, 0xdaadf302
        .word   0x3f6ffff5, 0x555bbbb7, 0x3f73fff5, 0x955f194a
        .word   0x3f77ffee, 0x00184ca6, 0x3f7bffe3, 0x6adf2fd1
        .word   0x3f7fffd5, 0x55bbba97, 0x3f83ffd6, 0x55f1929c
        .word   0x3f87ffb8, 0x0184c30a, 0x3f8bff8d, 0xadf2e78c
        .word   0x3f8fff55, 0x5bbb729b, 0x3f93ff59, 0x5f18a700
        .word   0x3f97fee0, 0x184a5c36, 0x3f9bfe36, 0xdf291712
        .word   0x3f9ffd55, 0xbba97625, 0x3fa3fd65, 0xf169c9d9
        .word   0x3fa7fb81, 0x8430da2a, 0x3fabf8dd, 0xf139c444
        .word   0x3faff55b, 0xb72cfdea, 0x3fb3f59f, 0x0e7c559d
        .word   0x3fb7ee18, 0x2602f10f, 0x3fbbe39e, 0xbe6f07c4
        .word   0x3fbfd5ba, 0x9aac2f6e, 0x3fc3d6ee, 0xe8c6626c
        .word   0x3fc7b97b, 0x4bce5b02, 0x3fcb90d7, 0x529260a2
        .word   0x3fcf5b75, 0xf92c80dd, 0x3fd36277, 0x3707ebcc
        .word   0x3fd6f619, 0x41e4def1, 0x3fda64ee, 0xc3cc23fd
        .word   0x3fddac67, 0x0561bb4f, 0x3fe1e00b, 0xabdefeb4
        .word   0x3fe4978f, 0xa3269ee1, 0x3fe700a7, 0xc5784634
        .word   0x3fe921fb, 0x54442d18, 0x3fecac7c, 0x57846f9e
        .word   0x3fef730b, 0xd281f69b, 0x3ff0d38f, 0x2c5ba09f
        .word   0x3ff1b6e1, 0x92ebbe44, 0x3ff30b6d, 0x796a4da8
        .word   0x3ff3fc17, 0x6b7a8560, 0x3ff4ae10, 0xfc6589a5
        .word   0x3ff5368c, 0x951e9cfd, 0x3ff5f973, 0x15254857
        .word   0x3ff67d88, 0x63bc99bd, 0x3ff6dcc5, 0x7bb565fd
        .word   0x3ff7249f, 0xaa996a21, 0x3ff789bd, 0x2c160054
        .word   0x3ff7cd6f, 0x6dc59db4, 0x3ff7fde8, 0x0870c2a0
        .word   0x3ff82250, 0x768ac529, 0x3ff8555a, 0x2787981f
        .word   0x3ff87769, 0xeb8e956b, 0x3ff88fc2, 0x18ace9dc
        .word   0x3ff8a205, 0xfd558740, 0x3ff8bb9a, 0x63718f45
        .word   0x3ff8cca9, 0x27cf0b3d, 0x3ff8d8d8, 0xbf65316f
        .word   0x3ff8e1fc, 0xa98cb633, 0x3ff8eec8, 0xcfd00665
        .word   0x3ff8f751, 0x0eba96e6, 0x3ff8fd69, 0x4acf36b0
        .word   0x3ff901fb, 0x7eee715e, 0x3ff90861, 0xd082d9b5
        .word   0x3ff90ca6, 0x0b9322c5, 0x3ff90fb2, 0x37a7ea27
        .word   0x3ff911fb, 0x59997f3a, 0x3ff9152e, 0x8a326c38
        .word   0x3ff91750, 0xab2e0d12, 0x3ff918d6, 0xc2f9c9e2
```

```
128         .word   0x3ff919fb, 0x54eed7a9, 0x3ff91b94, 0xee352849
129         .word   0x3ff91ca5, 0xff216922, 0x3ff91d69, 0x0b3f72ff
130         .word   0x3ff91dfb, 0x5459826d, 0x3ff91ec8, 0x211be619
131         .word   0x3ff91f50, 0xa99fd49a, 0x3ff91fb2, 0x2fb5defa
132         .word   0x3ff91ffb, 0x5446d7c3, 0x3ff92061, 0xbaabf105
133         .word   0x3ff920a5, 0xfeefa208, 0x3ff920d6, 0xc1fb87e7
134         .word   0x3ff920fb, 0x5444826e, 0x3ff9212e, 0x87778bfc
135         .word   0x3ff92150, 0xa9999bb6, 0x3ff92169, 0x0b1faabb
136         .word   0x3ff9217b, 0x544437c3, 0x3ff92194, 0xedddcc28
137         .word   0x3ff921a5, 0xfeeedaec, 0x3ff921b2, 0x2fb1e5f1
138         .word   0x3ff921bb, 0x54442e6e, 0x3ff921c8, 0x2110fa94
139         .word   0x3ff921d0, 0xa99982d3, 0x3ff921d6, 0xc1fb08c6
140         .word   0x3ff921db, 0x54442d43, 0x3ff921e1, 0xbaaa9395
141         .word   0x3ff921e5, 0xfeeed7d0, 0x3ff921e9, 0x0b1f9ad7
142         .word   0x3ff921eb, 0x54442d1e, 0x3ff921ee, 0x8777604e
143         .word   0x3ff921f0, 0xa999826f, 0x3ff921f2, 0x2fb1e3f5
144         .word   0x3ff921f3, 0x54442d19, 0x3ff921f4, 0xedddc6b2
145         .word   0x3ff921f5, 0xfeeed7c3, 0x3ff921f6, 0xc1fb0886
146         .word   0x3ff921f7, 0x54442d18, 0x3ff921f8, 0x2110f9e5
147         .word   0x3ff921f8, 0xa999826e, 0x3ff921f9, 0x0b1f9acf
148         .word   0x3ff921f9, 0x54442d18, 0x3ff921f9, 0xbaaa937f
149         .word   0x3ff921f9, 0xfeeed7c3, 0x3ff921fa, 0x2fb1e3f4
150         .word   0x3ff921fa, 0x54442d18, 0x3ff921fa, 0x8777604b
151         .word   0x3ff921fa, 0xa999826e, 0x3ff921fa, 0xc1fb0886
152         .word   0x3ff921fa, 0xd4442d18, 0x3ff921fa, 0xedddc6b2
153         .word   0x3ff921fa, 0xfeeed7c3, 0x3ff921fb, 0x0b1f9acf
154         .word   0x3ff921fb, 0x14442d18, 0x3ff921fb, 0x2110f9e5
155         .word   0x3ff921fb, 0x2999826e, 0x3ff921fb, 0x2fb1e3f4
156         .word   0x3ff921fb, 0x34442d18, 0x3ff921fb, 0x3aaa937f
157         .word   0x3ff921fb, 0x3eeed7c3, 0x3ff921fb, 0x41fb0886
158         .word   0x3ff921fb, 0x44442d18, 0x3ff921fb, 0x4777604b
159         .word   0x3ff921fb, 0x4999826e, 0x3ff921fb, 0x4b1f9acf
160         .word   0x3ff921fb, 0x4c442d18, 0x3ff921fb, 0x4dddc6b2
161         .word   0x3ff921fb, 0x4eeed7c3, 0x3ff921fb, 0x4fb1e3f4
162         .word   0x3ff921fb, 0x50442d18, 0x3ff921fb, 0x5110f9e5
163         .word   0x3ff921fb, 0x5199826e, 0x3ff921fb, 0x51fb0886

165 #define DC2             %f2
166 #define DTWO            %f6
167 #define DONE            %f52
168 #define K0              %f54
169 #define K1              %f56
170 #define K2              %f58
171 #define DC1             %f60
172 #define DC3             %f62

174 #define stridex         %o2
175 #define stridey         %o3
176 #define MASK_0x7fffffff %i1
177 #define MASK_0x100000   %i5

179 #define tmp_px          STACK_BIAS-32
180 #define tmp_counter     STACK_BIAS-24
181 #define tmp0            STACK_BIAS-16
182 #define tmp1            STACK_BIAS-8

184 #define counter         %l1

186 ! sizeof temp storage - must be a multiple of 16 for V9
187 #define tmps            0x20

189 !--------------------------------------------------------------------
190 !               !!!!!   vatanf algorithm        !!!!!
191 !  ux = ((int*)px)[0];
192 !  ax = ux & 0x7fffffff;
193 !
```



```
194 !  if ( ax < 0x39b89c55 )
195 !  {
196 !    *(int*)py = ux;
197 !    goto next;
198 !  }
199 !
200 !  if ( ax > 0x4c700518 )
201 !  {
202 !    if ( ax > 0x7f800000 )
203 !    {
204 !      float fpx = fabsf(*px);
205 !      fpx *= fpx;
206 !      *py = fpx;
207 !      goto next;
208 !    }
209 !
210 !    sign = ux & 0x80000000;
211 !    sign |= pi_2;
212 !    *(int*)py = sign;
213 !    goto next;
214 !  }
215 !
216 !  ftmp0 = *px;
217 !  x = (double)ftmp0;
218 !  px += stridex;
219 !  y = vis_fpadd32(x,DC1);
220 !  y = vis_fand(y,DC2);
221 !  div = x * y;
222 !  xx = x - y;
223 !  div += DONE;
224 !  i = ((unsigned long long*)&div)[0];
225 !  y0 = vis_fand(div,DC3);
226 !  i >>= 43;
227 !  i &= 508;
228 !  *(float*)&dtmp0 = *(float*)((char*)parr0 + i);
229 !  y0 = vis_fpsub32(dtmp0, y0);
230 !  dtmp0 = div0 * y0;
231 !  dtmp0 = DTWO - dtmp0;
232 !  y0 *= dtmp0;
233 !  dtmp1 = div0 * y0;
234 !  dtmp1 = DTWO - dtmp1;
235 !  y0 *= dtmp1;
236 !  ax = ux & 0x7fffffff;
237 !  ax += 0x00100000;
238 !  ax >>= 18;
239 !  ax &= -8;
240 !  res = *(double*)((char*)parr1 + ax);
241 !  ux >>= 28;
242 !  ux &= -8;
243 !  dtmp0 = *(double*)((char*)sign_arr + ux);
244 !  res *= dtmp0;
245 !  xx *= y0;
246 !  x2 = xx * xx;
247 !  dtmp0 = K2 * x2;
248 !  dtmp0 += K1;
249 !  dtmp0 *= x2;
250 !  dtmp0 += K0;
251 !  dtmp0 *= xx;
252 !  res += dtmp0;
253 !  ftmp0 = (float)res;
254 !  py[0] = ftmp0;
255 !  py += stridey;
256 !--------------------------------------------------------------------

258         ENTRY(__vatanf)
259         save    %sp,-SA(MINFRAME)-tmps,%sp
```

```
260         PIC_SETUP(l7)
261         PIC_SET(l7,.CONST_TBL,l2)

263         st      %i0,[%fp+tmp_counter]

265         sllx    %i2,2,stridex
266         sllx    %i4,2,stridey

268         or      %g0,%i3,%o1
269         stx     %i1,[%fp+tmp_px]

271         ldd     [%l2],K0
272         ldd     [%l2+8],K1
273         ldd     [%l2+16],K2
274         ldd     [%l2+24],DC1
275         ldd     [%l2+32],DC2
276         ldd     [%l2+40],DC3
277         ldd     [%l2+48],DONE
278         ldd     [%l2+56],DTWO

280         add     %l2,64,%i4
281         add     %l2,64+512,%l0
282         add     %l2,64+512+16-0x1cc*8,%l7

284         sethi   %hi(0x100000),MASK_0x100000
285         sethi   %hi(0x7ffffc00),MASK_0x7fffffff
286         add     MASK_0x7fffffff,1023,MASK_0x7fffffff

288         sethi   %hi(0x39b89c00),%o4
289         add     %o4,0x55,%o4
290         sethi   %hi(0x4c700400),%o5
291         add     %o5,0x118,%o5

293 .begin:
294         ld      [%fp+tmp_counter],counter
295         ldx     [%fp+tmp_px],%i3
296         st      %g0,[%fp+tmp_counter]
297 .begin1:
298         cmp     counter,0
299         ble,pn  %icc,.exit
300         nop

302         lda     [%i3]0x82,%l6           ! (0_0) ux = ((int*)px)[0];

304         and     %l6,MASK_0x7fffffff,%l5 ! (0_0) ax = ux & 0x7fffffff;
305         lda     [%i3]0x82,%f0           ! (0_0) ftmp0 = *px;

307         cmp     %l5,%o4                 ! (0_0) ax ? 0x39b89c55
308         bl,pn   %icc,.spec0             ! (0_0) if ( ax < 0x39b89c55 )
309         nop

311         cmp     %l5,%o5                 ! (0_0) ax ? 0x4c700518
312         bg,pn   %icc,.spec1             ! (0_0) if ( ax > 0x4c700518 )
313         nop

315         add     %i3,stridex,%l5         ! px += stridex;
316         fstod   %f0,%f22                ! (0_0) ftmp0 = *px;
317         mov     %l6,%i3

319         lda     [%l5]0x82,%l6           ! (1_0) ux = ((int*)px)[0];

321         and     %l6,MASK_0x7fffffff,%o7 ! (1_0) ax = ux & 0x7fffffff;
322         lda     [%l5]0x82,%f0           ! (1_0) ftmp0 = *px;
323         add     %l5,stridex,%l4         ! px += stridex;
324         fpadd32 %f22,DC1,%f24           ! (0_0) y = vis_fpadd32(x,dconst1);
```



```
326         cmp     %o7,%o4                 ! (1_0) ax ? 0x39b89c55
327         bl,pn   %icc,.update0           ! (1_0) if ( ax < 0x39b89c55 )
328         nop
329 .cont0:
330         cmp     %o7,%o5                 ! (1_0) ax ? 0x4c700518
331         bg,pn   %icc,.update1           ! (1_0) if ( ax > 0x4c700518 )
332         nop
333 .cont1:
334         fstod   %f0,%f20                ! (1_0) x = (double)ftmp0;
335         mov     %l6,%l5

337         fand    %f24,DC2,%f26           ! (0_0) y = vis_fand(y,dconst2);

339         fmuld   %f22,%f26,%f32          ! (0_0) div = x * y;

341         lda     [%l4]0x82,%l6           ! (2_0) ux = ((int*)px)[0];
342         fsubd   %f22,%f26,%f22          ! (0_0) xx = x - y;

344         and     %l6,MASK_0x7fffffff,%o7 ! (2_0) ax = ux & 0x7fffffff;
345         lda     [%l4]0x82,%f0           ! (2_0) ftmp0 = *px;
346         add     %l4,stridex,%l3         ! px += stridex;
347         fpadd32 %f20,DC1,%f24           ! (1_0) y = vis_fpadd32(x,dconst1);

349         cmp     %o7,%o4                 ! (2_0) ax ? 0x39b89c55
350         bl,pn   %icc,.update2           ! (2_0) if ( ax < 0x39b89c55 )
351         faddd   DONE,%f32,%f32          ! (0_0) div += done;
352 .cont2:
353         cmp     %o7,%o5                 ! (2_0) ax ? 0x4c700518
354         bg,pn   %icc,.update3           ! (2_0) if ( ax > 0x4c700518 )
355         nop
356 .cont3:
357         std     %f32,[%fp+tmp0]         ! (0_0) i = ((unsigned long long*)&div)[
358         mov     %l6,%l4
359         fstod   %f0,%f18                ! (2_0) x = (double)ftmp0;

361         fand    %f24,DC2,%f26           ! (1_0) y = vis_fand(y,dconst2);

363         fmuld   %f20,%f26,%f30          ! (1_0) div = x * y;

365         lda     [%l3]0x82,%l6           ! (3_0) ux = ((int*)px)[0];
366         fsubd   %f20,%f26,%f20          ! (1_0) xx = x - y;

368         and     %l6,MASK_0x7fffffff,%o7 ! (3_0) ax = ux & 0x7fffffff;
369         lda     [%l3]0x82,%f0           ! (3_0) ftmp0 = *px;
370         add     %l3,stridex,%i0         ! px += stridex;
371         fpadd32 %f18,DC1,%f24           ! (2_0) y = vis_fpadd32(x,dconst1);

373         cmp     %o7,%o4                 ! (3_0) ax ? 0x39b89c55
374         bl,pn   %icc,.update4           ! (3_0) if ( ax < 0x39b89c55 )
375         faddd   DONE,%f30,%f30          ! (1_0) div += done;
376 .cont4:
377         cmp     %o7,%o5                 ! (3_0) ax ? 0x4c700518
378         bg,pn   %icc,.update5           ! (3_0) if ( ax > 0x4c700518 )
379         nop
380 .cont5:
381         std     %f30,[%fp+tmp1]         ! (1_0) i = ((unsigned long long*)&div)[
382         mov     %l6,%l3
383         fstod   %f0,%f16                ! (3_0) x = (double)ftmp0;

385         ldx     [%fp+tmp0],%o0          ! (0_0) i = ((unsigned long long*)&div)[
386         fand    %f24,DC2,%f26           ! (2_0) y = vis_fand(y,dconst2);

388         fand    %f32,DC3,%f24           ! (0_0) y0 = vis_fand(div,dconst3);

390         srlx    %o0,43,%o0              ! (0_0) i >>= 43;
```

```
392         and     %o0,508,%l6             ! (0_0) i &= 508;

394         ld      [%i4+%l6],%f0           ! (0_0) *(float*)&dtmp0 = *(float*)((cha

396         fmuld   %f18,%f26,%f28          ! (2_0) div = x * y;

398         lda     [%i0]0x82,%l6           ! (4_0) ux = ((int*)px)[0];
399         fsubd   %f18,%f26,%f18          ! (2_0) xx = x - y;

401         fpsub32 %f0,%f24,%f40           ! (0_0) y0 = vis_fpsub32(dtmp0, y0);

403         and     %l6,MASK_0x7fffffff,%o7 ! (4_0) ax = ux & 0x7fffffff;
404         lda     [%i0]0x82,%f0           ! (4_0) ftmp0 = *px;
405         add     %i0,stridex,%i2         ! px += stridex;
406         fpadd32 %f16,DC1,%f24           ! (3_0) y = vis_fpadd32(x,dconst1);

408         cmp     %o7,%o4                 ! (4_0) ax ? 0x39b89c55
409         bl,pn   %icc,.update6           ! (4_0) if ( ax < 0x39b89c55 )
410         faddd   DONE,%f28,%f28          ! (2_0) div += done;
411 .cont6:
412         fmuld   %f32,%f40,%f42          ! (0_0) dtmp0 = div0 * y0;
413         cmp     %o7,%o5                 ! (4_0) ax ? 0x4c700518
414         bg,pn   %icc,.update7           ! (4_0) if ( ax > 0x4c700518 )
415         nop
416 .cont7:
417         std     %f28,[%fp+tmp0]         ! (2_0) i = ((unsigned long long*)&div)[
418         mov     %l6,%i0
419         fstod   %f0,%f14                ! (4_0) x = (double)ftmp0;

421         ldx     [%fp+tmp1],%g1          ! (1_0) i = ((unsigned long long*)&div)[
422         fand    %f24,DC2,%f26           ! (3_0) y = vis_fand(y,dconst2);

424         fand    %f30,DC3,%f24           ! (1_0) y0 = vis_fand(div,dconst3);

426         fsubd   DTWO,%f42,%f44          ! (0_0) dtmp0 = dtwo - dtmp0;
427         srlx    %g1,43,%g1              ! (1_0) i >>= 43;

429         and     %g1,508,%l6             ! (1_0) i &= 508;

431         ld      [%i4+%l6],%f0           ! (1_0) *(float*)&dtmp0 = *(float*)((cha

433         fmuld   %f16,%f26,%f34          ! (3_0) div = x * y;

435         lda     [%i2]0x82,%l6           ! (5_0) ux = ((int*)px)[0];
436         fsubd   %f16,%f26,%f16          ! (3_0) xx = x - y;

438         fpsub32 %f0,%f24,%f38           ! (1_0) y0 = vis_fpsub32(dtmp0, y0);
439         add     %i2,stridex,%l2         ! px += stridex;

441         fmuld   %f40,%f44,%f40          ! (0_0) y0 *= dtmp0;
442         and     %l6,MASK_0x7fffffff,%o7 ! (5_0) ax = ux & 0x7fffffff;
443         lda     [%i2]0x82,%f0           ! (5_0) ftmp0 = *px;
444         fpadd32 %f14,DC1,%f24           ! (4_0) y = vis_fpadd32(x,dconst1);

446         cmp     %o7,%o4                 ! (5_0) ax ? 0x39b89c55
447         bl,pn   %icc,.update8           ! (5_0) if ( ax < 0x39b89c55 )
448         faddd   DONE,%f34,%f34          ! (3_0) div += done;
449 .cont8:
450         fmuld   %f30,%f38,%f42          ! (1_0) dtmp0 = div0 * y0;
451         cmp     %o7,%o5                 ! (5_0) ax ? 0x4c700518
452         bg,pn   %icc,.update9           ! (5_0) if ( ax > 0x4c700518 )
453         nop
454 .cont9:
455         std     %f34,[%fp+tmp1]         ! (3_0) i = ((unsigned long long*)&div)[
456         mov     %l6,%i2
457         fstod   %f0,%f36                ! (5_0) x = (double)ftmp0;
```



```
459         fmuld   %f32,%f40,%f32          ! (0_0) dtmp1 = div0 * y0;
460         ldx     [%fp+tmp0],%o0          ! (2_0) i = ((unsigned long long*)&div)[
461         fand    %f24,DC2,%f26           ! (4_0) y = vis_fand(y,dconst2);

463         fand    %f28,DC3,%f24           ! (2_0) y0 = vis_fand(div,dconst3);

465         fsubd   DTWO,%f42,%f44          ! (1_0) dtmp0 = dtwo - dtmp0;
466         srlx    %o0,43,%o0              ! (2_0) i >>= 43;

468         and     %o0,508,%l6             ! (2_0) i &= 508;
469         fsubd   DTWO,%f32,%f46          ! (0_0) dtmp1 = dtwo - dtmp1;

471         ld      [%i4+%l6],%f0           ! (2_0) *(float*)&dtmp0 = *(float*)((cha

473         fmuld   %f14,%f26,%f32          ! (4_0) div = x * y;

475         lda     [%l2]0x82,%l6           ! (6_0) ux = ((int*)px)[0];
476         fsubd   %f14,%f26,%f14          ! (4_0) xx = x - y;

478         fmuld   %f40,%f46,%f26          ! (0_0) y0 *= dtmp1;
479         add     %l2,stridex,%g5         ! px += stridex;
480         fpsub32 %f0,%f24,%f40           ! (2_0) y0 = vis_fpsub32(dtmp0, y0);

482         fmuld   %f38,%f44,%f38          ! (1_0) y0 *= dtmp0;
483         and     %l6,MASK_0x7fffffff,%o7 ! (6_0) ax = ux & 0x7fffffff;
484         lda     [%l2]0x82,%f0           ! (6_0) ftmp0 = *px;
485         fpadd32 %f36,DC1,%f24           ! (5_0) y = vis_fpadd32(x,dconst1);

487         cmp     %o7,%o4                 ! (6_0) ax ? 0x39b89c55
488         bl,pn   %icc,.update10          ! (6_0) if ( ax < 0x39b89c55 )
489         faddd   DONE,%f32,%f32          ! (4_0) div += done;
490 .cont10:
491         fmuld   %f28,%f40,%f42          ! (2_0) dtmp0 = div0 * y0;
492         cmp     %o7,%o5                 ! (6_0) ax ? 0x4c700518
493         bg,pn   %icc,.update11          ! (6_0) if ( ax > 0x4c700518 )
494         nop
495 .cont11:
496         fmuld   %f22,%f26,%f22          ! (0_0) xx *= y0;
497         mov     %l6,%l2
498         std     %f32,[%fp+tmp0]         ! (4_0) i = ((unsigned long long*)&div)[
499         fstod   %f0,%f10                ! (6_0) x = (double)ftmp0;

501         fmuld   %f30,%f38,%f30          ! (1_0) dtmp1 = div0 * y0;
502         ldx     [%fp+tmp1],%g1          ! (3_0) i = ((unsigned long long*)&div)[
503         fand    %f24,DC2,%f26           ! (5_0) y = vis_fand(y,dconst2);

505         fand    %f34,DC3,%f24           ! (3_0) y0 = vis_fand(div,dconst3);

507         fmuld   %f22,%f22,%f50          ! (0_0) x2 = xx * xx;
508         srlx    %g1,43,%g1              ! (3_0) i >>= 43;
509         fsubd   DTWO,%f42,%f44          ! (2_0) dtmp0 = dtwo - dtmp0;

511         and     %g1,508,%l6             ! (3_0) i &= 508;
512         mov     %i3,%o7
513         fsubd   DTWO,%f30,%f46          ! (1_0) dtmp1 = dtwo - dtmp1;

515         ld      [%i4+%l6],%f0           ! (3_0) *(float*)&dtmp0 = *(float*)((cha

517         fmuld   %f36,%f26,%f30          ! (5_0) div = x * y;
518         srl     %o7,28,%g1              ! (0_0) ux >>= 28;
519         add     %g5,stridex,%i3         ! px += stridex;

521         fmuld   K2,%f50,%f4             ! (0_0) dtmp0 = K2 * x2;
522         and     %o7,MASK_0x7fffffff,%o0 ! (0_0) ax = ux & 0x7fffffff;
523         lda     [%g5]0x82,%l6           ! (7_0) ux = ((int*)px)[0];
```

```
524         fsubd   %f36,%f26,%f36          ! (5_0) xx = x - y;

526         fmuld   %f38,%f46,%f26          ! (1_0) y0 *= dtmp1;
527         add     %o0,MASK_0x100000,%o0   ! (0_0) ax += 0x00100000;
528         and     %g1,-8,%g1              ! (0_0) ux &= -8;
529         fpsub32 %f0,%f24,%f38           ! (3_0) y0 = vis_fpsub32(dtmp0, y0);

531         fmuld   %f40,%f44,%f40          ! (2_0) y0 *= dtmp0;
532         and     %l6,MASK_0x7fffffff,%o7 ! (7_0) ax = ux & 0x7fffffff;
533         lda     [%g5]0x82,%f0           ! (7_0) ftmp0 = *px;
534         fpadd32 %f10,DC1,%f24           ! (6_0) y = vis_fpadd32(x,dconst1);

536         cmp     %o7,%o4                 ! (7_0) ax ? 0x39b89c55
537         bl,pn   %icc,.update12          ! (7_0) if ( ax < 0x39b89c55 )
538         faddd   DONE,%f30,%f30          ! (5_0) div += done;
539 .cont12:
540         fmuld   %f34,%f38,%f42          ! (3_0) dtmp0 = div0 * y0;
541         cmp     %o7,%o5                 ! (7_0) ax ? 0x4c700518
542         bg,pn   %icc,.update13          ! (7_0) if ( ax > 0x4c700518 )
543         faddd   %f4,K1,%f4              ! (0_0) dtmp0 += K1;
544 .cont13:
545         fmuld   %f20,%f26,%f20          ! (1_0) xx *= y0;
546         srl     %o0,18,%o7              ! (0_0) ax >>= 18;
547         std     %f30,[%fp+tmp1]         ! (5_0) i = ((unsigned long long*)&div)[
548         fstod   %f0,%f8                 ! (7_0) x = (double)ftmp0;

550         fmuld   %f28,%f40,%f28          ! (2_0) dtmp1 = div0 * y0;
551         and     %o7,-8,%o7              ! (0_0) ux &= -8;
552         ldx     [%fp+tmp0],%o0          ! (4_0) i = ((unsigned long long*)&div)[
553         fand    %f24,DC2,%f26           ! (6_0) y = vis_fand(y,dconst2);

555         add     %o7,%l7,%o7             ! (0_0) (char*)parr1 + ax;
556         mov     %l6,%g5
557         ldd     [%l0+%g1],%f48          ! (0_0) dtmp0 = *(double*)((char*)sign_a

559         fmuld   %f4,%f50,%f4            ! (0_0) dtmp0 *= x2;
560         srlx    %o0,43,%o0              ! (4_0) i >>= 43;
561         ldd     [%o7],%f0               ! (0_0) res = *(double*)((char*)parr1 +
562         fand    %f32,DC3,%f24           ! (4_0) y0 = vis_fand(div,dconst3);

564         fmuld   %f20,%f20,%f50          ! (1_0) x2 = xx * xx;
565         and     %o0,508,%l6             ! (4_0) i &= 508;
566         mov     %l5,%o7
567         fsubd   DTWO,%f42,%f44          ! (3_0) dtmp0 = dtwo - dtmp0;

569         fsubd   DTWO,%f28,%f46          ! (2_0) dtmp1 = dtwo - dtmp1;

571         fmuld   %f0,%f48,%f48           ! (0_0) res *= dtmp0;
572         srl     %o7,28,%l5              ! (1_0) ux >>= 28;
573         ld      [%i4+%l6],%f0           ! (4_0) *(float*)&dtmp0 = *(float*)((cha

575         fmuld   %f10,%f26,%f28          ! (6_0) div = x * y;
576         faddd   %f4,K0,%f42             ! (0_0) dtmp0 += K0;

578         subcc   counter,8,counter
579         bneg,pn %icc,.tail
580         or      %g0,%o1,%o0

582         add     %fp,tmp0,%g1
583         lda     [%i3]0x82,%l6           ! (0_0) ux = ((int*)px)[0];

585         ba      .main_loop
586         add     %i3,stridex,%l5         ! px += stridex;

588         .align  16
589 .main_loop:
```



```
590         fsubd   %f10,%f26,%f10          ! (6_1) xx = x - y;
591         and     %o7,MASK_0x7fffffff,%o1 ! (1_1) ax = ux & 0x7fffffff;
592         st      %f12,[%g1]              ! (7_1) py[0] = ftmp0;
593         fmuld   K2,%f50,%f4             ! (1_1) dtmp0 = K2 * x2;

595         fmuld   %f40,%f46,%f26          ! (2_1) y0 *= dtmp1;
596         srl     %o7,28,%o7              ! (1_0) ux >>= 28;
597         add     %o1,MASK_0x100000,%g1   ! (1_1) ax += 0x00100000;
598         fpsub32 %f0,%f24,%f40           ! (4_1) y0 = vis_fpsub32(dtmp0, y0);

600         fmuld   %f38,%f44,%f38          ! (3_1) y0 *= dtmp0;
601         and     %l6,MASK_0x7fffffff,%o1 ! (0_0) ax = ux & 0x7fffffff;
602         lda     [%i3]0x82,%f0           ! (0_0) ftmp0 = *px;
603         fpadd32 %f8,DC1,%f24            ! (7_1) y = vis_fpadd32(x,dconst1);

605         fmuld   %f42,%f22,%f44          ! (0_1) dtmp0 *= xx;
606         cmp     %o1,%o4                 ! (0_0) ax ? 0x39b89c55
607         bl,pn   %icc,.update14          ! (0_0) if ( ax < 0x39b89c55 )
608         faddd   DONE,%f28,%f28          ! (6_1) div += done;
609 .cont14:
610         fmuld   %f32,%f40,%f42          ! (4_1) dtmp0 = div0 * y0;
611         cmp     %o1,%o5                 ! (0_0) ax ? 0x4c700518
612         bg,pn   %icc,.update15          ! (0_0) if ( ax > 0x4c700518 )
613         faddd   %f4,K1,%f4              ! (1_1) dtmp0 += K1;
614 .cont15:
615         fmuld   %f18,%f26,%f18          ! (2_1) xx *= y0;
616         srl     %g1,18,%o1              ! (1_1) ax >>= 18;
617         std     %f28,[%fp+tmp0]         ! (6_1) i = ((unsigned long long*)&div)[
618         fstod   %f0,%f22                ! (0_0) ftmp0 = *px;

620         fmuld   %f34,%f38,%f34          ! (3_1) dtmp1 = div0 * y0;
621         and     %o1,-8,%o1              ! (1_1) ax &= -8;
622         ldx     [%fp+tmp1],%g1          ! (5_1) i = ((unsigned long long*)&div)[
623         fand    %f24,DC2,%f26           ! (7_1) y = vis_fand(y,dconst2);

625         ldd     [%o1+%l7],%f0           ! (1_1) res = *(double*)((char*)parr1 +
626         and     %o7,-8,%o7              ! (1_1) ux &= -8;
627         mov     %l6,%i3
628         faddd   %f48,%f44,%f12          ! (0_1) res += dtmp0;

630         fmuld   %f4,%f50,%f4            ! (1_1) dtmp0 *= x2;
631         nop
632         ldd     [%l0+%o7],%f48          ! (1_1) dtmp0 = *(double*)((char*)sign_a
633         fand    %f30,DC3,%f24           ! (5_1) y0 = vis_fand(div,dconst3);

635         fmuld   %f18,%f18,%f50          ! (2_1) x2 = xx * xx;
636         srlx    %g1,43,%g1              ! (5_1) i >>= 43;
637         mov     %l4,%o7
638         fsubd   DTWO,%f42,%f44          ! (4_1) dtmp0 = dtwo - dtmp0;

640         and     %g1,508,%l6             ! (5_1) i &= 508;
641         nop
642         bn,pn   %icc,.exit
643         fsubd   DTWO,%f34,%f46          ! (3_1) dtmp1 = dtwo - dtmp1;

645         fmuld   %f0,%f48,%f48           ! (1_1) res *= dtmp0;
646         add     %o0,stridey,%g1         ! py += stridey;
647         ld      [%i4+%l6],%f0           ! (5_1) *(float*)&dtmp0 = *(float*)((cha
648         fdtos   %f12,%f12               ! (0_1) ftmp0 = (float)res;

650         fmuld   %f8,%f26,%f34           ! (7_1) div = x * y;
651         srl     %o7,28,%o1              ! (2_1) ux >>= 28;
652         lda     [%l5]0x82,%l6           ! (1_0) ux = ((int*)px)[0];
653         faddd   %f4,K0,%f42             ! (1_1) dtmp0 += K0;

655         fmuld   K2,%f50,%f4             ! (2_1) dtmp0 = K2 * x2;
```

```
656         and     %o7,MASK_0x7fffffff,%o7 ! (2_1) ax = ux & 0x7fffffff;
657         st      %f12,[%o0]              ! (0_1) py[0] = ftmp0;
658         fsubd   %f8,%f26,%f8            ! (7_1) xx = x - y;

660         fmuld   %f38,%f46,%f26          ! (3_1) y0 *= dtmp1;
661         add     %l5,stridex,%l4         ! px += stridex;
662         add     %o7,MASK_0x100000,%o0   ! (2_1) ax += 0x00100000;
663         fpsub32 %f0,%f24,%f38           ! (5_1) y0 = vis_fpsub32(dtmp0, y0);

665         fmuld   %f40,%f44,%f40          ! (4_1) y0 *= dtmp0;
666         and     %l6,MASK_0x7fffffff,%o7 ! (1_0) ax = ux & 0x7fffffff;
667         lda     [%l5]0x82,%f0           ! (1_0) ftmp0 = *px;
668         fpadd32 %f22,DC1,%f24           ! (0_0) y = vis_fpadd32(x,dconst1);

670         fmuld   %f42,%f20,%f44          ! (1_1) dtmp0 *= xx;
671         cmp     %o7,%o4                 ! (1_0) ax ? 0x39b89c55
672         bl,pn   %icc,.update16          ! (1_0) if ( ax < 0x39b89c55 )
673         faddd   DONE,%f34,%f34          ! (7_1) div += done;
674 .cont16:
675         fmuld   %f30,%f38,%f42          ! (5_1) dtmp0 = div0 * y0;
676         cmp     %o7,%o5                 ! (1_0) ax ? 0x4c700518
677         bg,pn   %icc,.update17          ! (1_0) if ( ax > 0x4c700518 )
678         faddd   %f4,K1,%f4              ! (2_1) dtmp0 += K1;
679 .cont17:
680         fmuld   %f16,%f26,%f16          ! (3_1) xx *= y0;
681         srl     %o0,18,%o7              ! (2_1) ax >>= 18;
682         std     %f34,[%fp+tmp1]         ! (7_1) i = ((unsigned long long*)&div)[
683         fstod   %f0,%f20                ! (1_0) x = (double)ftmp0;

685         fmuld   %f32,%f40,%f32          ! (4_1) dtmp1 = div0 * y0;
686         ldx     [%fp+tmp0],%o0          ! (6_1) i = ((unsigned long long*)&div)[
687         and     %o1,-8,%o1              ! (2_1) ux &= -8;
688         fand    %f24,DC2,%f26           ! (0_0) y = vis_fand(y,dconst2);

690         faddd   %f48,%f44,%f12          ! (1_1) res += dtmp0;
691         and     %o7,-8,%o7              ! (2_1) ax &= -8;
692         ldd     [%l0+%o1],%f48          ! (2_1) dtmp0 = *(double*)((char*)sign_a
693         bn,pn   %icc,.exit

695         ldd     [%o7+%l7],%f0           ! (2_1) res = *(double*)((char*)parr1 +
696         mov     %l6,%l5
697         fmuld   %f4,%f50,%f4            ! (2_1) dtmp0 *= x2;
698         fand    %f28,DC3,%f24           ! (6_1) y0 = vis_fand(div,dconst3);

700         fmuld   %f16,%f16,%f50          ! (3_1) x2 = xx * xx;
701         srlx    %o0,43,%o0              ! (6_1) i >>= 43;
702         mov     %l3,%o7
703         fsubd   DTWO,%f42,%f44          ! (5_1) dtmp0 = dtwo - dtmp0;

705         and     %o0,508,%l6             ! (6_1) i &= 508;
706         add     %l4,stridex,%l3         ! px += stridex;
707         bn,pn   %icc,.exit
708         fsubd   DTWO,%f32,%f46          ! (4_1) dtmp1 = dtwo - dtmp1;

710         fmuld   %f0,%f48,%f48           ! (2_1) res *= dtmp0;
711         add     %g1,stridey,%o0         ! py += stridey;
712         ld      [%i4+%l6],%f0           ! (6_1) *(float*)&dtmp0 = *(float*)((cha
713         fdtos   %f12,%f12               ! (1_1) ftmp0 = (float)res;

715         fmuld   %f22,%f26,%f32          ! (0_0) div = x * y;
716         srl     %o7,28,%o1              ! (3_1) ux >>= 28;
717         lda     [%l4]0x82,%l6           ! (2_0) ux = ((int*)px)[0];
718         faddd   %f4,K0,%f42             ! (2_1) dtmp0 += K0;

720         fmuld   K2,%f50,%f4             ! (3_1) dtmp0 = K2 * x2;
721         and     %o7,MASK_0x7fffffff,%o7 ! (3_1) ax = ux & 0x7fffffff;
```



```
722         st      %f12,[%g1]              ! (1_1) py[0] = ftmp0;
723         fsubd   %f22,%f26,%f22          ! (0_0) xx = x - y;

725         fmuld   %f40,%f46,%f26          ! (4_1) y0 *= dtmp1;
726         add     %o7,MASK_0x100000,%g1   ! (3_1) ax += 0x00100000;
727         and     %o1,-8,%o1              ! (3_1) ux &= -8;
728         fpsub32 %f0,%f24,%f40           ! (6_1) y0 = vis_fpsub32(dtmp0, y0);

730         fmuld   %f38,%f44,%f38          ! (5_1) y0 *= dtmp0;
731         and     %l6,MASK_0x7fffffff,%o7 ! (2_0) ax = ux & 0x7fffffff;
732         lda     [%l4]0x82,%f0           ! (2_0) ftmp0 = *px;
733         fpadd32 %f20,DC1,%f24           ! (1_0) y = vis_fpadd32(x,dconst1);

735         fmuld   %f42,%f18,%f44          ! (2_1) dtmp0 *= xx;
736         cmp     %o7,%o4                 ! (2_0) ax ? 0x39b89c55
737         bl,pn   %icc,.update18          ! (2_0) if ( ax < 0x39b89c55 )
738         faddd   DONE,%f32,%f32          ! (0_0) div += done;
739 .cont18:
740         fmuld   %f28,%f40,%f42          ! (6_1) dtmp0 = div0 * y0;
741         cmp     %o7,%o5                 ! (2_0) ax ? 0x4c700518
742         bg,pn   %icc,.update19          ! (2_0) if ( ax > 0x4c700518 )
743         faddd   %f4,K1,%f4              ! (3_1) dtmp0 += K1;
744 .cont19:
745         fmuld   %f14,%f26,%f14          ! (4_1) xx *= y0;
746         srl     %g1,18,%o7              ! (3_1) ax >>= 18;
747         std     %f32,[%fp+tmp0]         ! (0_0) i = ((unsigned long long*)&div)[
748         fstod   %f0,%f18                ! (2_0) x = (double)ftmp0;

750         fmuld   %f30,%f38,%f30          ! (5_1) dtmp1 = div0 * y0;
751         and     %o7,-8,%o7              ! (3_1) ax &= -8;
752         ldx     [%fp+tmp1],%g1          ! (7_1) i = ((unsigned long long*)&div)[
753         fand    %f24,DC2,%f26           ! (1_0) y = vis_fand(y,dconst2);

755         faddd   %f48,%f44,%f12          ! (2_1) res += dtmp0;
756         mov     %l6,%l4
757         ldd     [%l0+%o1],%f48          ! (3_1) dtmp0 = *(double*)((char*)sign_a
758         bn,pn   %icc,.exit

760         fmuld   %f4,%f50,%f4            ! (3_1) dtmp0 *= x2;
761         ldd     [%o7+%l7],%f0           ! (3_1) res = *(double*)((char*)parr1 +
762         nop
763         fand    %f34,DC3,%f24           ! (7_1) y0 = vis_fand(div,dconst3);

765         fmuld   %f14,%f14,%f50          ! (4_1) x2 = xx * xx;
766         srlx    %g1,43,%g1              ! (7_1) i >>= 43;
767         mov     %i0,%o7
768         fsubd   DTWO,%f42,%f44          ! (6_1) dtmp0 = dtwo - dtmp0;

770         and     %g1,508,%l6             ! (7_1) i &= 508;
771         add     %l3,stridex,%i0         ! px += stridex;
772         bn,pn   %icc,.exit
773         fsubd   DTWO,%f30,%f46          ! (5_1) dtmp1 = dtwo - dtmp1;

775         fmuld   %f0,%f48,%f48           ! (3_1) res *= dtmp0;
776         add     %o0,stridey,%g1         ! py += stridey;
777         ld      [%i4+%l6],%f0           ! (7_1) *(float*)&dtmp0 = *(float*)((cha
778         fdtos   %f12,%f12               ! (2_1) ftmp0 = (float)res;

780         fmuld   %f20,%f26,%f30          ! (1_0) div = x * y;
781         srl     %o7,28,%o1              ! (4_1) ux >>= 28;
782         lda     [%l3]0x82,%l6           ! (3_0) ux = ((int*)px)[0];
783         faddd   %f4,K0,%f42             ! (3_1) dtmp0 += K0;

785         fmuld   K2,%f50,%f4             ! (4_1) dtmp0 = K2 * x2;
786         and     %o7,MASK_0x7fffffff,%o7 ! (4_1) ax = ux & 0x7fffffff;
787         st      %f12,[%o0]              ! (2_1) py[0] = ftmp0;
```

```
788         fsubd   %f20,%f26,%f20          ! (1_0) xx = x - y;

790         fmuld   %f38,%f46,%f26          ! (5_1) y0 *= dtmp1;
791         add     %o7,MASK_0x100000,%o0   ! (4_1) ax += 0x00100000;
792         and     %o1,-8,%o1              ! (4_1) ux &= -8;
793         fpsub32 %f0,%f24,%f38           ! (7_1) y0 = vis_fpsub32(dtmp0, y0);

795         fmuld   %f40,%f44,%f40          ! (6_1) y0 *= dtmp0;
796         and     %l6,MASK_0x7fffffff,%o7 ! (3_0) ax = ux & 0x7fffffff;
797         lda     [%l3]0x82,%f0           ! (3_0) ftmp0 = *px;
798         fpadd32 %f18,DC1,%f24           ! (2_0) y = vis_fpadd32(x,dconst1);

800         fmuld   %f42,%f16,%f44          ! (3_1) dtmp0 *= xx;
801         cmp     %o7,%o4                 ! (3_0) ax ? 0x39b89c55
802         bl,pn   %icc,.update20          ! (3_0) if ( ax < 0x39b89c55 )
803         faddd   DONE,%f30,%f30          ! (1_0) div += done;
804 .cont20:
805         fmuld   %f34,%f38,%f42          ! (7_1) dtmp0 = div0 * y0;
806         cmp     %o7,%o5                 ! (3_0) ax ? 0x4c700518
807         bg,pn   %icc,.update21          ! (3_0) if ( ax > 0x4c700518 )
808         faddd   %f4,K1,%f4              ! (4_1) dtmp0 += K1;
809 .cont21:
810         fmuld   %f36,%f26,%f36          ! (5_1) xx *= y0;
811         srl     %o0,18,%o7              ! (4_1) ax >>= 18;
812         std     %f30,[%fp+tmp1]         ! (1_0) i = ((unsigned long long*)&div)[
813         fstod   %f0,%f16                ! (3_0) x = (double)ftmp0;

815         fmuld   %f28,%f40,%f28          ! (6_1) dtmp1 = div0 * y0;
816         and     %o7,-8,%o7              ! (4_1) ax &= -8;
817         ldx     [%fp+tmp0],%o0          ! (0_0) i = ((unsigned long long*)&div)[
818         fand    %f24,DC2,%f26           ! (2_0) y = vis_fand(y,dconst2);

820         faddd   %f48,%f44,%f12          ! (3_1) res += dtmp0;
821         nop
822         ldd     [%l0+%o1],%f48          ! (4_1) dtmp0 = *(double*)((char*)sign_a
823         bn,pn   %icc,.exit

825         ldd     [%o7+%l7],%f0           ! (4_1) res = *(double*)((char*)parr1 +
826         mov     %l6,%l3
827         fmuld   %f4,%f50,%f4            ! (4_1) dtmp0 *= x2;
828         fand    %f32,DC3,%f24           ! (0_0) y0 = vis_fand(div,dconst3);

830         fmuld   %f36,%f36,%f50          ! (5_1) x2 = xx * xx;
831         srlx    %o0,43,%o0              ! (0_0) i >>= 43;
832         mov     %i2,%o7
833         fsubd   DTWO,%f42,%f44          ! (7_1) dtmp0 = dtwo - dtmp0;

835         and     %o0,508,%l6             ! (0_0) i &= 508;
836         add     %i0,stridex,%i2         ! px += stridex;
837         bn,pn   %icc,.exit
838         fsubd   DTWO,%f28,%f46          ! (6_1) dtmp1 = dtwo - dtmp1;

840         fmuld   %f0,%f48,%f48           ! (4_1) res *= dtmp0;
841         add     %g1,stridey,%o0         ! py += stridey;
842         ld      [%i4+%l6],%f0           ! (0_0) *(float*)&dtmp0 = *(float*)((cha
843         fdtos   %f12,%f12               ! (3_1) ftmp0 = (float)res;

845         fmuld   %f18,%f26,%f28          ! (2_0) div = x * y;
846         srl     %o7,28,%o1              ! (5_1) ux >>= 28;
847         lda     [%i0]0x82,%l6           ! (4_0) ux = ((int*)px)[0];
848         faddd   %f4,K0,%f42             ! (4_1) dtmp0 += K0;

850         fmuld   K2,%f50,%f4             ! (5_1) dtmp0 = K2 * x2;
851         and     %o7,MASK_0x7fffffff,%o7 ! (5_1) ax = ux & 0x7fffffff;
852         st      %f12,[%g1]              ! (3_1) py[0] = ftmp0;
853         fsubd   %f18,%f26,%f18          ! (2_0) xx = x - y;
```



```
855         fmuld   %f40,%f46,%f26          ! (6_1) y0 *= dtmp1;
856         add     %o7,MASK_0x100000,%g1   ! (5_1) ax += 0x00100000;
857         and     %o1,-8,%o1              ! (5_1) ux &= -8;
858         fpsub32 %f0,%f24,%f40           ! (0_0) y0 = vis_fpsub32(dtmp0, y0);

860         fmuld   %f38,%f44,%f38          ! (7_1) y0 *= dtmp0;
861         and     %l6,MASK_0x7fffffff,%o7 ! (4_0) ax = ux & 0x7fffffff;
862         lda     [%i0]0x82,%f0           ! (4_0) ftmp0 = *px;
863         fpadd32 %f16,DC1,%f24           ! (3_0) y = vis_fpadd32(x,dconst1);

865         fmuld   %f42,%f14,%f44          ! (4_1) dtmp0 *= xx;
866         cmp     %o7,%o4                 ! (4_0) ax ? 0x39b89c55
867         bl,pn   %icc,.update22          ! (4_0) if ( ax < 0x39b89c55 )
868         faddd   DONE,%f28,%f28          ! (2_0) div += done;
869 .cont22:
870         fmuld   %f32,%f40,%f42          ! (0_0) dtmp0 = div0 * y0;
871         cmp     %o7,%o5                 ! (4_0) ax ? 0x4c700518
872         bg,pn   %icc,.update23          ! (4_0) if ( ax > 0x4c700518 )
873         faddd   %f4,K1,%f4              ! (5_1) dtmp0 += K1;
874 .cont23:
875         fmuld   %f10,%f26,%f10          ! (6_1) xx *= y0;
876         srl     %g1,18,%o7              ! (5_1) ax >>= 18;
877         std     %f28,[%fp+tmp0]         ! (2_0) i = ((unsigned long long*)&div)[
878         fstod   %f0,%f14                ! (4_0) x = (double)ftmp0;

880         fmuld   %f34,%f38,%f34          ! (7_1) dtmp1 = div0 * y0;
881         and     %o7,-8,%o7              ! (5_1) ax &= -8;
882         ldx     [%fp+tmp1],%g1          ! (1_0) i = ((unsigned long long*)&div)[
883         fand    %f24,DC2,%f26           ! (3_0) y = vis_fand(y,dconst2);

885         faddd   %f48,%f44,%f12          ! (4_1) res += dtmp0;
886         mov     %l6,%i0
887         ldd     [%l0+%o1],%f48          ! (5_1) dtmp0 = *(double*)((char*)sign_a
888         bn,pn   %icc,.exit

890         ldd     [%o7+%l7],%f0           ! (5_1) res = *(double*)((char*)parr1 +
891         nop
892         fmuld   %f4,%f50,%f4            ! (5_1) dtmp0 *= x2;
893         fand    %f30,DC3,%f24           ! (1_0) y0 = vis_fand(div,dconst3);

895         fmuld   %f10,%f10,%f50          ! (6_1) x2 = xx * xx;
896         srlx    %g1,43,%g1              ! (1_0) i >>= 43;
897         mov     %l2,%o7
898         fsubd   DTWO,%f42,%f44          ! (0_0) dtmp0 = dtwo - dtmp0;

900         and     %g1,508,%l6             ! (1_0) i &= 508;
901         add     %i2,stridex,%l2         ! px += stridex;
902         bn,pn   %icc,.exit
903         fsubd   DTWO,%f34,%f46          ! (7_1) dtmp1 = dtwo - dtmp1;

905         fmuld   %f0,%f48,%f48           ! (5_1) res *= dtmp0;
906         add     %o0,stridey,%g1         ! py += stridey;
907         ld      [%i4+%l6],%f0           ! (1_0) *(float*)&dtmp0 = *(float*)((cha
908         fdtos   %f12,%f12               ! (4_1) ftmp0 = (float)res;

910         fmuld   %f16,%f26,%f34          ! (3_0) div = x * y;
911         srl     %o7,28,%o1              ! (6_1) ux >>= 28;
912         lda     [%i2]0x82,%l6           ! (5_0) ux = ((int*)px)[0];
913         faddd   %f4,K0,%f42             ! (5_1) dtmp0 += K0;

915         fmuld   K2,%f50,%f4             ! (6_1) dtmp0 = K2 * x2;
916         and     %o7,MASK_0x7fffffff,%o7 ! (6_1) ax = ux & 0x7fffffff;
917         st      %f12,[%o0]              ! (4_1) py[0] = ftmp0;
918         fsubd   %f16,%f26,%f16          ! (3_0) xx = x - y;
```

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        fmuld   %f38,%f46,%f26          ! (7_1) y0 *= dtmp1;
        add     %o7,MASK_0x100000,%o0   ! (6_1) ax += 0x00100000;
        and     %o1,-8,%o1              ! (6_1) ux &= -8;
        fpsub32 %f0,%f24,%f38           ! (1_0) y0 = vis_fpsub32(dtmp0, y0);

        fmuld   %f40,%f44,%f40          ! (0_0) y0 *= dtmp0;
        and     %l6,MASK_0x7fffffff,%o7 ! (5_0) ax = ux & 0x7fffffff;
        lda     [%i2]0x82,%f0           ! (5_0) ftmp0 = *px;
        fpadd32 %f14,DC1,%f24           ! (4_0) y = vis_fpadd32(x,dconst1);

        fmuld   %f42,%f36,%f44          ! (5_1) dtmp0 *= xx;
        cmp     %o7,%o4                 ! (5_0) ax ? 0x39b89c55
        bl,pn   %icc,.update24          ! (5_0) if ( ax < 0x39b89c55 )
        faddd   DONE,%f34,%f34          ! (3_0) div += done;
.cont24:
        fmuld   %f30,%f38,%f42          ! (1_0) dtmp0 = div0 * y0;
        cmp     %o7,%o5                 ! (5_0) ax ? 0x4c700518
        bg,pn   %icc,.update25          ! (5_0) if ( ax > 0x4c700518 )
        faddd   %f4,K1,%f4              ! (6_1) dtmp0 += K1;
.cont25:
        fmuld   %f8,%f26,%f8            ! (7_1) xx *= y0;
        srl     %o0,18,%o7              ! (6_1) ax >>= 18;
        std     %f34,[%fp+tmp1]         ! (3_0) i = ((unsigned long long*)&div)[
        fstod   %f0,%f36                ! (5_0) x = (double)ftmp0;

        fmuld   %f32,%f40,%f32          ! (0_0) dtmp1 = div0 * y0;
        and     %o7,-8,%o7              ! (6_1) ax &= -8;
        ldx     [%fp+tmp0],%o0          ! (2_0) i = ((unsigned long long*)&div)[
        fand    %f24,DC2,%f26           ! (4_0) y = vis_fand(y,dconst2);

        faddd   %f48,%f44,%f12          ! (5_1) res += dtmp0;
        mov     %l6,%i2
        ldd     [%l0+%o1],%f48          ! (6_1) dtmp0 = *(double*)((char*)sign_a
        bn,pn   %icc,.exit

        ldd     [%o7+%l7],%f0           ! (6_1) res = *(double*)((char*)parr1 +
        nop
        fmuld   %f4,%f50,%f4            ! (6_1) dtmp0 *= x2;
        fand    %f28,DC3,%f24           ! (2_0) y0 = vis_fand(div,dconst3);

        fmuld   %f8,%f8,%f50            ! (7_1) x2 = xx * xx;
        srlx    %o0,43,%o0              ! (2_0) i >>= 43;
        mov     %g5,%o7
        fsubd   DTWO,%f42,%f44          ! (1_0) dtmp0 = dtwo - dtmp0;

        and     %o0,508,%l6             ! (2_0) i &= 508;
        add     %l2,stridex,%g5         ! px += stridex;
        bn,pn   %icc,.exit
        fsubd   DTWO,%f32,%f46          ! (0_0) dtmp1 = dtwo - dtmp1;

        fmuld   %f0,%f48,%f48           ! (6_1) res *= dtmp0;
        add     %g1,stridey,%o0         ! py += stridey;
        ld      [%i4+%l6],%f0           ! (2_0) *(float*)&dtmp0 = *(float*)((cha
        fdtos   %f12,%f12               ! (5_1) ftmp0 = (float)res;

        fmuld   %f14,%f26,%f32          ! (4_0) div = x * y;
        srl     %o7,28,%o1              ! (7_1) ux >>= 28;
        lda     [%l2]0x82,%l6           ! (6_0) ux = ((int*)px)[0];
        faddd   %f4,K0,%f42             ! (6_1) dtmp0 += K0;

        fmuld   K2,%f50,%f4             ! (7_1) dtmp0 = K2 * x2;
        and     %o7,MASK_0x7fffffff,%o7 ! (7_1) ax = ux & 0x7fffffff;
        st      %f12,[%g1]              ! (5_1) py[0] = ftmp0;
        fsubd   %f14,%f26,%f14          ! (4_0) xx = x - y;

        fmuld   %f40,%f46,%f26          ! (0_0) y0 *= dtmp1;
```



```
        add     %o7,MASK_0x100000,%g1   ! (7_1) ax += 0x00100000;
        and     %o1,-8,%o1              ! (7_1) ux &= -8;
        fpsub32 %f0,%f24,%f40           ! (2_0) y0 = vis_fpsub32(dtmp0, y0);

        fmuld   %f38,%f44,%f38          ! (1_0) y0 *= dtmp0;
        and     %l6,MASK_0x7fffffff,%o7 ! (6_0) ax = ux & 0x7fffffff;
        lda     [%l2]0x82,%f0           ! (6_0) ftmp0 = *px;
        fpadd32 %f36,DC1,%f24           ! (5_0) y = vis_fpadd32(x,dconst1);

        fmuld   %f42,%f10,%f44          ! (6_1) dtmp0 *= xx;
        cmp     %o7,%o4                 ! (6_0) ax ? 0x39b89c55
        bl,pn   %icc,.update26          ! (6_0) if ( ax < 0x39b89c55 )
        faddd   DONE,%f32,%f32          ! (4_0) div += done;
.cont26:
        fmuld   %f28,%f40,%f42          ! (2_0) dtmp0 = div0 * y0;
        cmp     %o7,%o5                 ! (6_0) ax ? 0x4c700518
        bg,pn   %icc,.update27          ! (6_0) if ( ax > 0x4c700518 )
        faddd   %f4,K1,%f4              ! (7_1) dtmp0 += K1;
.cont27:
        fmuld   %f22,%f26,%f22          ! (0_0) xx *= y0;
        srl     %g1,18,%o7              ! (7_1) ax >>= 18;
        std     %f32,[%fp+tmp0]         ! (4_0) i = ((unsigned long long*)&div)[
        fstod   %f0,%f10                ! (6_0) x = (double)ftmp0;

        fmuld   %f30,%f38,%f30          ! (1_0) dtmp1 = div0 * y0;
        and     %o7,-8,%o7              ! (7_1) ax &= -8;
        ldx     [%fp+tmp1],%g1          ! (3_0) i = ((unsigned long long*)&div)[
        fand    %f24,DC2,%f26           ! (5_0) y = vis_fand(y,dconst2);

        faddd   %f48,%f44,%f12          ! (6_1) res += dtmp0;
        mov     %l6,%l2
        ldd     [%l0+%o1],%f48          ! (7_1) dtmp0 = *(double*)((char*)sign_a
        bn,pn   %icc,.exit

        ldd     [%o7+%l7],%f0           ! (7_1) res = *(double*)((char*)parr1 +
        nop
        fmuld   %f4,%f50,%f4            ! (7_1) dtmp0 *= x2;
        fand    %f34,DC3,%f24           ! (3_0) y0 = vis_fand(div,dconst3);

        fmuld   %f22,%f22,%f50          ! (0_0) x2 = xx * xx;
        srlx    %g1,43,%g1              ! (3_0) i >>= 43;
        mov     %i3,%o7
        fsubd   DTWO,%f42,%f44          ! (2_0) dtmp0 = dtwo - dtmp0;

        and     %g1,508,%l6             ! (3_0) i &= 508;
        add     %g5,stridex,%i3         ! px += stridex;
        bn,pn   %icc,.exit
        fsubd   DTWO,%f30,%f46          ! (1_0) dtmp1 = dtwo - dtmp1;

        fmuld   %f0,%f48,%f48           ! (7_1) res *= dtmp0;
        add     %o0,stridey,%g1         ! py += stridey;
        ld      [%i4+%l6],%f0           ! (3_0) *(float*)&dtmp0 = *(float*)((cha
        fdtos   %f12,%f12               ! (6_1) ftmp0 = (float)res;

        fmuld   %f36,%f26,%f30          ! (5_0) div = x * y;
        srl     %o7,28,%o1              ! (0_0) ux >>= 28;
        lda     [%g5]0x82,%l6           ! (7_0) ux = ((int*)px)[0];
        faddd   %f4,K0,%f42             ! (7_1) dtmp0 += K0;

        fmuld   K2,%f50,%f4             ! (0_0) dtmp0 = K2 * x2;
        and     %o7,MASK_0x7fffffff,%o7 ! (0_0) ax = ux & 0x7fffffff;
        st      %f12,[%o0]              ! (6_1) py[0] = ftmp0;
        fsubd   %f36,%f26,%f36          ! (5_0) xx = x - y;

        fmuld   %f38,%f46,%f26          ! (1_0) y0 *= dtmp1;
        add     %o7,MASK_0x100000,%o0   ! (0_0) ax += 0x00100000;
```

```
1052          and     %o1,-8,%o1              ! (0_0) ux &= -8;
1053          fpsub32 %f0,%f24,%f38           ! (3_0) y0 = vis_fpsub32(dtmp0, y0);

1055          fmuld   %f40,%f44,%f40          ! (2_0) y0 *= dtmp0;
1056          and     %l6,MASK_0x7fffffff,%o7 ! (7_0) ax = ux & 0x7fffffff;
1057          lda     [%g5]0x82,%f0           ! (7_0) ftmp0 = *px;
1058          fpadd32 %f10,DC1,%f24           ! (6_0) y = vis_fpadd32(x,dconst1);

1060          fmuld   %f42,%f8,%f44           ! (7_1) dtmp0 *= xx;
1061          cmp     %o7,%o4                 ! (7_0) ax ? 0x39b89c55
1062          bl,pn   %icc,.update28          ! (7_0) if ( ax < 0x39b89c55 )
1063          faddd   DONE,%f30,%f30          ! (5_0) div += done;
1064  .cont28:
1065          fmuld   %f34,%f38,%f42          ! (3_0) dtmp0 = div0 * y0;
1066          cmp     %o7,%o5                 ! (7_0) ax ? 0x4c700518
1067          bg,pn   %icc,.update29          ! (7_0) if ( ax > 0x4c700518 )
1068          faddd   %f4,K1,%f4              ! (0_0) dtmp0 += K1;
1069  .cont29:
1070          fmuld   %f20,%f26,%f20          ! (1_0) xx *= y0;
1071          srl     %o0,18,%o7              ! (0_0) ax >>= 18;
1072          std     %f30,[%fp+tmp1]         ! (5_0) i = ((unsigned long long*)&div)[
1073          fstod   %f0,%f8                 ! (7_0) x = (double)ftmp0;

1075          fmuld   %f28,%f40,%f28          ! (2_0) dtmp1 = div0 * y0;
1076          and     %o7,-8,%o7              ! (0_0) ux &= -8;
1077          ldx     [%fp+tmp0],%o0          ! (4_0) i = ((unsigned long long*)&div)[
1078          fand    %f24,DC2,%f26           ! (6_0) y = vis_fand(y,dconst2);

1080          faddd   %f48,%f44,%f12          ! (7_1) res += dtmp0;
1081          subcc   counter,8,counter
1082          ldd     [%l0+%o1],%f48          ! (0_0) dtmp0 = *(double*)((char*)sign_a
1083          bn,pn   %icc,.exit

1085          fmuld   %f4,%f50,%f4            ! (0_0) dtmp0 *= x2;
1086          mov     %l6,%g5
1087          ldd     [%o7+%l7],%f0           ! (0_0) res = *(double*)((char*)parr1 +
1088          fand    %f32,DC3,%f24           ! (4_0) y0 = vis_fand(div,dconst3);

1090          fmuld   %f20,%f20,%f50          ! (1_0) x2 = xx * xx;
1091          srlx    %o0,43,%l6              ! (4_0) i >>= 43;
1092          mov     %l5,%o7
1093          fsubd   DTWO,%f42,%f44          ! (3_0) dtmp0 = dtwo - dtmp0;

1095          add     %g1,stridey,%o0         ! py += stridey;
1096          and     %l6,508,%l6             ! (4_0) i &= 508;
1097          bn,pn   %icc,.exit
1098          fsubd   DTWO,%f28,%f46          ! (2_0) dtmp1 = dtwo - dtmp1;

1100          fmuld   %f0,%f48,%f48           ! (0_0) res *= dtmp0;
1101          ld      [%i4+%l6],%f0           ! (4_0) *(float*)&dtmp0 = *(float*)((cha
1102          add     %i3,stridex,%l5         ! px += stridex;
1103          fdtos   %f12,%f12               ! (7_1) ftmp0 = (float)res;

1105          lda     [%i3]0x82,%l6           ! (0_0) ux = ((int*)px)[0];
1106          fmuld   %f10,%f26,%f28          ! (6_0) div = x * y;
1107          bpos,pt %icc,.main_loop
1108          faddd   %f4,K0,%f42             ! (0_0) dtmp0 += K0;

1110          srl     %o7,28,%l5              ! (1_0) ux >>= 28;
1111          st      %f12,[%g1]              ! (7_1) py[0] = ftmp0;

1113  .tail:
1114          addcc   counter,7,counter
1115          bneg,pn %icc,.begin
1116          or      %g0,%o0,%o1
```



```
1118          fsubd   %f10,%f26,%f10          ! (6_1) xx = x - y;
1119          and     %o7,MASK_0x7fffffff,%g1 ! (1_1) ax = ux & 0x7fffffff;
1120          fmuld   K2,%f50,%f4             ! (1_1) dtmp0 = K2 * x2;

1122          fmuld   %f40,%f46,%f26          ! (2_1) y0 *= dtmp1;
1123          add     %g1,MASK_0x100000,%g1   ! (1_1) ax += 0x00100000;
1124          and     %l5,-8,%l5              ! (1_1) ux &= -8;
1125          fpsub32 %f0,%f24,%f40           ! (4_1) y0 = vis_fpsub32(dtmp0, y0);

1127          fmuld   %f38,%f44,%f38          ! (3_1) y0 *= dtmp0;

1129          fmuld   %f42,%f22,%f44          ! (0_1) dtmp0 *= xx;
1130          faddd   DONE,%f28,%f28          ! (6_1) div += done;

1132          fmuld   %f32,%f40,%f42          ! (4_1) dtmp0 = div0 * y0;
1133          faddd   %f4,K1,%f4              ! (1_1) dtmp0 += K1;

1135          fmuld   %f18,%f26,%f18          ! (2_1) xx *= y0;
1136          srl     %g1,18,%o7              ! (1_1) ax >>= 18;
1137          std     %f28,[%fp+tmp0]         ! (6_1) i = ((unsigned long long*)&div)[

1139          fmuld   %f34,%f38,%f34          ! (3_1) dtmp1 = div0 * y0;
1140          and     %o7,-8,%o7              ! (1_1) ax &= -8;
1141          ldx     [%fp+tmp1],%g1          ! (5_1) i = ((unsigned long long*)&div)[

1143          faddd   %f48,%f44,%f12          ! (0_1) res += dtmp0;
1144          add     %o7,%l7,%o7             ! (1_1) (char*)parr1 + ax;
1145          ldd     [%l0+%l5],%f48          ! (1_1) dtmp0 = *(double*)((char*)sign_a

1147          fmuld   %f4,%f50,%f4            ! (1_1) dtmp0 *= x2;
1148          fand    %f30,DC3,%f24           ! (5_1) y0 = vis_fand(div,dconst3);
1149          ldd     [%o7],%f0               ! (1_1) res = *(double*)((char*)parr1 +

1151          fmuld   %f18,%f18,%f50          ! (2_1) x2 = xx * xx;
1152          fsubd   DTWO,%f42,%f44          ! (4_1) dtmp0 = dtwo - dtmp0;
1153          srlx    %g1,43,%g1              ! (5_1) i >>= 43;

1155          and     %g1,508,%l6             ! (5_1) i &= 508;
1156          mov     %l4,%o7
1157          fsubd   DTWO,%f34,%f46          ! (3_1) dtmp1 = dtwo - dtmp1;

1159          fmuld   %f0,%f48,%f48           ! (1_1) res *= dtmp0;
1160          add     %o0,stridey,%g1         ! py += stridey;
1161          ld      [%i4+%l6],%f0           ! (5_1) *(float*)&dtmp0 = *(float*)((cha
1162          fdtos   %f12,%f12               ! (0_1) ftmp0 = (float)res;

1164          srl     %o7,28,%l4              ! (2_1) ux >>= 28;
1165          st      %f12,[%o0]              ! (0_1) py[0] = ftmp0;
1166          faddd   %f4,K0,%f42             ! (1_1) dtmp0 += K0;

1168          subcc   counter,1,counter
1169          bneg,pn %icc,.begin
1170          or      %g0,%g1,%o1

1172          fmuld   K2,%f50,%f4             ! (2_1) dtmp0 = K2 * x2;
1173          and     %o7,MASK_0x7fffffff,%o0 ! (2_1) ax = ux & 0x7fffffff;

1175          fmuld   %f38,%f46,%f26          ! (3_1) y0 *= dtmp1;
1176          add     %o0,MASK_0x100000,%o0   ! (2_1) ax += 0x00100000;
1177          and     %l4,-8,%l4              ! (2_1) ux &= -8;
1178          fpsub32 %f0,%f24,%f38           ! (5_1) y0 = vis_fpsub32(dtmp0, y0);

1180          fmuld   %f40,%f44,%f40          ! (4_1) y0 *= dtmp0;

1182          fmuld   %f42,%f20,%f44          ! (1_1) dtmp0 *= xx;
```

```
1184         fmuld   %f30,%f38,%f42          ! (5_1) dtmp0 = div0 * y0;
1185         faddd   %f4,K1,%f4              ! (2_1) dtmp0 += K1;

1187         fmuld   %f16,%f26,%f16          ! (3_1) xx *= y0;
1188         srl     %o0,18,%o7              ! (2_1) ax >>= 18;

1190         fmuld   %f32,%f40,%f32          ! (4_1) dtmp1 = div0 * y0;
1191         and     %o7,-8,%o7              ! (2_1) ax &= -8;
1192         ldx     [%fp+tmp0],%o0          ! (6_1) i = ((unsigned long long*)&div)[

1194         faddd   %f48,%f44,%f12          ! (1_1) res += dtmp0;
1195         add     %o7,%l7,%o7             ! (2_1) (char*)parr1 + ax;
1196         ldd     [%l0+%l4],%f48          ! (2_1) dtmp0 = *(double*)((char*)sign_a

1198         fmuld   %f4,%f50,%f4            ! (2_1) dtmp0 *= x2;
1199         fand    %f28,DC3,%f24           ! (6_1) y0 = vis_fand(div,dconst3);
1200         ldd     [%o7],%f0               ! (2_1) res = *(double*)((char*)parr1 +

1202         fmuld   %f16,%f16,%f50          ! (3_1) x2 = xx * xx;
1203         fsubd   DTWO,%f42,%f44          ! (5_1) dtmp0 = dtwo - dtmp0;
1204         srlx    %o0,43,%o0              ! (6_1) i >>= 43;

1206         and     %o0,508,%l6             ! (6_1) i &= 508;
1207         mov     %l3,%o7
1208         fsubd   DTWO,%f32,%f46          ! (4_1) dtmp1 = dtwo - dtmp1;

1210         fmuld   %f0,%f48,%f48           ! (2_1) res *= dtmp0;
1211         add     %g1,stridey,%o0         ! py += stridey;
1212         ld      [%i4+%l6],%f0           ! (6_1) *(float*)&dtmp0 = *(float*)((cha
1213         fdtos   %f12,%f12               ! (1_1) ftmp0 = (float)res;

1215         srl     %o7,28,%l3              ! (3_1) ux >>= 28;
1216         st      %f12,[%g1]              ! (1_1) py[0] = ftmp0;
1217         faddd   %f4,K0,%f42             ! (2_1) dtmp0 += K0;

1219         subcc   counter,1,counter
1220         bneg,pn %icc,.begin
1221         or      %g0,%o0,%o1

1223         fmuld   K2,%f50,%f4             ! (3_1) dtmp0 = K2 * x2;
1224         and     %o7,MASK_0x7fffffff,%g1 ! (3_1) ax = ux & 0x7fffffff;

1226         fmuld   %f40,%f46,%f26          ! (4_1) y0 *= dtmp1;
1227         add     %g1,MASK_0x100000,%g1   ! (3_1) ax += 0x00100000;
1228         and     %l3,-8,%l3              ! (3_1) ux &= -8;
1229         fpsub32 %f0,%f24,%f40           ! (6_1) y0 = vis_fpsub32(dtmp0, y0);

1231         fmuld   %f38,%f44,%f38          ! (5_1) y0 *= dtmp0;

1233         fmuld   %f42,%f18,%f44          ! (2_1) dtmp0 *= xx;

1235         fmuld   %f28,%f40,%f42          ! (6_1) dtmp0 = div0 * y0;
1236         faddd   %f4,K1,%f4              ! (3_1) dtmp0 += K1;

1238         fmuld   %f14,%f26,%f14          ! (4_1) xx *= y0;
1239         srl     %g1,18,%o7              ! (3_1) ax >>= 18;

1241         fmuld   %f30,%f38,%f30          ! (5_1) dtmp1 = div0 * y0;
1242         and     %o7,-8,%o7              ! (3_1) ax &= -8;

1244         faddd   %f48,%f44,%f12          ! (2_1) res += dtmp0;
1245         add     %o7,%l7,%o7             ! (3_1) (char*)parr1 + ax;
1246         ldd     [%l0+%l3],%f48          ! (3_1) dtmp0 = *(double*)((char*)sign_a

1248         fmuld   %f4,%f50,%f4            ! (3_1) dtmp0 *= x2;
1249         ldd     [%o7],%f0               ! (3_1) res = *(double*)((char*)parr1 +
```



```
1251         fmuld   %f14,%f14,%f50          ! (4_1) x2 = xx * xx;
1252         fsubd   DTWO,%f42,%f44          ! (6_1) dtmp0 = dtwo - dtmp0;

1254         mov     %i0,%o7
1255         fsubd   DTWO,%f30,%f46          ! (5_1) dtmp1 = dtwo - dtmp1;

1257         fmuld   %f0,%f48,%f48           ! (3_1) res *= dtmp0;
1258         add     %o0,stridey,%g1         ! py += stridey;
1259         fdtos   %f12,%f12               ! (2_1) ftmp0 = (float)res;

1261         srl     %o7,28,%i0              ! (4_1) ux >>= 28;
1262         st      %f12,[%o0]              ! (2_1) py[0] = ftmp0;
1263         faddd   %f4,K0,%f42             ! (3_1) dtmp0 += K0;

1265         subcc   counter,1,counter
1266         bneg,pn %icc,.begin
1267         or      %g0,%g1,%o1

1269         fmuld   K2,%f50,%f4             ! (4_1) dtmp0 = K2 * x2;
1270         and     %o7,MASK_0x7fffffff,%o0 ! (4_1) ax = ux & 0x7fffffff;

1272         fmuld   %f38,%f46,%f26          ! (5_1) y0 *= dtmp1;
1273         add     %o0,MASK_0x100000,%o0   ! (4_1) ax += 0x00100000;
1274         and     %i0,-8,%i0              ! (4_1) ux &= -8;

1276         fmuld   %f40,%f44,%f40          ! (6_1) y0 *= dtmp0;

1278         fmuld   %f42,%f16,%f44          ! (3_1) dtmp0 *= xx;

1280         faddd   %f4,K1,%f4              ! (4_1) dtmp0 += K1;

1282         fmuld   %f36,%f26,%f36          ! (5_1) xx *= y0;
1283         srl     %o0,18,%o7              ! (4_1) ax >>= 18;

1285         fmuld   %f28,%f40,%f28          ! (6_1) dtmp1 = div0 * y0;
1286         and     %o7,-8,%o7              ! (4_1) ax &= -8;

1288         faddd   %f48,%f44,%f12          ! (3_1) res += dtmp0;
1289         add     %o7,%l7,%o7             ! (4_1) (char*)parr1 + ax;
1290         ldd     [%l0+%i0],%f48          ! (4_1) dtmp0 = *(double*)((char*)sign_a

1292         fmuld   %f4,%f50,%f4            ! (4_1) dtmp0 *= x2;
1293         ldd     [%o7],%f0               ! (4_1) res = *(double*)((char*)parr1 +

1295         fmuld   %f36,%f36,%f50          ! (5_1) x2 = xx * xx;

1297         mov     %i2,%o7
1298         fsubd   DTWO,%f28,%f46          ! (6_1) dtmp1 = dtwo - dtmp1;

1300         fmuld   %f0,%f48,%f48           ! (4_1) res *= dtmp0;
1301         add     %g1,stridey,%o0         ! py += stridey;
1302         fdtos   %f12,%f12               ! (3_1) ftmp0 = (float)res;

1304         srl     %o7,28,%i2              ! (5_1) ux >>= 28;
1305         st      %f12,[%g1]              ! (3_1) py[0] = ftmp0;
1306         faddd   %f4,K0,%f42             ! (4_1) dtmp0 += K0;

1308         subcc   counter,1,counter
1309         bneg,pn %icc,.begin
1310         or      %g0,%o0,%o1

1312         fmuld   K2,%f50,%f4             ! (5_1) dtmp0 = K2 * x2;
1313         and     %o7,MASK_0x7fffffff,%g1 ! (5_1) ax = ux & 0x7fffffff;

1315         fmuld   %f40,%f46,%f26          ! (6_1) y0 *= dtmp1;
```

```
1316         add     %g1,MASK_0x100000,%g1   ! (5_1) ax += 0x00100000;
1317         and     %i2,-8,%i2              ! (5_1) ux &= -8;

1319         fmuld   %f42,%f14,%f44          ! (4_1) dtmp0 *= xx;

1321         faddd   %f4,K1,%f4              ! (5_1) dtmp0 += K1;

1323         fmuld   %f10,%f26,%f10          ! (6_1) xx *= y0;
1324         srl     %g1,18,%o7              ! (5_1) ax >>= 18;

1326         and     %o7,-8,%o7              ! (5_1) ax &= -8;

1328         faddd   %f48,%f44,%f12          ! (4_1) res += dtmp0;
1329         add     %o7,%l7,%o7             ! (5_1) (char*)parr1 + ax;
1330         ldd     [%l0+%i2],%f48          ! (5_1) dtmp0 = *(double*)((char*)sign_a

1332         fmuld   %f4,%f50,%f4            ! (5_1) dtmp0 *= x2;
1333         ldd     [%o7],%f0               ! (5_1) res = *(double*)((char*)parr1 +

1335         fmuld   %f10,%f10,%f50          ! (6_1) x2 = xx * xx;

1337         mov     %l2,%o7

1339         fmuld   %f0,%f48,%f48           ! (5_1) res *= dtmp0;
1340         add     %o0,stridey,%g1         ! py += stridey;
1341         fdtos   %f12,%f12               ! (4_1) ftmp0 = (float)res;

1343         srl     %o7,28,%l2              ! (6_1) ux >>= 28;
1344         st      %f12,[%o0]              ! (4_1) py[0] = ftmp0;
1345         faddd   %f4,K0,%f42             ! (5_1) dtmp0 += K0;

1347         subcc   counter,1,counter
1348         bneg,pn %icc,.begin
1349         or      %g0,%g1,%o1

1351         fmuld   K2,%f50,%f4             ! (6_1) dtmp0 = K2 * x2;
1352         and     %o7,MASK_0x7fffffff,%o0 ! (6_1) ax = ux & 0x7fffffff;

1354         add     %o0,MASK_0x100000,%o0   ! (6_1) ax += 0x00100000;
1355         and     %l2,-8,%l2              ! (6_1) ux &= -8;

1357         fmuld   %f42,%f36,%f44          ! (5_1) dtmp0 *= xx;

1359         faddd   %f4,K1,%f4              ! (6_1) dtmp0 += K1;

1361         srl     %o0,18,%o7              ! (6_1) ax >>= 18;

1363         and     %o7,-8,%o7              ! (6_1) ax &= -8;

1365         faddd   %f48,%f44,%f12          ! (5_1) res += dtmp0;
1366         add     %o7,%l7,%o7             ! (6_1) (char*)parr1 + ax;
1367         ldd     [%l0+%l2],%f48          ! (6_1) dtmp0 = *(double*)((char*)sign_a

1369         fmuld   %f4,%f50,%f4            ! (6_1) dtmp0 *= x2;
1370         ldd     [%o7],%f0               ! (6_1) res = *(double*)((char*)parr1 +

1372         fmuld   %f0,%f48,%f48           ! (6_1) res *= dtmp0;
1373         add     %g1,stridey,%o0         ! py += stridey;
1374         fdtos   %f12,%f12               ! (5_1) ftmp0 = (float)res;

1376         st      %f12,[%g1]              ! (5_1) py[0] = ftmp0;
1377         faddd   %f4,K0,%f42             ! (6_1) dtmp0 += K0;

1379         subcc   counter,1,counter
1380         bneg,pn %icc,.begin
1381         or      %g0,%o0,%o1
```



```
1383         fmuld   %f42,%f10,%f44          ! (6_1) dtmp0 *= xx;

1385         faddd   %f48,%f44,%f12          ! (6_1) res += dtmp0;

1387         add     %o0,stridey,%g1         ! py += stridey;
1388         fdtos   %f12,%f12               ! (6_1) ftmp0 = (float)res;

1390         st      %f12,[%o0]              ! (6_1) py[0] = ftmp0;

1392         ba      .begin
1393         or      %g0,%g1,%o1             ! py += stridey;

1395 .exit:
1396         ret
1397         restore %g0,%g0,%g0

1399         .align  16
1400 .spec0:
1401         add     %i3,stridex,%i3         ! px += stridex;
1402         sub     counter,1,counter
1403         st      %l6,[%o1]               ! *(int*)py = ux;

1405         ba      .begin1
1406         add     %o1,stridey,%o1         ! py += stridey;

1408         .align  16
1409 .spec1:
1410         sethi   %hi(0x7f800000),%l3
1411         sethi   %hi(0x3fc90c00),%l4     ! pi_2

1413         sethi   %hi(0x80000000),%o0
1414         add     %l4,0x3db,%l4           ! pi_2

1416         cmp     %l5,%l3                 ! if ( ax > 0x7f800000 )
1417         bg,a,pn %icc,1f
1418         fabss   %f0,%f0                 ! fpx = fabsf(*px);

1420         and     %l6,%o0,%l6             ! sign = ux & 0x80000000;

1422         or      %l6,%l4,%l6             ! sign |= pi_2;

1424         add     %i3,stridex,%i3         ! px += stridex;
1425         sub     counter,1,counter
1426         st      %l6,[%o1]               ! *(int*)py = sign;

1428         ba      .begin1
1429         add     %o1,stridey,%o1         ! py += stridey;

1431 1:
1432         fmuls   %f0,%f0,%f0             ! fpx *= fpx;

1434         add     %i3,stridex,%i3         ! px += stridex
1435         sub     counter,1,counter
1436         st      %f0,[%o1]               ! *py = fpx;

1438         ba      .begin1
1439         add     %o1,stridey,%o1         ! py += stridey;

1441         .align  16
1442 .update0:
1443         cmp     counter,1
1444         fzeros  %f0
1445         ble,a   .cont0
1446         sethi   %hi(0x3fffffff),%l6
```

```
1448         sub     counter,1,counter
1449         st      counter,[%fp+tmp_counter]

1451         stx     %l5,[%fp+tmp_px]
1452         sethi   %hi(0x3fffffff),%l6
1453         ba      .cont0
1454         or      %g0,1,counter

1456         .align  16
1457 .update1:
1458         cmp     counter,1
1459         fzeros  %f0
1460         ble,a   .cont1
1461         sethi   %hi(0x3fffffff),%l6

1463         sub     counter,1,counter
1464         st      counter,[%fp+tmp_counter]

1466         stx     %l5,[%fp+tmp_px]
1467         sethi   %hi(0x3fffffff),%l6
1468         ba      .cont1
1469         or      %g0,1,counter

1471         .align  16
1472 .update2:
1473         cmp     counter,2
1474         fzeros  %f0
1475         ble,a   .cont2
1476         sethi   %hi(0x3fffffff),%l6

1478         sub     counter,2,counter
1479         st      counter,[%fp+tmp_counter]

1481         stx     %l4,[%fp+tmp_px]
1482         sethi   %hi(0x3fffffff),%l6
1483         ba      .cont2
1484         or      %g0,2,counter

1486         .align  16
1487 .update3:
1488         cmp     counter,2
1489         fzeros  %f0
1490         ble,a   .cont3
1491         sethi   %hi(0x3fffffff),%l6

1493         sub     counter,2,counter
1494         st      counter,[%fp+tmp_counter]

1496         stx     %l4,[%fp+tmp_px]
1497         sethi   %hi(0x3fffffff),%l6
1498         ba      .cont3
1499         or      %g0,2,counter

1501         .align  16
1502 .update4:
1503         cmp     counter,3
1504         fzeros  %f0
1505         ble,a   .cont4
1506         sethi   %hi(0x3fffffff),%l6

1508         sub     counter,3,counter
1509         st      counter,[%fp+tmp_counter]

1511         stx     %l3,[%fp+tmp_px]
1512         sethi   %hi(0x3fffffff),%l6
1513         ba      .cont4
```



```
1514         or      %g0,3,counter

1516         .align  16
1517 .update5:
1518         cmp     counter,3
1519         fzeros  %f0
1520         ble,a   .cont5
1521         sethi   %hi(0x3fffffff),%l6

1523         sub     counter,3,counter
1524         st      counter,[%fp+tmp_counter]

1526         stx     %l3,[%fp+tmp_px]
1527         sethi   %hi(0x3fffffff),%l6
1528         ba      .cont5
1529         or      %g0,3,counter

1531         .align  16
1532 .update6:
1533         cmp     counter,4
1534         fzeros  %f0
1535         ble,a   .cont6
1536         sethi   %hi(0x3fffffff),%l6

1538         sub     counter,4,counter
1539         st      counter,[%fp+tmp_counter]

1541         stx     %i0,[%fp+tmp_px]
1542         sethi   %hi(0x3fffffff),%l6
1543         ba      .cont6
1544         or      %g0,4,counter

1546         .align  16
1547 .update7:
1548         cmp     counter,4
1549         fzeros  %f0
1550         ble,a   .cont7
1551         sethi   %hi(0x3fffffff),%l6

1553         sub     counter,4,counter
1554         st      counter,[%fp+tmp_counter]

1556         stx     %i0,[%fp+tmp_px]
1557         sethi   %hi(0x3fffffff),%l6
1558         ba      .cont7
1559         or      %g0,4,counter

1561         .align  16
1562 .update8:
1563         cmp     counter,5
1564         fzeros  %f0
1565         ble,a   .cont8
1566         sethi   %hi(0x3fffffff),%l6

1568         sub     counter,5,counter
1569         st      counter,[%fp+tmp_counter]

1571         stx     %i2,[%fp+tmp_px]
1572         sethi   %hi(0x3fffffff),%l6
1573         ba      .cont8
1574         or      %g0,5,counter

1576         .align  16
1577 .update9:
1578         cmp     counter,5
1579         fzeros  %f0
```

```
1580         ble,a   .cont9
1581         sethi   %hi(0x3fffffff),%l6

1583         sub     counter,5,counter
1584         st      counter,[%fp+tmp_counter]

1586         stx     %i2,[%fp+tmp_px]
1587         sethi   %hi(0x3fffffff),%l6
1588         ba      .cont9
1589         or      %g0,5,counter

1591         .align  16
1592 .update10:
1593         cmp     counter,6
1594         fzeros  %f0
1595         ble,a   .cont10
1596         sethi   %hi(0x3fffffff),%l6

1598         sub     counter,6,counter
1599         st      counter,[%fp+tmp_counter]

1601         stx     %l2,[%fp+tmp_px]
1602         sethi   %hi(0x3fffffff),%l6
1603         ba      .cont10
1604         or      %g0,6,counter

1606         .align  16
1607 .update11:
1608         cmp     counter,6
1609         fzeros  %f0
1610         ble,a   .cont11
1611         sethi   %hi(0x3fffffff),%l6

1613         sub     counter,6,counter
1614         st      counter,[%fp+tmp_counter]

1616         stx     %l2,[%fp+tmp_px]
1617         sethi   %hi(0x3fffffff),%l6
1618         ba      .cont11
1619         or      %g0,6,counter

1621         .align  16
1622 .update12:
1623         cmp     counter,7
1624         fzeros  %f0
1625         ble,a   .cont12
1626         sethi   %hi(0x3fffffff),%l6

1628         sub     counter,7,counter
1629         st      counter,[%fp+tmp_counter]

1631         stx     %g5,[%fp+tmp_px]
1632         sethi   %hi(0x3fffffff),%l6
1633         ba      .cont12
1634         or      %g0,7,counter

1636         .align  16
1637 .update13:
1638         cmp     counter,7
1639         fzeros  %f0
1640         ble,a   .cont13
1641         sethi   %hi(0x3fffffff),%l6

1643         sub     counter,7,counter
1644         st      counter,[%fp+tmp_counter]
```



```
1646         stx     %g5,[%fp+tmp_px]
1647         sethi   %hi(0x3fffffff),%l6
1648         ba      .cont13
1649         or      %g0,7,counter

1651         .align  16
1652 .update14:
1653         cmp     counter,0
1654         fzeros  %f0
1655         ble,a   .cont14
1656         sethi   %hi(0x3fffffff),%l6

1658         sub     counter,0,counter
1659         st      counter,[%fp+tmp_counter]

1661         stx     %i3,[%fp+tmp_px]
1662         sethi   %hi(0x3fffffff),%l6
1663         ba      .cont14
1664         or      %g0,0,counter

1666         .align  16
1667 .update15:
1668         cmp     counter,0
1669         fzeros  %f0
1670         ble,a   .cont15
1671         sethi   %hi(0x3fffffff),%l6

1673         sub     counter,0,counter
1674         st      counter,[%fp+tmp_counter]

1676         stx     %i3,[%fp+tmp_px]
1677         sethi   %hi(0x3fffffff),%l6
1678         ba      .cont15
1679         or      %g0,0,counter

1681         .align  16
1682 .update16:
1683         cmp     counter,1
1684         fzeros  %f0
1685         ble,a   .cont16
1686         sethi   %hi(0x3fffffff),%l6

1688         sub     counter,1,counter
1689         st      counter,[%fp+tmp_counter]

1691         stx     %l5,[%fp+tmp_px]
1692         sethi   %hi(0x3fffffff),%l6
1693         ba      .cont16
1694         or      %g0,1,counter

1696         .align  16
1697 .update17:
1698         cmp     counter,1
1699         fzeros  %f0
1700         ble,a   .cont17
1701         sethi   %hi(0x3fffffff),%l6

1703         sub     counter,1,counter
1704         st      counter,[%fp+tmp_counter]

1706         stx     %l5,[%fp+tmp_px]
1707         sethi   %hi(0x3fffffff),%l6
1708         ba      .cont17
1709         or      %g0,1,counter

1711         .align  16
```

```
.update18:
        cmp     counter,2
        fzeros  %f0
        ble,a   .cont18
        sethi   %hi(0x3fffffff),%l6

        sub     counter,2,counter
        st      counter,[%fp+tmp_counter]

        stx     %l4,[%fp+tmp_px]
        sethi   %hi(0x3fffffff),%l6
        ba      .cont18
        or      %g0,2,counter

        .align  16
.update19:
        cmp     counter,2
        fzeros  %f0
        ble,a   .cont19
        sethi   %hi(0x3fffffff),%l6

        sub     counter,2,counter
        st      counter,[%fp+tmp_counter]

        stx     %l4,[%fp+tmp_px]
        sethi   %hi(0x3fffffff),%l6
        ba      .cont19
        or      %g0,2,counter

        .align  16
.update20:
        cmp     counter,3
        fzeros  %f0
        ble,a   .cont20
        sethi   %hi(0x3fffffff),%l6

        sub     counter,3,counter
        st      counter,[%fp+tmp_counter]

        stx     %l3,[%fp+tmp_px]
        sethi   %hi(0x3fffffff),%l6
        ba      .cont20
        or      %g0,3,counter

        .align  16
.update21:
        cmp     counter,3
        fzeros  %f0
        ble,a   .cont21
        sethi   %hi(0x3fffffff),%l6

        sub     counter,3,counter
        st      counter,[%fp+tmp_counter]

        stx     %l3,[%fp+tmp_px]
        sethi   %hi(0x3fffffff),%l6
        ba      .cont21
        or      %g0,3,counter

        .align  16
.update22:
        cmp     counter,4
        fzeros  %f0
        ble,a   .cont22
        sethi   %hi(0x3fffffff),%l6
```



```
        sub     counter,4,counter
        st      counter,[%fp+tmp_counter]

        stx     %i0,[%fp+tmp_px]
        sethi   %hi(0x3fffffff),%l6
        ba      .cont22
        or      %g0,4,counter

        .align  16
.update23:
        cmp     counter,4
        fzeros  %f0
        ble,a   .cont23
        sethi   %hi(0x3fffffff),%l6

        sub     counter,4,counter
        st      counter,[%fp+tmp_counter]

        stx     %i0,[%fp+tmp_px]
        sethi   %hi(0x3fffffff),%l6
        ba      .cont23
        or      %g0,4,counter

        .align  16
.update24:
        cmp     counter,5
        fzeros  %f0
        ble,a   .cont24
        sethi   %hi(0x3fffffff),%l6

        sub     counter,5,counter
        st      counter,[%fp+tmp_counter]

        stx     %i2,[%fp+tmp_px]
        sethi   %hi(0x3fffffff),%l6
        ba      .cont24
        or      %g0,5,counter

        .align  16
.update25:
        cmp     counter,5
        fzeros  %f0
        ble,a   .cont25
        sethi   %hi(0x3fffffff),%l6

        sub     counter,5,counter
        st      counter,[%fp+tmp_counter]

        stx     %i2,[%fp+tmp_px]
        sethi   %hi(0x3fffffff),%l6
        ba      .cont25
        or      %g0,5,counter

        .align  16
.update26:
        cmp     counter,6
        fzeros  %f0
        ble,a   .cont26
        sethi   %hi(0x3fffffff),%l6

        sub     counter,6,counter
        st      counter,[%fp+tmp_counter]

        stx     %l2,[%fp+tmp_px]
        sethi   %hi(0x3fffffff),%l6
        ba      .cont26
```

```
1844         or      %g0,6,counter

1846         .align  16
1847 .update27:
1848         cmp     counter,6
1849         fzeros  %f0
1850         ble,a   .cont27
1851         sethi   %hi(0x3fffffff),%l6

1853         sub     counter,6,counter
1854         st      counter,[%fp+tmp_counter]

1856         stx     %l2,[%fp+tmp_px]
1857         sethi   %hi(0x3fffffff),%l6
1858         ba      .cont27
1859         or      %g0,6,counter

1861         .align  16
1862 .update28:
1863         cmp     counter,7
1864         fzeros  %f0
1865         ble,a   .cont28
1866         sethi   %hi(0x3fffffff),%l6

1868         sub     counter,7,counter
1869         st      counter,[%fp+tmp_counter]

1871         stx     %g5,[%fp+tmp_px]
1872         sethi   %hi(0x3fffffff),%l6
1873         ba      .cont28
1874         or      %g0,7,counter

1876         .align  16
1877 .update29:
1878         cmp     counter,7
1879         fzeros  %f0
1880         ble,a   .cont29
1881         sethi   %hi(0x3fffffff),%l6

1883         sub     counter,7,counter
1884         st      counter,[%fp+tmp_counter]

1886         stx     %g5,[%fp+tmp_px]
1887         sethi   %hi(0x3fffffff),%l6
1888         ba      .cont29
1889         or      %g0,7,counter

1891         SET_SIZE(__vatanf)
```

```
**********************************************************
   52494 Sat May 10 12:09:58 2014
new/usr/src/lib/libmvec/common/vis/__vcos.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vcos.S"

#include "libm.h"

        RO_DATA
        .align  64
constants:
        .word   0x3ec718e3,0xa6972785
        .word   0x3ef9fd39,0x94293940
        .word   0xbf2a019f,0x75ee4be1
        .word   0xbf56c16b,0xba552569
        .word   0x3f811111,0x1108c703
        .word   0x3fa55555,0x554f5b35
        .word   0xbfc55555,0x555554d0
        .word   0xbfdfffff,0xffffff85
        .word   0x3ff00000,0x00000000
        .word   0xbfc55555,0x5551fc28
        .word   0x3f811107,0x62eacc9d
        .word   0xbfdfffff,0xffff6328
        .word   0x3fa55551,0x5f7acf0c
        .word   0x3fe45f30,0x6dc9c883
        .word   0x43380000,0x00000000
        .word   0x3ff921fb,0x54400000
        .word   0x3dd0b461,0x1a600000
        .word   0x3ba3198a,0x2e000000
        .word   0x397b839a,0x252049c1
        .word   0x80000000,0x00004000
        .word   0xffff8000,0x00000000   ! N.B.: low-order words used
        .word   0x3fc90000,0x80000000   ! for sign bit hacking; see
        .word   0x3fc40000,0x00000000   ! references to "thresh" below

#define p4              0x0
#define q4              0x08
```



```
#define p3              0x10
#define q3              0x18
#define p2              0x20
#define q2              0x28
#define p1              0x30
#define q1              0x38
#define one             0x40
#define pp1             0x48
#define pp2             0x50
#define qq1             0x58
#define qq2             0x60
#define invpio2         0x68
#define round           0x70
#define pio2_1          0x78
#define pio2_2          0x80
#define pio2_3          0x88
#define pio2_3t         0x90
#define f30val          0x98
#define mask            0xa0
#define thresh          0xa8

! local storage indices

#define xsave           STACK_BIAS-0x8
#define ysave           STACK_BIAS-0x10
#define nsave           STACK_BIAS-0x14
#define sxsave          STACK_BIAS-0x18
#define sysave          STACK_BIAS-0x1c
#define biguns          STACK_BIAS-0x20
#define n2              STACK_BIAS-0x24
#define n1              STACK_BIAS-0x28
#define n0              STACK_BIAS-0x2c
#define x2_1            STACK_BIAS-0x40
#define x1_1            STACK_BIAS-0x50
#define x0_1            STACK_BIAS-0x60
#define y2_0            STACK_BIAS-0x70
#define y1_0            STACK_BIAS-0x80
#define y0_0            STACK_BIAS-0x90
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x90

!--------------------------------------------------------------------
! define pipes for easier reading

#define P0_f0           %f0
#define P0_f1           %f1
#define P0_f2           %f2
#define P0_f3           %f3
#define P0_f4           %f4
#define P0_f5           %f5
#define P0_f6           %f6
#define P0_f7           %f7
#define P0_f8           %f8
#define P0_f9           %f9

#define P1_f10          %f10
#define P1_f11          %f11
#define P1_f12          %f12
#define P1_f13          %f13
#define P1_f14          %f14
#define P1_f15          %f15
#define P1_f16          %f16
#define P1_f17          %f17
#define P1_f18          %f18
#define P1_f19          %f19
```

```
128 #define P2_f20          %f20
129 #define P2_f21          %f21
130 #define P2_f22          %f22
131 #define P2_f23          %f23
132 #define P2_f24          %f24
133 #define P2_f25          %f25
134 #define P2_f26          %f26
135 #define P2_f27          %f27
136 #define P2_f28          %f28
137 #define P2_f29          %f29

139 ! define __vlibm_TBL_sincos_hi & lo for easy reading

141 #define SC_HI           %l3
142 #define SC_LO           %l4

144 ! define constants for easy reading

146 #define C_q1 %f46
147 #define C_q2 %f48
148 #define C_q3 %f50
149 #define C_q4 %f52

151 ! one ( 1 ) uno eins echi un
152 #define C_ONE           %f54
153 #define C_ONE_LO        %f55

155 ! masks
156 #define MSK_SIGN        %i5
157 #define MSK_BIT31       %f30
158 #define MSK_BIT13       %f31
159 #define MSK_BITSHI17    %f44


162 ! constants for pp and qq
163 #define C_pp1 %f56
164 #define C_pp2 %f58
165 #define C_qq1 %f60
166 #define C_qq2 %f62

168 ! sign mask
169 #define C_signM         %i5

171 #define LIM_l5          %l5
172 #define LIM_l6          %l6
173 ! when in pri range, using value as transition from poly to table.
174 ! for Medium range,change use of %l6 and use to keep track of biguns.
175 #define LIM_l7          %l7

177 !--------------------------------------------------------------------

179
180         ENTRY(__vcos)
181         save    %sp,-SA(MINFRAME)-tmps,%sp
182         PIC_SETUP(g5)
183         PIC_SET(g5,__vlibm_TBL_sincos_hi,l3)
184         PIC_SET(g5,__vlibm_TBL_sincos_lo,l4)
185         PIC_SET(g5,constants,o0)
186         mov     %o0,%g1
187         wr      %g0,0x82,%asi           ! set %asi for non-faulting loads

189 ! ========== primary range ==========

191 ! register use

193 ! i0  n
```



```
194 ! i1  x
195 ! i2  stridex
196 ! i3  y
197 ! i4  stridey
198 ! i5  0x80000000

200 ! l0  hx0
201 ! l1  hx1
202 ! l2  hx2
203 ! l3  __vlibm_TBL_sincos_hi
204 ! l4  __vlibm_TBL_sincos_lo
205 ! l5  0x3fc40000
206 ! l6  0x3e400000
207 ! l7  0x3fe921fb

209 ! the following are 64-bit registers in both V8+ and V9

211 ! g1  scratch
212 ! g5

214 ! o0  py0
215 ! o1  py1
216 ! o2  py2
217 ! o3  oy0
218 ! o4  oy1
219 ! o5  oy2
220 ! o7  scratch

222 ! f0  x0
223 ! f2
224 ! f4
225 ! f6
226 ! f8  scratch for table base
227 ! f9  signbit0
228 ! f10 x1
229 ! f12
230 ! f14
231 ! f16
232 ! f18 scratch for table base
233 ! f19 signbit1
234 ! f20 x2
235 ! f22
236 ! f24
237 ! f26
238 ! f28 scratch for table base
239 ! f29 signbit2
240 ! f30 0x80000000
241 ! f31 0x4000
242 ! f32
243 ! f34
244 ! f36
245 ! f38
246 ! f40
247 ! f42
248 ! f44 0xffff800000000000
249 ! f46 p1
250 ! f48 p2
251 ! f50 p3
252 ! f52 p4
253 ! f54 one
254 ! f56 pp1
255 ! f58 pp2
256 ! f60 qq1
257 ! f62 qq2

259 #ifdef __sparcv9
```

```
260         stx     %i1,[%fp+xsave]         ! save arguments
261         stx     %i3,[%fp+ysave]
262 #else
263         st      %i1,[%fp+xsave]         ! save arguments
264         st      %i3,[%fp+ysave]
265 #endif

267         st      %i0,[%fp+nsave]
268         st      %i2,[%fp+sxsave]
269         st      %i4,[%fp+sysave]
270         sethi   %hi(0x80000000),MSK_SIGN        ! load/set up constants
271         sethi   %hi(0x3fc40000),LIM_l5
272         sethi   %hi(0x3e400000),LIM_l6
273         sethi   %hi(0x3fe921fb),LIM_l7
274         or      LIM_l7,%lo(0x3fe921fb),LIM_l7
275         ldd     [%g1+f30val],MSK_BIT31
276         ldd     [%g1+mask],MSK_BITSHI17
277         ldd     [%g1+q1],C_q1
278         ldd     [%g1+q2],C_q2
279         ldd     [%g1+q3],C_q3
280         ldd     [%g1+q4],C_q4
281         ldd     [%g1+one],C_ONE
282         ldd     [%g1+pp1],C_pp1
283         ldd     [%g1+pp2],C_pp2
284         ldd     [%g1+qq1],C_qq1
285         ldd     [%g1+qq2],C_qq2
286         sll     %i2,3,%i2               ! scale strides
287         sll     %i4,3,%i4
288         add     %fp,x0_1,%o3            ! precondition loop
289         add     %fp,x0_1,%o4
290         add     %fp,x0_1,%o5
291         ld      [%i1],%l0               ! hx = *x
292         ld      [%i1],P0_f0
293         ld      [%i1+4],P0_f1
294         andn    %l0,MSK_SIGN,%l0                ! hx &= ~0x80000000
295         add     %i1,%i2,%i1             ! x += stridex
296
297         ba,pt   %icc,.loop0
298 !delay slot
299         nop

301         .align 32
302 .loop0:
303         lda     [%i1]%asi,%l1           ! preload next argument
304         sub     %l0,LIM_l6,%g1
305         sub     LIM_l7,%l0,%o7
306         fands   P0_f0,MSK_BIT31,P0_f9           ! save signbit

308         lda     [%i1]%asi,P1_f10
309         orcc    %o7,%g1,%g0
310         mov     %i3,%o0                 ! py0 = y
311         bl,pn   %icc,.range0            ! if hx < 0x3e400000 or > 0x3fe921fb

313 ! delay slot
314         lda     [%i1+4]%asi,P1_f11
315         addcc   %i0,-1,%i0
316         add     %i3,%i4,%i3             ! y += stridey
317         ble,pn  %icc,.endloop1

319 ! delay slot
320         andn    %l1,MSK_SIGN,%l1
321         add     %i1,%i2,%i1             ! x += stridex
322         fabsd   P0_f0,P0_f0
323         fmuld   C_ONE,C_ONE,C_ONE               ! one*one; a nop for alignment o

325 .loop1:
```



```
326         lda     [%i1]%asi,%l2           ! preload next argument
327         sub     %l1,LIM_l6,%g1
328         sub     LIM_l7,%l1,%o7
329         fands   P1_f10,MSK_BIT31,P1_f19         ! save signbit

331         lda     [%i1]%asi,P2_f20
332         orcc    %o7,%g1,%g0
333         mov     %i3,%o1                 ! py1 = y
334         bl,pn   %icc,.range1            ! if hx < 0x3e400000 or > 0x3fe921fb

336 ! delay slot
337         lda     [%i1+4]%asi,P2_f21
338         addcc   %i0,-1,%i0
339         add     %i3,%i4,%i3             ! y += stridey
340         ble,pn  %icc,.endloop2

342 ! delay slot
343         andn    %l2,MSK_SIGN,%l2
344         add     %i1,%i2,%i1             ! x += stridex
345         fabsd   P1_f10,P1_f10
346         fmuld   C_ONE,C_ONE,C_ONE               ! one*one; a nop for alignment o

348 .loop2:
349         st      P0_f6,[%o3]
350         sub     %l2,LIM_l6,%g1
351         sub     LIM_l7,%l2,%o7
352         fands   P2_f20,MSK_BIT31,P2_f29         ! save signbit

354         st      P0_f7,[%o3+4]
355         orcc    %g1,%o7,%g0
356         mov     %i3,%o2                 ! py2 = y
357         bl,pn   %icc,.range2            ! if hx < 0x3e400000 or > 0x3fe921fb

359 ! delay slot
360         add     %i3,%i4,%i3             ! y += stridey
361         cmp     %l0,LIM_l5
362         fabsd   P2_f20,P2_f20
363         bl,pn   %icc,.case4

365 ! delay slot
366         st      P1_f16,[%o4]
367         cmp     %l1,LIM_l5
368         fpadd32s P0_f0,MSK_BIT13,P0_f8
369         bl,pn   %icc,.case2

371 ! delay slot
372         st      P1_f17,[%o4+4]
373         cmp     %l2,LIM_l5
374         fpadd32s P1_f10,MSK_BIT13,P1_f18
375         bl,pn   %icc,.case1

377 ! delay slot
378         st      P2_f26,[%o5]
379         mov     %o0,%o3
380         sethi   %hi(0x3fc3c000),%o7
381         fpadd32s P2_f20,MSK_BIT13,P2_f28

383         st      P2_f27,[%o5+4]
384         fand    P0_f8,MSK_BITSHI17,P0_f2
385         mov     %o1,%o4

387         fand    P1_f18,MSK_BITSHI17,P1_f12
388         mov     %o2,%o5
389         sub     %l0,%o7,%l0

391         fand    P2_f28,MSK_BITSHI17,P2_f22
```

```
392         sub     %l1,%o7,%l1
393         sub     %l2,%o7,%l2

395         fsubd   P0_f0,P0_f2,P0_f0
396         srl     %l0,10,%l0
397         add     SC_HI,8,%g1;add SC_LO,8,%o7

399         fsubd   P1_f10,P1_f12,P1_f10
400         srl     %l1,10,%l1

402         fsubd   P2_f20,P2_f22,P2_f20
403         srl     %l2,10,%l2

405         fmuld   P0_f0,P0_f0,P0_f2
406         andn    %l0,0x1f,%l0

408         fmuld   P1_f10,P1_f10,P1_f12
409         andn    %l1,0x1f,%l1

411         fmuld   P2_f20,P2_f20,P2_f22
412         andn    %l2,0x1f,%l2

414         fmuld   P0_f2,C_pp2,P0_f6
415         ldd     [%g1+%l0],%f32

417         fmuld   P1_f12,C_pp2,P1_f16
418         ldd     [%g1+%l1],%f36

420         fmuld   P2_f22,C_pp2,P2_f26
421         ldd     [%g1+%l2],%f40

423         faddd   P0_f6,C_pp1,P0_f6
424         fmuld   P0_f2,C_qq2,P0_f4
425         ldd     [SC_HI+%l0],%f34

427         faddd   P1_f16,C_pp1,P1_f16
428         fmuld   P1_f12,C_qq2,P1_f14
429         ldd     [SC_HI+%l1],%f38

431         faddd   P2_f26,C_pp1,P2_f26
432         fmuld   P2_f22,C_qq2,P2_f24
433         ldd     [SC_HI+%l2],%f42

435         fmuld   P0_f2,P0_f6,P0_f6
436         faddd   P0_f4,C_qq1,P0_f4

438         fmuld   P1_f12,P1_f16,P1_f16
439         faddd   P1_f14,C_qq1,P1_f14

441         fmuld   P2_f22,P2_f26,P2_f26
442         faddd   P2_f24,C_qq1,P2_f24

444         faddd   P0_f6,C_ONE,P0_f6
445         fmuld   P0_f2,P0_f4,P0_f4

447         faddd   P1_f16,C_ONE,P1_f16
448         fmuld   P1_f12,P1_f14,P1_f14

450         faddd   P2_f26,C_ONE,P2_f26
451         fmuld   P2_f22,P2_f24,P2_f24

453         fmuld   P0_f0,P0_f6,P0_f6
454         ldd     [%o7+%l0],P0_f2

456         fmuld   P1_f10,P1_f16,P1_f16
457         ldd     [%o7+%l1],P1_f12
```



```
459         fmuld   P2_f20,P2_f26,P2_f26
460         ldd     [%o7+%l2],P2_f22

462         fmuld   P0_f4,%f32,P0_f4
463         lda     [%i1]%asi,%l0           ! preload next argument

465         fmuld   P1_f14,%f36,P1_f14
466         lda     [%i1]%asi,P0_f0

468         fmuld   P2_f24,%f40,P2_f24
469         lda     [%i1+4]%asi,P0_f1

471         fmuld   P0_f6,%f34,P0_f6
472         add     %i1,%i2,%i1             ! x += stridex

474         fmuld   P1_f16,%f38,P1_f16

476         fmuld   P2_f26,%f42,P2_f26

478         fsubd   P0_f6,P0_f4,P0_f6

480         fsubd   P1_f16,P1_f14,P1_f16

482         fsubd   P2_f26,P2_f24,P2_f26

484         fsubd   P0_f2,P0_f6,P0_f6

486         fsubd   P1_f12,P1_f16,P1_f16

488         fsubd   P2_f22,P2_f26,P2_f26

490         faddd   P0_f6,%f32,P0_f6

492         faddd   P1_f16,%f36,P1_f16

494         faddd   P2_f26,%f40,P2_f26
495         andn    %l0,MSK_SIGN,%l0                ! hx &= ~0x80000000

497         nop     !!(vsin)        fors    P0_f6,P0_f9,P0_f6
498         addcc   %i0,-1,%i0

500         nop     !!(vsin)        fors    P1_f16,P1_f19,P1_f16
501         bg,pt   %icc,.loop0

503 ! delay slot
504         nop     !!(vsin)        fors    P2_f26,P2_f29,P2_f26

506         ba,pt   %icc,.endloop0
507 ! delay slot
508         nop

510         .align  32
511 .case1:
512         st      P2_f27,[%o5+4]
513         sethi   %hi(0x3fc3c000),%o7
514         fand    P0_f8,MSK_BITSHI17,P0_f2

516         sub     %l0,%o7,%l0
517         sub     %l1,%o7,%l1
518         add     SC_HI,8,%g1;add SC_LO,8,%o7
519         fand    P1_f18,MSK_BITSHI17,P1_f12
520         fmuld   P2_f20,P2_f20,P2_f22

522         fsubd   P0_f0,P0_f2,P0_f0
523         srl     %l0,10,%l0
```

```
524         mov     %o0,%o3

526         fsubd   P1_f10,P1_f12,P1_f10
527         srl     %l1,10,%l1
528         mov     %o1,%o4

530         fmuld   P2_f22,C_q4,P2_f24
531         mov     %o2,%o5

533         fmuld   P0_f0,P0_f0,P0_f2
534         andn    %l0,0x1f,%l0

536         fmuld   P1_f10,P1_f10,P1_f12
537         andn    %l1,0x1f,%l1

539         faddd   P2_f24,C_q3,P2_f24

541         fmuld   P0_f2,C_pp2,P0_f6
542         ldd     [%g1+%l0],%f32

544         fmuld   P1_f12,C_pp2,P1_f16
545         ldd     [%g1+%l1],%f36

547         fmuld   P2_f22,P2_f24,P2_f24

549         faddd   P0_f6,C_pp1,P0_f6
550         fmuld   P0_f2,C_qq2,P0_f4
551         ldd     [SC_HI+%l0],%f34

553         faddd   P1_f16,C_pp1,P1_f16
554         fmuld   P1_f12,C_qq2,P1_f14
555         ldd     [SC_HI+%l1],%f38

557         faddd   P2_f24,C_q2,P2_f24

559         fmuld   P0_f2,P0_f6,P0_f6
560         faddd   P0_f4,C_qq1,P0_f4

562         fmuld   P1_f12,P1_f16,P1_f16
563         faddd   P1_f14,C_qq1,P1_f14

565         fmuld   P2_f22,P2_f24,P2_f24

567         faddd   P0_f6,C_ONE,P0_f6
568         fmuld   P0_f2,P0_f4,P0_f4

570         faddd   P1_f16,C_ONE,P1_f16
571         fmuld   P1_f12,P1_f14,P1_f14

573         faddd   P2_f24,C_q1,P2_f24

575         fmuld   P0_f0,P0_f6,P0_f6
576         ldd     [%o7+%l0],P0_f2

578         fmuld   P1_f10,P1_f16,P1_f16
579         ldd     [%o7+%l1],P1_f12

581         fmuld   P0_f4,%f32,P0_f4
582         lda     [%i1]%asi,%l0           ! preload next argument

584         fmuld   P1_f14,%f36,P1_f14
585         lda     [%i1]%asi,P0_f0

587         fmuld   P0_f6,%f34,P0_f6
588         lda     [%i1+4]%asi,P0_f1
```



```
590         fmuld   P1_f16,%f38,P1_f16
591         add     %i1,%i2,%i1             ! x += stridex

593         fmuld   P2_f22,P2_f24,P2_f24

595         fsubd   P0_f6,P0_f4,P0_f6

597         fsubd   P1_f16,P1_f14,P1_f16

599         !!(vsin)fmuld   P2_f20,P2_f24,P2_f24

601         fsubd   P0_f2,P0_f6,P0_f6

603         fsubd   P1_f12,P1_f16,P1_f16

605         faddd   C_ONE,P2_f24,P2_f26 !!(vsin)faddd       P2_f20,P2_f24,P2_f26

607         faddd   P0_f6,%f32,P0_f6

609         faddd   P1_f16,%f36,P1_f16
610         andn    %l0,MSK_SIGN,%l0                ! hx &= ~0x80000000

612         nop     !!(vsin)        fors    P2_f26,P2_f29,P2_f26
613         addcc   %i0,-1,%i0

615         nop     !!(vsin)        fors    P0_f6,P0_f9,P0_f6
616         bg,pt   %icc,.loop0

618 ! delay slot
619         nop     !!(vsin)        fors    P1_f16,P1_f19,P1_f16

621         ba,pt   %icc,.endloop0
622 ! delay slot
623         nop

625         .align  32
626 .case2:
627         st      P2_f26,[%o5]
628         cmp     %l2,LIM_l5
629         fpadd32s P2_f20,MSK_BIT13,P2_f28
630         bl,pn   %icc,.case3

632 ! delay slot
633         st      P2_f27,[%o5+4]
634         sethi   %hi(0x3fc3c000),%o7
635         fand    P0_f8,MSK_BITSHI17,P0_f2

637         sub     %l0,%o7,%l0
638         sub     %l2,%o7,%l2
639         add     SC_HI,8,%g1;add SC_LO,8,%o7
640         fand    P2_f28,MSK_BITSHI17,P2_f22
641         fmuld   P1_f10,P1_f10,P1_f12

643         fsubd   P0_f0,P0_f2,P0_f0
644         srl     %l0,10,%l0
645         mov     %o0,%o3

647         fsubd   P2_f20,P2_f22,P2_f20
648         srl     %l2,10,%l2
649         mov     %o2,%o5

651         fmuld   P1_f12,C_q4,P1_f14
652         mov     %o1,%o4

654         fmuld   P0_f0,P0_f0,P0_f2
655         andn    %l0,0x1f,%l0
```

```
657         fmuld   P2_f20,P2_f20,P2_f22
658         andn    %l2,0x1f,%l2

660         faddd   P1_f14,C_q3,P1_f14

662         fmuld   P0_f2,C_pp2,P0_f6
663         ldd     [%g1+%l0],%f32

665         fmuld   P2_f22,C_pp2,P2_f26
666         ldd     [%g1+%l2],%f40

668         fmuld   P1_f12,P1_f14,P1_f14

670         faddd   P0_f6,C_pp1,P0_f6
671         fmuld   P0_f2,C_qq2,P0_f4
672         ldd     [SC_HI+%l0],%f34

674         faddd   P2_f26,C_pp1,P2_f26
675         fmuld   P2_f22,C_qq2,P2_f24
676         ldd     [SC_HI+%l2],%f42

678         faddd   P1_f14,C_q2,P1_f14

680         fmuld   P0_f2,P0_f6,P0_f6
681         faddd   P0_f4,C_qq1,P0_f4

683         fmuld   P2_f22,P2_f26,P2_f26
684         faddd   P2_f24,C_qq1,P2_f24

686         fmuld   P1_f12,P1_f14,P1_f14

688         faddd   P0_f6,C_ONE,P0_f6
689         fmuld   P0_f2,P0_f4,P0_f4

691         faddd   P2_f26,C_ONE,P2_f26
692         fmuld   P2_f22,P2_f24,P2_f24

694         faddd   P1_f14,C_q1,P1_f14

696         fmuld   P0_f0,P0_f6,P0_f6
697         ldd     [%o7+%l0],P0_f2

699         fmuld   P2_f20,P2_f26,P2_f26
700         ldd     [%o7+%l2],P2_f22

702         fmuld   P0_f4,%f32,P0_f4
703         lda     [%i1]%asi,%l0           ! preload next argument

705         fmuld   P2_f24,%f40,P2_f24
706         lda     [%i1]%asi,P0_f0

708         fmuld   P0_f6,%f34,P0_f6
709         lda     [%i1+4]%asi,P0_f1

711         fmuld   P2_f26,%f42,P2_f26
712         add     %i1,%i2,%i1             ! x += stridex

714         fmuld   P1_f12,P1_f14,P1_f14

716         fsubd   P0_f6,P0_f4,P0_f6

718         fsubd   P2_f26,P2_f24,P2_f26

720         !!(vsin)fmuld   P1_f10,P1_f14,P1_f14
```



```
722         fsubd   P0_f2,P0_f6,P0_f6

724         fsubd   P2_f22,P2_f26,P2_f26

726         faddd   C_ONE,P1_f14,P1_f16 !!(vsin)faddd       P1_f10,P1_f14,P1_f16

728         faddd   P0_f6,%f32,P0_f6

730         faddd   P2_f26,%f40,P2_f26
731         andn    %l0,MSK_SIGN,%l0                ! hx &= ~0x80000000

733         nop     !!(vsin)        fors    P1_f16,P1_f19,P1_f16
734         addcc   %i0,-1,%i0

736         nop     !!(vsin)        fors    P0_f6,P0_f9,P0_f6
737         bg,pt   %icc,.loop0

739 ! delay slot
740         nop     !!(vsin)        fors    P2_f26,P2_f29,P2_f26

742         ba,pt   %icc,.endloop0
743 ! delay slot
744         nop

746         .align  32
747 .case3:
748         sethi   %hi(0x3fc3c000),%o7
749         fand    P0_f8,MSK_BITSHI17,P0_f2
750         fmuld   P1_f10,P1_f10,P1_f12

752         sub     %l0,%o7,%l0
753         add     SC_HI,8,%g1;add SC_LO,8,%o7
754         fmuld   P2_f20,P2_f20,P2_f22

756         fsubd   P0_f0,P0_f2,P0_f0
757         srl     %l0,10,%l0
758         mov     %o0,%o3

760         fmuld   P1_f12,C_q4,P1_f14
761         mov     %o1,%o4

763         fmuld   P2_f22,C_q4,P2_f24
764         mov     %o2,%o5

766         fmuld   P0_f0,P0_f0,P0_f2
767         andn    %l0,0x1f,%l0

769         faddd   P1_f14,C_q3,P1_f14

771         faddd   P2_f24,C_q3,P2_f24

773         fmuld   P0_f2,C_pp2,P0_f6
774         ldd     [%g1+%l0],%f32

776         fmuld   P1_f12,P1_f14,P1_f14

778         fmuld   P2_f22,P2_f24,P2_f24

780         faddd   P0_f6,C_pp1,P0_f6
781         fmuld   P0_f2,C_qq2,P0_f4
782         ldd     [SC_HI+%l0],%f34

784         faddd   P1_f14,C_q2,P1_f14

786         faddd   P2_f24,C_q2,P2_f24
```

```
788         fmuld   P0_f2,P0_f6,P0_f6
789         faddd   P0_f4,C_qq1,P0_f4

791         fmuld   P1_f12,P1_f14,P1_f14

793         fmuld   P2_f22,P2_f24,P2_f24

795         faddd   P0_f6,C_ONE,P0_f6
796         fmuld   P0_f2,P0_f4,P0_f4

798         faddd   P1_f14,C_q1,P1_f14

800         faddd   P2_f24,C_q1,P2_f24

802         fmuld   P0_f0,P0_f6,P0_f6
803         ldd     [%o7+%l0],P0_f2

805         fmuld   P0_f4,%f32,P0_f4
806         lda     [%i1]%asi,%l0           ! preload next argument

808         fmuld   P1_f12,P1_f14,P1_f14
809         lda     [%i1]%asi,P0_f0

811         fmuld   P0_f6,%f34,P0_f6
812         lda     [%i1+4]%asi,P0_f1

814         fmuld   P2_f22,P2_f24,P2_f24
815         add     %i1,%i2,%i1             ! x += stridex

817         !!(vsin)fmuld   P1_f10,P1_f14,P1_f14

819         fsubd   P0_f6,P0_f4,P0_f6

821         !!(vsin)fmuld   P2_f20,P2_f24,P2_f24

823         faddd   C_ONE,P1_f14,P1_f16 !!(vsin)faddd       P1_f10,P1_f14,P1_f16

825         fsubd   P0_f2,P0_f6,P0_f6

827         faddd   C_ONE,P2_f24,P2_f26 !!(vsin)faddd       P2_f20,P2_f24,P2_f26

829         nop     !!(vsin)        fors    P1_f16,P1_f19,P1_f16
830         andn    %l0,MSK_SIGN,%l0                ! hx &= ~0x80000000

832         faddd   P0_f6,%f32,P0_f6
833         addcc   %i0,-1,%i0

835         nop     !!(vsin)        fors    P2_f26,P2_f29,P2_f26
836         bg,pt   %icc,.loop0

838 ! delay slot
839         nop     !!(vsin)        fors    P0_f6,P0_f9,P0_f6

841         ba,pt   %icc,.endloop0
842 ! delay slot
843         nop

845         .align  32
846 .case4:
847         st      P1_f17,[%o4+4]
848         cmp     %l1,LIM_l5
849         fpadd32s P1_f10,MSK_BIT13,P1_f18
850         bl,pn   %icc,.case6

852 ! delay slot
853         st      P2_f26,[%o5]
```



```
854         cmp     %l2,LIM_l5
855         fpadd32s P2_f20,MSK_BIT13,P2_f28
856         bl,pn   %icc,.case5

858 ! delay slot
859         st      P2_f27,[%o5+4]
860         sethi   %hi(0x3fc3c000),%o7
861         fand    P1_f18,MSK_BITSHI17,P1_f12

863         sub     %l1,%o7,%l1
864         sub     %l2,%o7,%l2
865         add     SC_HI,8,%g1;add SC_LO,8,%o7
866         fand    P2_f28,MSK_BITSHI17,P2_f22
867         fmuld   P0_f0,P0_f0,P0_f2

869         fsubd   P1_f10,P1_f12,P1_f10
870         srl     %l1,10,%l1
871         mov     %o1,%o4

873         fsubd   P2_f20,P2_f22,P2_f20
874         srl     %l2,10,%l2
875         mov     %o2,%o5

877         fmovd   P0_f0,P0_f6             !ID for processing
878         fmuld   P0_f2,C_q4,P0_f4
879         mov     %o0,%o3

881         fmuld   P1_f10,P1_f10,P1_f12
882         andn    %l1,0x1f,%l1

884         fmuld   P2_f20,P2_f20,P2_f22
885         andn    %l2,0x1f,%l2

887         faddd   P0_f4,C_q3,P0_f4

889         fmuld   P1_f12,C_pp2,P1_f16
890         ldd     [%g1+%l1],%f36

892         fmuld   P2_f22,C_pp2,P2_f26
893         ldd     [%g1+%l2],%f40

895         fmuld   P0_f2,P0_f4,P0_f4

897         faddd   P1_f16,C_pp1,P1_f16
898         fmuld   P1_f12,C_qq2,P1_f14
899         ldd     [SC_HI+%l1],%f38

901         faddd   P2_f26,C_pp1,P2_f26
902         fmuld   P2_f22,C_qq2,P2_f24
903         ldd     [SC_HI+%l2],%f42

905         faddd   P0_f4,C_q2,P0_f4

907         fmuld   P1_f12,P1_f16,P1_f16
908         faddd   P1_f14,C_qq1,P1_f14

910         fmuld   P2_f22,P2_f26,P2_f26
911         faddd   P2_f24,C_qq1,P2_f24

913         fmuld   P0_f2,P0_f4,P0_f4

915         faddd   P1_f16,C_ONE,P1_f16
916         fmuld   P1_f12,P1_f14,P1_f14

918         faddd   P2_f26,C_ONE,P2_f26
919         fmuld   P2_f22,P2_f24,P2_f24
```

```
921         faddd   P0_f4,C_q1,P0_f4

923         fmuld   P1_f10,P1_f16,P1_f16
924         ldd     [%o7+%l1],P1_f12

926         fmuld   P2_f20,P2_f26,P2_f26
927         ldd     [%o7+%l2],P2_f22

929         fmuld   P1_f14,%f36,P1_f14
930         lda     [%i1]%asi,%l0           ! preload next argument

932         fmuld   P2_f24,%f40,P2_f24
933         lda     [%i1]%asi,P0_f0

935         fmuld   P1_f16,%f38,P1_f16
936         lda     [%i1+4]%asi,P0_f1

938         fmuld   P2_f26,%f42,P2_f26
939         add     %i1,%i2,%i1             ! x += stridex

941         fmuld   P0_f2,P0_f4,P0_f4

943         fsubd   P1_f16,P1_f14,P1_f16

945         fsubd   P2_f26,P2_f24,P2_f26

947         !!(vsin)fmuld   P0_f6,P0_f4,P0_f4

949         fsubd   P1_f12,P1_f16,P1_f16

951         fsubd   P2_f22,P2_f26,P2_f26

953         faddd   C_ONE,P0_f4,P0_f6 !!(vsin)faddd   P0_f6,P0_f4,P0_f6     ! faddd

955         faddd   P1_f16,%f36,P1_f16

957         faddd   P2_f26,%f40,P2_f26
958         andn    %l0,MSK_SIGN,%l0                ! hx &= ~0x80000000

960         nop     !!(vsin)        fors    P0_f6,P0_f9,P0_f6
961         addcc   %i0,-1,%i0

963         nop     !!(vsin)        fors    P1_f16,P1_f19,P1_f16
964         bg,pt   %icc,.loop0

966 ! delay slot
967         nop     !!(vsin)        fors    P2_f26,P2_f29,P2_f26

969         ba,pt   %icc,.endloop0
970 ! delay slot
971         nop

973         .align  32
974 .case5:
975         sethi   %hi(0x3fc3c000),%o7
976         fand    P1_f18,MSK_BITSHI17,P1_f12
977         fmuld   P0_f0,P0_f0,P0_f2

979         sub     %l1,%o7,%l1
980         add     SC_HI,8,%g1;add SC_LO,8,%o7
981         fmuld   P2_f20,P2_f20,P2_f22

983         fsubd   P1_f10,P1_f12,P1_f10
984         srl     %l1,10,%l1
985         mov     %o1,%o4
```



```
987         fmovd   P0_f0,P0_f6             !ID for processing
988         fmuld   P0_f2,C_q4,P0_f4
989         mov     %o0,%o3

991         fmuld   P2_f22,C_q4,P2_f24
992         mov     %o2,%o5

994         fmuld   P1_f10,P1_f10,P1_f12
995         andn    %l1,0x1f,%l1

997         faddd   P0_f4,C_q3,P0_f4

999         faddd   P2_f24,C_q3,P2_f24

1001        fmuld   P1_f12,C_pp2,P1_f16
1002        ldd     [%g1+%l1],%f36

1004        fmuld   P0_f2,P0_f4,P0_f4

1006        fmuld   P2_f22,P2_f24,P2_f24

1008        faddd   P1_f16,C_pp1,P1_f16
1009        fmuld   P1_f12,C_qq2,P1_f14
1010        ldd     [SC_HI+%l1],%f38

1012        faddd   P0_f4,C_q2,P0_f4

1014        faddd   P2_f24,C_q2,P2_f24

1016        fmuld   P1_f12,P1_f16,P1_f16
1017        faddd   P1_f14,C_qq1,P1_f14

1019        fmuld   P0_f2,P0_f4,P0_f4

1021        fmuld   P2_f22,P2_f24,P2_f24

1023        faddd   P1_f16,C_ONE,P1_f16
1024        fmuld   P1_f12,P1_f14,P1_f14

1026        faddd   P0_f4,C_q1,P0_f4

1028        faddd   P2_f24,C_q1,P2_f24

1030        fmuld   P1_f10,P1_f16,P1_f16
1031        ldd     [%o7+%l1],P1_f12

1033        fmuld   P1_f14,%f36,P1_f14
1034        lda     [%i1]%asi,%l0           ! preload next argument

1036        fmuld   P0_f2,P0_f4,P0_f4
1037        lda     [%i1]%asi,P0_f0

1039        fmuld   P1_f16,%f38,P1_f16
1040        lda     [%i1+4]%asi,P0_f1

1042        fmuld   P2_f22,P2_f24,P2_f24
1043        add     %i1,%i2,%i1             ! x += stridex

1045        !!(vsin)fmuld   P0_f6,P0_f4,P0_f4

1047        fsubd   P1_f16,P1_f14,P1_f16

1049        !!(vsin)fmuld   P2_f20,P2_f24,P2_f24

1051        faddd   C_ONE,P0_f4,P0_f6 !!(vsin)faddd   P0_f6,P0_f4,P0_f6     ! faddd
```

```
1053         fsubd   P1_f12,P1_f16,P1_f16

1055         faddd   C_ONE,P2_f24,P2_f26 !!(vsin)faddd       P2_f20,P2_f24,P2_f26

1057         nop     !!(vsin)        fors    P0_f6,P0_f9,P0_f6
1058         andn    %l0,MSK_SIGN,%l0                ! hx &= ~0x80000000

1060         faddd   P1_f16,%f36,P1_f16
1061         addcc   %i0,-1,%i0

1063         nop     !!(vsin)        fors    P2_f26,P2_f29,P2_f26
1064         bg,pt   %icc,.loop0

1066 ! delay slot
1067         nop     !!(vsin)        fors    P1_f16,P1_f19,P1_f16

1069         ba,pt   %icc,.endloop0
1070 ! delay slot
1071         nop

1073         .align  32
1074 .case6:
1075         st      P2_f27,[%o5+4]
1076         cmp     %l2,LIM_l5
1077         fpadd32s P2_f20,MSK_BIT13,P2_f28
1078         bl,pn   %icc,.case7

1080 ! delay slot
1081         sethi   %hi(0x3fc3c000),%o7
1082         fand    P2_f28,MSK_BITSHI17,P2_f22
1083         fmuld   P0_f0,P0_f0,P0_f2

1085         sub     %l2,%o7,%l2
1086         add     SC_HI,8,%g1;add SC_LO,8,%o7
1087         fmuld   P1_f10,P1_f10,P1_f12

1089         fsubd   P2_f20,P2_f22,P2_f20
1090         srl     %l2,10,%l2
1091         mov     %o2,%o5

1093         fmovd   P0_f0,P0_f6             !ID for processing
1094         fmuld   P0_f2,C_q4,P0_f4
1095         mov     %o0,%o3

1097         fmuld   P1_f12,C_q4,P1_f14
1098         mov     %o1,%o4

1100         fmuld   P2_f20,P2_f20,P2_f22
1101         andn    %l2,0x1f,%l2

1103         faddd   P0_f4,C_q3,P0_f4

1105         faddd   P1_f14,C_q3,P1_f14

1107         fmuld   P2_f22,C_pp2,P2_f26
1108         ldd     [%g1+%l2],%f40

1110         fmuld   P0_f2,P0_f4,P0_f4

1112         fmuld   P1_f12,P1_f14,P1_f14

1114         faddd   P2_f26,C_pp1,P2_f26
1115         fmuld   P2_f22,C_qq2,P2_f24
1116         ldd     [SC_HI+%l2],%f42
```



```
1118         faddd   P0_f4,C_q2,P0_f4

1120         faddd   P1_f14,C_q2,P1_f14

1122         fmuld   P2_f22,P2_f26,P2_f26
1123         faddd   P2_f24,C_qq1,P2_f24

1125         fmuld   P0_f2,P0_f4,P0_f4

1127         fmuld   P1_f12,P1_f14,P1_f14

1129         faddd   P2_f26,C_ONE,P2_f26
1130         fmuld   P2_f22,P2_f24,P2_f24

1132         faddd   P0_f4,C_q1,P0_f4

1134         faddd   P1_f14,C_q1,P1_f14

1136         fmuld   P2_f20,P2_f26,P2_f26
1137         ldd     [%o7+%l2],P2_f22

1139         fmuld   P2_f24,%f40,P2_f24
1140         lda     [%i1]%asi,%l0           ! preload next argument

1142         fmuld   P0_f2,P0_f4,P0_f4
1143         lda     [%i1]%asi,P0_f0

1145         fmuld   P2_f26,%f42,P2_f26
1146         lda     [%i1+4]%asi,P0_f1

1148         fmuld   P1_f12,P1_f14,P1_f14
1149         add     %i1,%i2,%i1             ! x += stridex

1151         !!(vsin)fmuld   P0_f6,P0_f4,P0_f4

1153         fsubd   P2_f26,P2_f24,P2_f26

1155         !!(vsin)fmuld   P1_f10,P1_f14,P1_f14

1157         faddd   C_ONE,P0_f4,P0_f6 !!(vsin)faddd   P0_f6,P0_f4,P0_f6     ! faddd

1159         fsubd   P2_f22,P2_f26,P2_f26

1161         faddd   C_ONE,P1_f14,P1_f16 !!(vsin)faddd       P1_f10,P1_f14,P1_f16

1163         nop     !!(vsin)        fors    P0_f6,P0_f9,P0_f6
1164         andn    %l0,MSK_SIGN,%l0                ! hx &= ~0x80000000

1166         faddd   P2_f26,%f40,P2_f26
1167         addcc   %i0,-1,%i0

1169         nop     !!(vsin)        fors    P1_f16,P1_f19,P1_f16
1170         bg,pt   %icc,.loop0

1172 ! delay slot
1173         nop     !!(vsin)        fors    P2_f26,P2_f29,P2_f26

1175         ba,pt   %icc,.endloop0
1176 ! delay slot
1177         nop

1179         .align  32
1180 .case7:
1181         fmuld   P0_f0,P0_f0,P0_f2
1182         fmovd   P0_f0,P0_f6             !ID for processing
1183         mov     %o0,%o3
```

```
1185         fmuld   P1_f10,P1_f10,P1_f12
1186         mov     %o1,%o4

1188         fmuld   P2_f20,P2_f20,P2_f22
1189         mov     %o2,%o5

1191         fmuld   P0_f2,C_q4,P0_f4
1192         lda     [%i1]%asi,%l0           ! preload next argument

1194         fmuld   P1_f12,C_q4,P1_f14
1195         lda     [%i1]%asi,P0_f0

1197         fmuld   P2_f22,C_q4,P2_f24
1198         lda     [%i1+4]%asi,P0_f1

1200         faddd   P0_f4,C_q3,P0_f4
1201         add     %i1,%i2,%i1             ! x += stridex

1203         faddd   P1_f14,C_q3,P1_f14

1205         faddd   P2_f24,C_q3,P2_f24

1207         fmuld   P0_f2,P0_f4,P0_f4

1209         fmuld   P1_f12,P1_f14,P1_f14

1211         fmuld   P2_f22,P2_f24,P2_f24

1213         faddd   P0_f4,C_q2,P0_f4

1215         faddd   P1_f14,C_q2,P1_f14

1217         faddd   P2_f24,C_q2,P2_f24

1219         fmuld   P0_f2,P0_f4,P0_f4

1221         fmuld   P1_f12,P1_f14,P1_f14

1223         fmuld   P2_f22,P2_f24,P2_f24

1225         faddd   P0_f4,C_q1,P0_f4

1227         faddd   P1_f14,C_q1,P1_f14

1229         faddd   P2_f24,C_q1,P2_f24

1231         fmuld   P0_f2,P0_f4,P0_f4

1233         fmuld   P1_f12,P1_f14,P1_f14

1235         fmuld   P2_f22,P2_f24,P2_f24

1237         !!(vsin)fmuld   P0_f6,P0_f4,P0_f4

1239         !!(vsin)fmuld   P1_f10,P1_f14,P1_f14

1241         !!(vsin)fmuld   P2_f20,P2_f24,P2_f24

1243         faddd   C_ONE,P0_f4,P0_f6 !!(vsin)faddd   P0_f6,P0_f4,P0_f6     ! faddd

1245         faddd   C_ONE,P1_f14,P1_f16 !!(vsin)faddd       P1_f10,P1_f14,P1_f16

1247         faddd   C_ONE,P2_f24,P2_f26 !!(vsin)faddd       P2_f20,P2_f24,P2_f26
1248         andn    %l0,MSK_SIGN,%l0                ! hx &= ~0x80000000
```



```
1250         nop     !!(vsin)        fors    P0_f6,P0_f9,P0_f6
1251         addcc   %i0,-1,%i0

1253         nop     !!(vsin)        fors    P1_f16,P1_f19,P1_f16
1254         bg,pt   %icc,.loop0

1256 ! delay slot
1257         nop     !!(vsin)        fors    P2_f26,P2_f29,P2_f26

1259         ba,pt   %icc,.endloop0
1260 ! delay slot
1261         nop


1264         .align  32
1265 .endloop2:
1266         cmp     %l1,LIM_l5
1267         bl,pn   %icc,1f
1268 ! delay slot
1269         fabsd   P1_f10,P1_f10
1270         sethi   %hi(0x3fc3c000),%o7
1271         fpadd32s P1_f10,MSK_BIT13,P1_f18
1272         fand    P1_f18,MSK_BITSHI17,P1_f12
1273         sub     %l1,%o7,%l1
1274         add     SC_HI,8,%g1;add SC_LO,8,%o7
1275         fsubd   P1_f10,P1_f12,P1_f10
1276         srl     %l1,10,%l1
1277         fmuld   P1_f10,P1_f10,P1_f12
1278         andn    %l1,0x1f,%l1
1279         fmuld   P1_f12,C_pp2,P2_f20
1280         ldd     [%g1+%l1],%f36
1281         faddd   P2_f20,C_pp1,P2_f20
1282         fmuld   P1_f12,C_qq2,P1_f14
1283         ldd     [SC_HI+%l1],%f38
1284         fmuld   P1_f12,P2_f20,P2_f20
1285         faddd   P1_f14,C_qq1,P1_f14
1286         faddd   P2_f20,C_ONE,P2_f20
1287         fmuld   P1_f12,P1_f14,P1_f14
1288         fmuld   P1_f10,P2_f20,P2_f20
1289         ldd     [%o7+%l1],P1_f12
1290         fmuld   P1_f14,%f36,P1_f14
1291         fmuld   P2_f20,%f38,P2_f20
1292         fsubd   P2_f20,P1_f14,P2_f20
1293         fsubd   P1_f12,P2_f20,P2_f20
1294         ba,pt   %icc,2f
1295 ! delay slot
1296         faddd   P2_f20,%f36,P2_f20
1297 1:
1298         fmuld   P1_f10,P1_f10,P1_f12
1299         fmuld   P1_f12,C_q4,P1_f14
1300         faddd   P1_f14,C_q3,P1_f14
1301         fmuld   P1_f12,P1_f14,P1_f14
1302         faddd   P1_f14,C_q2,P1_f14
1303         fmuld   P1_f12,P1_f14,P1_f14
1304         faddd   P1_f14,C_q1,P1_f14
1305         fmuld   P1_f12,P1_f14,P1_f14
1306         !!(vsin)fmuld   P1_f10,P1_f14,P1_f14
1307         faddd   C_ONE,P1_f14,P2_f20 !!(vsin)faddd       P1_f10,P1_f14,P2_f20
1308 2:
1309         nop     !!(vsin)        fors    P2_f20,P1_f19,P2_f20
1310         st      P2_f20,[%o1]
1311         st      P2_f21,[%o1+4]

1313 .endloop1:
1314         cmp     %l0,LIM_l5
1315         bl,pn   %icc,1f
```

```
1316 ! delay slot
1317         fabsd   P0_f0,P0_f0
1318         sethi   %hi(0x3fc3c000),%o7
1319         fpadd32s P0_f0,MSK_BIT13,P0_f8
1320         fand    P0_f8,MSK_BITSHI17,P0_f2
1321         sub     %l0,%o7,%l0
1322         add     SC_HI,8,%g1;add SC_LO,8,%o7
1323         fsubd   P0_f0,P0_f2,P0_f0
1324         srl     %l0,10,%l0
1325         fmuld   P0_f0,P0_f0,P0_f2
1326         andn    %l0,0x1f,%l0
1327         fmuld   P0_f2,C_pp2,P2_f20
1328         ldd     [%g1+%l0],%f32
1329         faddd   P2_f20,C_pp1,P2_f20
1330         fmuld   P0_f2,C_qq2,P0_f4
1331         ldd     [SC_HI+%l0],%f34
1332         fmuld   P0_f2,P2_f20,P2_f20
1333         faddd   P0_f4,C_qq1,P0_f4
1334         faddd   P2_f20,C_ONE,P2_f20
1335         fmuld   P0_f2,P0_f4,P0_f4
1336         fmuld   P0_f0,P2_f20,P2_f20
1337         ldd     [%o7+%l0],P0_f2
1338         fmuld   P0_f4,%f32,P0_f4
1339         fmuld   P2_f20,%f34,P2_f20
1340         fsubd   P2_f20,P0_f4,P2_f20
1341         fsubd   P0_f2,P2_f20,P2_f20
1342         ba,pt   %icc,2f
1343 ! delay slot
1344         faddd   P2_f20,%f32,P2_f20
1345 1:
1346         fmuld   P0_f0,P0_f0,P0_f2
1347         fmuld   P0_f2,C_q4,P0_f4
1348         faddd   P0_f4,C_q3,P0_f4
1349         fmuld   P0_f2,P0_f4,P0_f4
1350         faddd   P0_f4,C_q2,P0_f4
1351         fmuld   P0_f2,P0_f4,P0_f4
1352         faddd   P0_f4,C_q1,P0_f4
1353         fmuld   P0_f2,P0_f4,P0_f4
1354         !!(vsin)fmuld   P0_f0,P0_f4,P0_f4
1355         faddd   C_ONE,P0_f4,P2_f20 !!(vsin)faddd        P0_f0,P0_f4,P2_f20
1356 2:
1357         nop     !!(vsin)        fors    P2_f20,P0_f9,P2_f20
1358         st      P2_f20,[%o0]
1359         st      P2_f21,[%o0+4]

1361 .endloop0:
1362         st      P0_f6,[%o3]
1363         st      P0_f7,[%o3+4]
1364         st      P1_f16,[%o4]
1365         st      P1_f17,[%o4+4]
1366         st      P2_f26,[%o5]
1367         st      P2_f27,[%o5+4]

1369 ! return.  finished off with only primary range arguments

1371         ret
1372         restore


1375         .align  32
1376 .range0:
1377         cmp     %l0,LIM_l6
1378         bg,a,pt %icc,.MEDIUM            ! branch to Medium range on big arg.
1379 ! delay slot, annulled if branch not taken
1380         mov     0x1,LIM_l6              ! set biguns flag or
1381         fdtoi   P0_f0,P0_f2; fmovd      C_ONE,P0_f0 ; st        P0_f0,[%o0]
```



```
1382         st      P0_f1,[%o0+4]
1383         !nop            ! (vsin) fdtoi  P0_f0,P0_f2
1384         addcc   %i0,-1,%i0
1385         ble,pn  %icc,.endloop0
1386 ! delay slot, harmless if branch taken
1387         add     %i3,%i4,%i3             ! y += stridey
1388         andn    %l1,MSK_SIGN,%l0                ! hx &= ~0x80000000
1389         fmovd   P1_f10,P0_f0
1390         ba,pt   %icc,.loop0
1391 ! delay slot
1392         add     %i1,%i2,%i1             ! x += stridex


1395         .align  32
1396 .range1:
1397         cmp     %l1,LIM_l6
1398         bg,a,pt %icc,.MEDIUM            ! branch to Medium range on big arg.
1399 ! delay slot, annulled if branch not taken
1400         mov     0x2,LIM_l6              ! set biguns flag or
1401         fdtoi   P1_f10,P1_f12; fmovd    C_ONE,P1_f10 ; st       P1_f10,[%o1]
1402         st      P1_f11,[%o1+4]
1403         !nop            ! (vsin) fdtoi  P1_f10,P1_f12
1404         addcc   %i0,-1,%i0
1405         ble,pn  %icc,.endloop1
1406 ! delay slot, harmless if branch taken
1407         add     %i3,%i4,%i3             ! y += stridey
1408         andn    %l2,MSK_SIGN,%l1                ! hx &= ~0x80000000
1409         fmovd   P2_f20,P1_f10
1410         ba,pt   %icc,.loop1
1411 ! delay slot
1412         add     %i1,%i2,%i1             ! x += stridex


1415         .align  32
1416 .range2:
1417         cmp     %l2,LIM_l6
1418         bg,a,pt %icc,.MEDIUM            ! brance to Medium range on big arg.
1419 ! delay slot, annulled if branch not taken
1420         mov     0x3,LIM_l6              ! set biguns flag or
1421         fdtoi   P2_f20,P2_f22; fmovd    C_ONE,P2_f20 ; st       P2_f20,[%o2]
1422         st      P2_f21,[%o2+4]
1423         nop             ! (vsin) fdtoi  P2_f20,P2_f22
1424 1:
1425         addcc   %i0,-1,%i0
1426         ble,pn  %icc,.endloop2
1427 ! delay slot
1428         nop
1429         ld      [%i1],%l2
1430         ld      [%i1],P2_f20
1431         ld      [%i1+4],P2_f21
1432         andn    %l2,MSK_SIGN,%l2                ! hx &= ~0x80000000
1433         ba,pt   %icc,.loop2
1434 ! delay slot
1435         add     %i1,%i2,%i1             ! x += stridex


1438         .align  32
1439 .MEDIUM:

1441 ! ========== medium range ==========

1443 ! register use

1445 ! i0  n
1446 ! i1  x
1447 ! i2  stridex
```

```
! i3  y
! i4  stridey
! i5  0x80000000

! l0  hx0
! l1  hx1
! l2  hx2
! l3  __vlibm_TBL_sincos_hi
! l4  __vlibm_TBL_sincos_lo
! l5  constants
! l6  biguns stored here : still called LIM_l6
! l7  0x413921fb

! the following are 64-bit registers in both V8+ and V9

! g1  scratch
! g5

! o0  py0
! o1  py1
! o2  py2
! o3  n0
! o4  n1
! o5  n2
! o7  scratch

! f0  x0
! f2  n0,y0
! f4
! f6
! f8  scratch for table base
! f9  signbit0
! f10 x1
! f12 n1,y1
! f14
! f16
! f18 scratch for table base
! f19 signbit1
! f20 x2
! f22 n2,y2
! f24
! f26
! f28 scratch for table base
! f29 signbit2
! f30 0x80000000
! f31 0x4000
! f32
! f34
! f36
! f38
! f40 invpio2
! f42 round
! f44 0xffff800000000000
! f46 pio2_1
! f48 pio2_2
! f50 pio2_3
! f52 pio2_3t
! f54 one
! f56 pp1
! f58 pp2
! f60 qq1
! f62 qq2

        PIC_SET(g5,constants,l5)
```



```
        ! %o3,%o4,%o5 need to be stored
        st      P0_f6,[%o3]
        sethi   %hi(0x413921fb),%l7
        st      P0_f7,[%o3+4]
        or      %l7,%lo(0x413921fb),%l7
        st      P1_f16,[%o4]
        st      P1_f17,[%o4+4]
        st      P2_f26,[%o5]
        st      P2_f27,[%o5+4]
        ldd     [%l5+invpio2],%f40
        ldd     [%l5+round],%f42
        ldd     [%l5+pio2_1],%f46
        ldd     [%l5+pio2_2],%f48
        ldd     [%l5+pio2_3],%f50
        ldd     [%l5+pio2_3t],%f52
        std     %f54,[%fp+x0_1+8]       ! set up stack data
        std     %f54,[%fp+x1_1+8]
        std     %f54,[%fp+x2_1+8]
        stx     %g0,[%fp+y0_0+8]
        stx     %g0,[%fp+y1_0+8]
        stx     %g0,[%fp+y2_0+8]

!       branched here in the middle of the array.  Need to adjust
!       for the members of the triple that were selected in the primary
!       loop.

!       no adjustment since all three selected here
        subcc   LIM_l6,0x1,%g0          ! continue in LOOP0?
        bz,a    %icc,.LOOP0
        mov     0x0,LIM_l6              ! delay slot set biguns=0

!       ajust 1st triple since 2d and 3d done here
        subcc   LIM_l6,0x2,%g0          ! continue in LOOP1?
        fmuld   %f0,%f40,%f2            ! adj LOOP0
        bz,a    %icc,.LOOP1
        mov     0x0,LIM_l6              ! delay slot set biguns=0

!       ajust 1st and 2d triple since 3d done here
        subcc   LIM_l6,0x3,%g0          ! continue in LOOP2?
        !done fmuld     %f0,%f40,%f2            ! adj LOOP0
        sub     %i3,%i4,%i3             ! adjust to not double increment
        fmuld   %f10,%f40,%f12          ! adj LOOP1
        faddd   %f2,%f42,%f2            ! adj LOOP1
        bz,a    %icc,.LOOP2
        mov     0x0,LIM_l6              ! delay slot set biguns=0

        ba      .LOOP0
        nop

! -- 16 byte aligned

        .align  32
.LOOP0:
        lda     [%i1]%asi,%l1           ! preload next argument
        mov     %i3,%o0                 ! py0 = y

        lda     [%i1]%asi,%f10
        cmp     %l0,%l7
        add     %i3,%i4,%i3             ! y += stridey
        bg,pn   %icc,.BIG0              ! if hx > 0x413921fb

! delay slot
        lda     [%i1+4]%asi,%f11
        addcc   %i0,-1,%i0
        add     %i1,%i2,%i1             ! x += stridex
        ble,pn  %icc,.ENDLOOP1
```

```
1581 ! delay slot
1582         andn    %l1,%i5,%l1
1583         nop
1584         fmuld   %f0,%f40,%f2
1585         fabsd   %f54,%f54               ! a nop for alignment only

1587 .LOOP1:
1588         lda     [%i1]%asi,%l2           ! preload next argument
1589         mov     %i3,%o1                 ! py1 = y

1591         lda     [%i1]%asi,%f20
1592         cmp     %l1,%l7
1593         add     %i3,%i4,%i3             ! y += stridey
1594         bg,pn   %icc,.BIG1              ! if hx > 0x413921fb

1596 ! delay slot
1597         lda     [%i1+4]%asi,%f21
1598         addcc   %i0,-1,%i0
1599         add     %i1,%i2,%i1             ! x += stridex
1600         ble,pn  %icc,.ENDLOOP2

1602 ! delay slot
1603         andn    %l2,%i5,%l2
1604         nop
1605         fmuld   %f10,%f40,%f12
1606         faddd   %f2,%f42,%f2

1608 .LOOP2:
1609         st      %f3,[%fp+n0]
1610         mov     %i3,%o2                 ! py2 = y

1612         cmp     %l2,%l7
1613         add     %i3,%i4,%i3             ! y += stridey
1614         fmuld   %f20,%f40,%f22
1615         bg,pn   %icc,.BIG2              ! if hx > 0x413921fb

1617 ! delay slot
1618         add     %l5,thresh+4,%o7
1619         faddd   %f12,%f42,%f12
1620         st      %f13,[%fp+n1]

1622 ! -

1624         add     %l5,thresh,%g1
1625         faddd   %f22,%f42,%f22
1626         st      %f23,[%fp+n2]

1628         fsubd   %f2,%f42,%f2            ! n

1630         fsubd   %f12,%f42,%f12          ! n

1632         fsubd   %f22,%f42,%f22          ! n

1634         fmuld   %f2,%f46,%f4

1636         fmuld   %f12,%f46,%f14

1638         fmuld   %f22,%f46,%f24

1640         fsubd   %f0,%f4,%f4
1641         fmuld   %f2,%f48,%f6

1643         fsubd   %f10,%f14,%f14
1644         fmuld   %f12,%f48,%f16
```



```
1646         fsubd   %f20,%f24,%f24
1647         fmuld   %f22,%f48,%f26

1649         fsubd   %f4,%f6,%f0
1650         ld      [%fp+n0],%o3 ; add      %o3,1,%o3

1652         fsubd   %f14,%f16,%f10
1653         ld      [%fp+n1],%o4 ; add      %o4,1,%o4

1655         fsubd   %f24,%f26,%f20
1656         ld      [%fp+n2],%o5 ; add      %o5,1,%o5

1658         fsubd   %f4,%f0,%f32
1659         and     %o3,1,%o3

1661         fsubd   %f14,%f10,%f34
1662         and     %o4,1,%o4

1664         fsubd   %f24,%f20,%f36
1665         and     %o5,1,%o5

1667         fsubd   %f32,%f6,%f32
1668         fmuld   %f2,%f50,%f8
1669         sll     %o3,3,%o3

1671         fsubd   %f34,%f16,%f34
1672         fmuld   %f12,%f50,%f18
1673         sll     %o4,3,%o4

1675         fsubd   %f36,%f26,%f36
1676         fmuld   %f22,%f50,%f28
1677         sll     %o5,3,%o5

1679         fsubd   %f8,%f32,%f8
1680         ld      [%g1+%o3],%f6

1682         fsubd   %f18,%f34,%f18
1683         ld      [%g1+%o4],%f16

1685         fsubd   %f28,%f36,%f28
1686         ld      [%g1+%o5],%f26

1688         fsubd   %f0,%f8,%f4

1690         fsubd   %f10,%f18,%f14

1692         fsubd   %f20,%f28,%f24

1694         fsubd   %f0,%f4,%f32

1696         fsubd   %f10,%f14,%f34

1698         fsubd   %f20,%f24,%f36

1700         fsubd   %f32,%f8,%f32
1701         fmuld   %f2,%f52,%f2

1703         fsubd   %f34,%f18,%f34
1704         fmuld   %f12,%f52,%f12

1706         fsubd   %f36,%f28,%f36
1707         fmuld   %f22,%f52,%f22

1709         fsubd   %f2,%f32,%f2
1710         ld      [%o7+%o3],%f8
```

```
1712         fsubd   %f12,%f34,%f12
1713         ld      [%o7+%o4],%f18

1715         fsubd   %f22,%f36,%f22
1716         ld      [%o7+%o5],%f28

1718         fsubd   %f4,%f2,%f0             ! x

1720         fsubd   %f14,%f12,%f10          ! x

1722         fsubd   %f24,%f22,%f20          ! x

1724         fsubd   %f4,%f0,%f4

1726         fsubd   %f14,%f10,%f14

1728         fsubd   %f24,%f20,%f24

1730         fands   %f0,%f30,%f9            ! save signbit

1732         fands   %f10,%f30,%f19          ! save signbit

1734         fands   %f20,%f30,%f29          ! save signbit

1736         fabsd   %f0,%f0
1737         std     %f0,[%fp+x0_1]

1739         fabsd   %f10,%f10
1740         std     %f10,[%fp+x1_1]

1742         fabsd   %f20,%f20
1743         std     %f20,[%fp+x2_1]

1745         fsubd   %f4,%f2,%f2             ! y

1747         fsubd   %f14,%f12,%f12          ! y

1749         fsubd   %f24,%f22,%f22          ! y

1751         fcmpgt32 %f6,%f0,%l0

1753         fcmpgt32 %f16,%f10,%l1

1755         fcmpgt32 %f26,%f20,%l2

1757 ! -- 16 byte aligned
1758         fxors   %f2,%f9,%f2

1760         fxors   %f12,%f19,%f12

1762         fxors   %f22,%f29,%f22

1764         fands   %f9,%f8,%f9             ! if (n & 1) clear sign bit
1765         andcc   %l0,2,%g0
1766         bne,pn  %icc,.CASE4

1768 ! delay slot
1769         fands   %f19,%f18,%f19          ! if (n & 1) clear sign bit
1770         andcc   %l1,2,%g0
1771         bne,pn  %icc,.CASE2

1773 ! delay slot
1774         fands   %f29,%f28,%f29          ! if (n & 1) clear sign bit
1775         andcc   %l2,2,%g0
1776         bne,pn  %icc,.CASE1
```



```
1778 ! delay slot
1779         fpadd32s %f0,%f31,%f8
1780         sethi   %hi(0x3fc3c000),%o7
1781         ld      [%fp+x0_1],%l0

1783         fpadd32s %f10,%f31,%f18
1784         add     %l3,8,%g1
1785         ld      [%fp+x1_1],%l1

1787         fpadd32s %f20,%f31,%f28
1788         ld      [%fp+x2_1],%l2

1790         fand    %f8,%f44,%f4
1791         sub     %l0,%o7,%l0

1793         fand    %f18,%f44,%f14
1794         sub     %l1,%o7,%l1

1796         fand    %f28,%f44,%f24
1797         sub     %l2,%o7,%l2

1799         fsubd   %f0,%f4,%f0
1800         srl     %l0,10,%l0

1802         fsubd   %f10,%f14,%f10
1803         srl     %l1,10,%l1

1805         fsubd   %f20,%f24,%f20
1806         srl     %l2,10,%l2

1808         faddd   %f0,%f2,%f0
1809         andn    %l0,0x1f,%l0

1811         faddd   %f10,%f12,%f10
1812         andn    %l1,0x1f,%l1

1814         faddd   %f20,%f22,%f20
1815         andn    %l2,0x1f,%l2

1817         fmuld   %f0,%f0,%f2
1818         add     %l0,%o3,%l0

1820         fmuld   %f10,%f10,%f12
1821         add     %l1,%o4,%l1

1823         fmuld   %f20,%f20,%f22
1824         add     %l2,%o5,%l2

1826         fmuld   %f2,%f58,%f6
1827         ldd     [%l3+%l0],%f32

1829         fmuld   %f12,%f58,%f16
1830         ldd     [%l3+%l1],%f34

1832         fmuld   %f22,%f58,%f26
1833         ldd     [%l3+%l2],%f36

1835         faddd   %f6,%f56,%f6
1836         fmuld   %f2,%f62,%f4

1838         faddd   %f16,%f56,%f16
1839         fmuld   %f12,%f62,%f14

1841         faddd   %f26,%f56,%f26
1842         fmuld   %f22,%f62,%f24
```

```
1844          fmuld   %f2,%f6,%f6
1845          faddd   %f4,%f60,%f4

1847          fmuld   %f12,%f16,%f16
1848          faddd   %f14,%f60,%f14

1850          fmuld   %f22,%f26,%f26
1851          faddd   %f24,%f60,%f24

1853          faddd   %f6,%f54,%f6
1854          fmuld   %f2,%f4,%f4

1856          faddd   %f16,%f54,%f16
1857          fmuld   %f12,%f14,%f14

1859          faddd   %f26,%f54,%f26
1860          fmuld   %f22,%f24,%f24

1862          fmuld   %f0,%f6,%f6
1863          ldd     [%g1+%l0],%f2

1865          fmuld   %f10,%f16,%f16
1866          ldd     [%g1+%l1],%f12

1868          fmuld   %f20,%f26,%f26
1869          ldd     [%g1+%l2],%f22

1871          fmuld   %f4,%f32,%f4
1872          ldd     [%l4+%l0],%f0

1874          fmuld   %f14,%f34,%f14
1875          ldd     [%l4+%l1],%f10

1877          fmuld   %f24,%f36,%f24
1878          ldd     [%l4+%l2],%f20

1880          fmuld   %f6,%f2,%f6

1882          fmuld   %f16,%f12,%f16

1884          fmuld   %f26,%f22,%f26

1886          faddd   %f6,%f4,%f6

1888          faddd   %f16,%f14,%f16

1890          faddd   %f26,%f24,%f26

1892          faddd   %f6,%f0,%f6

1894          faddd   %f16,%f10,%f16

1896          faddd   %f26,%f20,%f26

1898          faddd   %f6,%f32,%f6

1900          faddd   %f16,%f34,%f16

1902          faddd   %f26,%f36,%f26

1904  .FIXSIGN:
1905          ld      [%fp+n0],%o3 ; add      %o3,1,%o3
1906          add     %l5,thresh-4,%g1

1908          ld      [%fp+n1],%o4 ; add      %o4,1,%o4
```



```
1910          ld      [%fp+n2],%o5 ; add      %o5,1,%o5
1911          and     %o3,2,%o3

1913          sll     %o3,2,%o3
1914          and     %o4,2,%o4
1915          lda     [%i1]%asi,%l0           ! preload next argument

1917          sll     %o4,2,%o4
1918          and     %o5,2,%o5
1919          ld      [%g1+%o3],%f8

1921          sll     %o5,2,%o5
1922          ld      [%g1+%o4],%f18

1924          ld      [%g1+%o5],%f28
1925          fxors   %f9,%f8,%f9

1927          lda     [%i1]%asi,%f0
1928          fxors   %f29,%f28,%f29

1930          lda     [%i1+4]%asi,%f1
1931          fxors   %f19,%f18,%f19

1933          fors    %f6,%f9,%f6             ! tack on sign
1934          add     %i1,%i2,%i1             ! x += stridex
1935          st      %f6,[%o0]

1937          fors    %f26,%f29,%f26          ! tack on sign
1938          st      %f7,[%o0+4]

1940          fors    %f16,%f19,%f16          ! tack on sign
1941          st      %f26,[%o2]

1943          st      %f27,[%o2+4]
1944          addcc   %i0,-1,%i0

1946          st      %f16,[%o1]
1947          andn    %l0,%i5,%l0             ! hx &= ~0x80000000
1948          bg,pt   %icc,.LOOP0

1950  ! delay slot
1951          st      %f17,[%o1+4]

1953          ba,pt   %icc,.ENDLOOP0
1954  ! delay slot
1955          nop

1957          .align  32
1958  .CASE1:
1959          fpadd32s %f10,%f31,%f18
1960          sethi   %hi(0x3fc3c000),%o7
1961          ld      [%fp+x0_1],%l0

1963          fand    %f8,%f44,%f4
1964          add     %l3,8,%g1
1965          ld      [%fp+x1_1],%l1

1967          fand    %f18,%f44,%f14
1968          sub     %l0,%o7,%l0

1970          fsubd   %f0,%f4,%f0
1971          srl     %l0,10,%l0
1972          sub     %l1,%o7,%l1

1974          fsubd   %f10,%f14,%f10
1975          srl     %l1,10,%l1
```

```
1977         fmuld   %f20,%f20,%f20
1978         ldd     [%l5+%o5],%f36
1979         add     %l5,%o5,%l2

1981         faddd   %f0,%f2,%f0
1982         andn    %l0,0x1f,%l0

1984         faddd   %f10,%f12,%f10
1985         andn    %l1,0x1f,%l1

1987         fmuld   %f20,%f36,%f24
1988         ldd     [%l2+0x10],%f26
1989         add     %fp,%o5,%o5

1991         fmuld   %f0,%f0,%f2
1992         add     %l0,%o3,%l0

1994         fmuld   %f10,%f10,%f12
1995         add     %l1,%o4,%l1

1997         faddd   %f24,%f26,%f24
1998         ldd     [%l2+0x20],%f36

2000         fmuld   %f2,%f58,%f6
2001         ldd     [%l3+%l0],%f32

2003         fmuld   %f12,%f58,%f16
2004         ldd     [%l3+%l1],%f34

2006         fmuld   %f20,%f24,%f24
2007         ldd     [%l2+0x30],%f26

2009         faddd   %f6,%f56,%f6
2010         fmuld   %f2,%f62,%f4

2012         faddd   %f16,%f56,%f16
2013         fmuld   %f12,%f62,%f14

2015         faddd   %f24,%f36,%f24
2016         ldd     [%o5+x2_1],%f36

2018         fmuld   %f2,%f6,%f6
2019         faddd   %f4,%f60,%f4

2021         fmuld   %f12,%f16,%f16
2022         faddd   %f14,%f60,%f14

2024         fmuld   %f20,%f24,%f24

2026         faddd   %f6,%f54,%f6
2027         fmuld   %f2,%f4,%f4
2028         ldd     [%g1+%l0],%f2

2030         faddd   %f16,%f54,%f16
2031         fmuld   %f12,%f14,%f14
2032         ldd     [%g1+%l1],%f12

2034         faddd   %f24,%f26,%f24

2036         fmuld   %f0,%f6,%f6
2037         ldd     [%l4+%l0],%f0

2039         fmuld   %f10,%f16,%f16
2040         ldd     [%l4+%l1],%f10
```



```
2042         fmuld   %f4,%f32,%f4
2043         std     %f22,[%fp+y2_0]

2045         fmuld   %f14,%f34,%f14

2047         fmuld   %f6,%f2,%f6

2049         fmuld   %f16,%f12,%f16

2051         fmuld   %f20,%f24,%f24

2053         faddd   %f6,%f4,%f6

2055         faddd   %f16,%f14,%f16

2057         fmuld   %f36,%f24,%f24
2058         ldd     [%o5+y2_0],%f22

2060         faddd   %f6,%f0,%f6

2062         faddd   %f16,%f10,%f16

2064         faddd   %f24,%f22,%f24

2066         faddd   %f6,%f32,%f6

2068         faddd   %f16,%f34,%f16
2069         ba,pt   %icc,.FIXSIGN

2071 ! delay slot
2072         faddd   %f36,%f24,%f26

2074         .align  32
2075 .CASE2:
2076         fpadd32s %f0,%f31,%f8
2077         ld      [%fp+x0_1],%l0
2078         andcc   %l2,2,%g0
2079         bne,pn  %icc,.CASE3

2081 ! delay slot
2082         sethi   %hi(0x3fc3c000),%o7
2083         fpadd32s %f20,%f31,%f28
2084         ld      [%fp+x2_1],%l2

2086         fand    %f8,%f44,%f4
2087         sub     %l0,%o7,%l0
2088         add     %l3,8,%g1

2090         fand    %f28,%f44,%f24
2091         sub     %l2,%o7,%l2

2093         fsubd   %f0,%f4,%f0
2094         srl     %l0,10,%l0

2096         fsubd   %f20,%f24,%f20
2097         srl     %l2,10,%l2

2099         fmuld   %f10,%f10,%f10
2100         ldd     [%l5+%o4],%f34
2101         add     %l5,%o4,%l1

2103         faddd   %f0,%f2,%f0
2104         andn    %l0,0x1f,%l0

2106         faddd   %f20,%f22,%f20
2107         andn    %l2,0x1f,%l2
```

```
2109          fmuld   %f10,%f34,%f14
2110          ldd     [%l1+0x10],%f16
2111          add     %fp,%o4,%o4

2113          fmuld   %f0,%f0,%f2
2114          add     %l0,%o3,%l0

2116          fmuld   %f20,%f20,%f22
2117          add     %l2,%o5,%l2

2119          faddd   %f14,%f16,%f14
2120          ldd     [%l1+0x20],%f34

2122          fmuld   %f2,%f58,%f6
2123          ldd     [%l3+%l0],%f32

2125          fmuld   %f22,%f58,%f26
2126          ldd     [%l3+%l2],%f36

2128          fmuld   %f10,%f14,%f14
2129          ldd     [%l1+0x30],%f16

2131          faddd   %f6,%f56,%f6
2132          fmuld   %f2,%f62,%f4

2134          faddd   %f26,%f56,%f26
2135          fmuld   %f22,%f62,%f24

2137          faddd   %f14,%f34,%f14
2138          ldd     [%o4+x1_1],%f34

2140          fmuld   %f2,%f6,%f6
2141          faddd   %f4,%f60,%f4

2143          fmuld   %f22,%f26,%f26
2144          faddd   %f24,%f60,%f24

2146          fmuld   %f10,%f14,%f14

2148          faddd   %f6,%f54,%f6
2149          fmuld   %f2,%f4,%f4
2150          ldd     [%g1+%l0],%f2

2152          faddd   %f26,%f54,%f26
2153          fmuld   %f22,%f24,%f24
2154          ldd     [%g1+%l2],%f22

2156          faddd   %f14,%f16,%f14

2158          fmuld   %f0,%f6,%f6
2159          ldd     [%l4+%l0],%f0

2161          fmuld   %f20,%f26,%f26
2162          ldd     [%l4+%l2],%f20

2164          fmuld   %f4,%f32,%f4
2165          std     %f12,[%fp+y1_0]

2167          fmuld   %f24,%f36,%f24

2169          fmuld   %f6,%f2,%f6

2171          fmuld   %f26,%f22,%f26

2173          fmuld   %f10,%f14,%f14
```



```
2175          faddd   %f6,%f4,%f6

2177          faddd   %f26,%f24,%f26

2179          fmuld   %f34,%f14,%f14
2180          ldd     [%o4+y1_0],%f12

2182          faddd   %f6,%f0,%f6

2184          faddd   %f26,%f20,%f26

2186          faddd   %f14,%f12,%f14

2188          faddd   %f6,%f32,%f6

2190          faddd   %f26,%f36,%f26
2191          ba,pt   %icc,.FIXSIGN

2193  ! delay slot
2194          faddd   %f34,%f14,%f16

2196          .align  32
2197  .CASE3:
2198          fand    %f8,%f44,%f4
2199          add     %l3,8,%g1
2200          sub     %l0,%o7,%l0

2202          fmuld   %f10,%f10,%f10
2203          ldd     [%l5+%o4],%f34
2204          add     %l5,%o4,%l1

2206          fsubd   %f0,%f4,%f0
2207          srl     %l0,10,%l0

2209          fmuld   %f20,%f20,%f20
2210          ldd     [%l5+%o5],%f36
2211          add     %l5,%o5,%l2

2213          fmuld   %f10,%f34,%f14
2214          ldd     [%l1+0x10],%f16
2215          add     %fp,%o4,%o4

2217          faddd   %f0,%f2,%f0
2218          andn    %l0,0x1f,%l0

2220          fmuld   %f20,%f36,%f24
2221          ldd     [%l2+0x10],%f26
2222          add     %fp,%o5,%o5

2224          faddd   %f14,%f16,%f14
2225          ldd     [%l1+0x20],%f34

2227          fmuld   %f0,%f0,%f2
2228          add     %l0,%o3,%l0

2230          faddd   %f24,%f26,%f24
2231          ldd     [%l2+0x20],%f36

2233          fmuld   %f10,%f14,%f14
2234          ldd     [%l1+0x30],%f16

2236          fmuld   %f2,%f58,%f6
2237          ldd     [%l3+%l0],%f32

2239          fmuld   %f20,%f24,%f24
```

```
2240         ldd     [%l2+0x30],%f26

2242         faddd   %f14,%f34,%f14
2243         ldd     [%o4+x1_1],%f34

2245         faddd   %f6,%f56,%f6
2246         fmuld   %f2,%f62,%f4

2248         faddd   %f24,%f36,%f24
2249         ldd     [%o5+x2_1],%f36

2251         fmuld   %f10,%f14,%f14
2252         std     %f12,[%fp+y1_0]

2254         fmuld   %f2,%f6,%f6
2255         faddd   %f4,%f60,%f4

2257         fmuld   %f20,%f24,%f24
2258         std     %f22,[%fp+y2_0]

2260         faddd   %f14,%f16,%f14

2262         faddd   %f6,%f54,%f6
2263         fmuld   %f2,%f4,%f4
2264         ldd     [%g1+%l0],%f2

2266         faddd   %f24,%f26,%f24

2268         fmuld   %f10,%f14,%f14

2270         fmuld   %f0,%f6,%f6
2271         ldd     [%l4+%l0],%f0

2273         fmuld   %f4,%f32,%f4

2275         fmuld   %f20,%f24,%f24

2277         fmuld   %f6,%f2,%f6

2279         fmuld   %f34,%f14,%f14
2280         ldd     [%o4+y1_0],%f12

2282         fmuld   %f36,%f24,%f24
2283         ldd     [%o5+y2_0],%f22

2285         faddd   %f6,%f4,%f6

2287         faddd   %f14,%f12,%f14

2289         faddd   %f24,%f22,%f24

2291         faddd   %f6,%f0,%f6

2293         faddd   %f34,%f14,%f16

2295         faddd   %f36,%f24,%f26
2296         ba,pt   %icc,.FIXSIGN

2298 ! delay slot
2299         faddd   %f6,%f32,%f6

2301         .align  32
2302 .CASE4:
2303         fands   %f29,%f28,%f29          ! if (n & 1) clear sign bit
2304         sethi   %hi(0x3fc3c000),%o7
2305         andcc   %l1,2,%g0
```



```
2306         bne,pn  %icc,.CASE6

2308 ! delay slot
2309         andcc   %l2,2,%g0
2310         fpadd32s %f10,%f31,%f18
2311         ld      [%fp+x1_1],%l1
2312         bne,pn  %icc,.CASE5

2314 ! delay slot
2315         add     %l3,8,%g1
2316         ld      [%fp+x2_1],%l2
2317         fpadd32s %f20,%f31,%f28

2319         fand    %f18,%f44,%f14
2320         sub     %l1,%o7,%l1

2322         fand    %f28,%f44,%f24
2323         sub     %l2,%o7,%l2

2325         fsubd   %f10,%f14,%f10
2326         srl     %l1,10,%l1

2328         fsubd   %f20,%f24,%f20
2329         srl     %l2,10,%l2

2331         fmuld   %f0,%f0,%f0
2332         ldd     [%l5+%o3],%f32
2333         add     %l5,%o3,%l0

2335         faddd   %f10,%f12,%f10
2336         andn    %l1,0x1f,%l1

2338         faddd   %f20,%f22,%f20
2339         andn    %l2,0x1f,%l2

2341         fmuld   %f0,%f32,%f4
2342         ldd     [%l0+0x10],%f6
2343         add     %fp,%o3,%o3

2345         fmuld   %f10,%f10,%f12
2346         add     %l1,%o4,%l1

2348         fmuld   %f20,%f20,%f22
2349         add     %l2,%o5,%l2

2351         faddd   %f4,%f6,%f4
2352         ldd     [%l0+0x20],%f32

2354         fmuld   %f12,%f58,%f16
2355         ldd     [%l3+%l1],%f34

2357         fmuld   %f22,%f58,%f26
2358         ldd     [%l3+%l2],%f36

2360         fmuld   %f0,%f4,%f4
2361         ldd     [%l0+0x30],%f6

2363         faddd   %f16,%f56,%f16
2364         fmuld   %f12,%f62,%f14

2366         faddd   %f26,%f56,%f26
2367         fmuld   %f22,%f62,%f24

2369         faddd   %f4,%f32,%f4
2370         ldd     [%o3+x0_1],%f32
```

```
2372          fmuld   %f12,%f16,%f16
2373          faddd   %f14,%f60,%f14

2375          fmuld   %f22,%f26,%f26
2376          faddd   %f24,%f60,%f24

2378          fmuld   %f0,%f4,%f4

2380          faddd   %f16,%f54,%f16
2381          fmuld   %f12,%f14,%f14
2382          ldd     [%g1+%l1],%f12

2384          faddd   %f26,%f54,%f26
2385          fmuld   %f22,%f24,%f24
2386          ldd     [%g1+%l2],%f22

2388          faddd   %f4,%f6,%f4

2390          fmuld   %f10,%f16,%f16
2391          ldd     [%l4+%l1],%f10

2393          fmuld   %f20,%f26,%f26
2394          ldd     [%l4+%l2],%f20

2396          fmuld   %f14,%f34,%f14
2397          std     %f2,[%fp+y0_0]

2399          fmuld   %f24,%f36,%f24

2401          fmuld   %f0,%f4,%f4

2403          fmuld   %f16,%f12,%f16

2405          fmuld   %f26,%f22,%f26

2407          fmuld   %f32,%f4,%f4
2408          ldd     [%o3+y0_0],%f2

2410          faddd   %f16,%f14,%f16

2412          faddd   %f26,%f24,%f26

2414          faddd   %f4,%f2,%f4

2416          faddd   %f16,%f10,%f16

2418          faddd   %f26,%f20,%f26

2420          faddd   %f32,%f4,%f6

2422          faddd   %f16,%f34,%f16
2423          ba,pt   %icc,.FIXSIGN

2425 ! delay slot
2426          faddd   %f26,%f36,%f26

2428          .align  32
2429 .CASE5:
2430          fand    %f18,%f44,%f14
2431          sub     %l1,%o7,%l1

2433          fmuld   %f0,%f0,%f0
2434          ldd     [%l5+%o3],%f32
2435          add     %l5,%o3,%l0

2437          fsubd   %f10,%f14,%f10
```



```
2438          srl     %l1,10,%l1

2440          fmuld   %f20,%f20,%f20
2441          ldd     [%l5+%o5],%f36
2442          add     %l5,%o5,%l2

2444          fmuld   %f0,%f32,%f4
2445          ldd     [%l0+0x10],%f6
2446          add     %fp,%o3,%o3

2448          faddd   %f10,%f12,%f10
2449          andn    %l1,0x1f,%l1

2451          fmuld   %f20,%f36,%f24
2452          ldd     [%l2+0x10],%f26
2453          add     %fp,%o5,%o5

2455          faddd   %f4,%f6,%f4
2456          ldd     [%l0+0x20],%f32

2458          fmuld   %f10,%f10,%f12
2459          add     %l1,%o4,%l1

2461          faddd   %f24,%f26,%f24
2462          ldd     [%l2+0x20],%f36

2464          fmuld   %f0,%f4,%f4
2465          ldd     [%l0+0x30],%f6

2467          fmuld   %f12,%f58,%f16
2468          ldd     [%l3+%l1],%f34

2470          fmuld   %f20,%f24,%f24
2471          ldd     [%l2+0x30],%f26

2473          faddd   %f4,%f32,%f4
2474          ldd     [%o3+x0_1],%f32

2476          faddd   %f16,%f56,%f16
2477          fmuld   %f12,%f62,%f14

2479          faddd   %f24,%f36,%f24
2480          ldd     [%o5+x2_1],%f36

2482          fmuld   %f0,%f4,%f4
2483          std     %f2,[%fp+y0_0]

2485          fmuld   %f12,%f16,%f16
2486          faddd   %f14,%f60,%f14

2488          fmuld   %f20,%f24,%f24
2489          std     %f22,[%fp+y2_0]

2491          faddd   %f4,%f6,%f4

2493          faddd   %f16,%f54,%f16
2494          fmuld   %f12,%f14,%f14
2495          ldd     [%g1+%l1],%f12

2497          faddd   %f24,%f26,%f24

2499          fmuld   %f0,%f4,%f4

2501          fmuld   %f10,%f16,%f16
2502          ldd     [%l4+%l1],%f10
```

```
2504         fmuld   %f14,%f34,%f14

2506         fmuld   %f20,%f24,%f24

2508         fmuld   %f16,%f12,%f16

2510         fmuld   %f32,%f4,%f4
2511         ldd     [%o3+y0_0],%f2

2513         fmuld   %f36,%f24,%f24
2514         ldd     [%o5+y2_0],%f22

2516         faddd   %f16,%f14,%f16

2518         faddd   %f4,%f2,%f4

2520         faddd   %f24,%f22,%f24

2522         faddd   %f16,%f10,%f16

2524         faddd   %f32,%f4,%f6

2526         faddd   %f36,%f24,%f26
2527         ba,pt   %icc,.FIXSIGN

2529 ! delay slot
2530         faddd   %f16,%f34,%f16

2532         .align  32
2533 .CASE6:
2534         ld      [%fp+x2_1],%l2
2535         add     %l3,8,%g1
2536         bne,pn  %icc,.CASE7
2537 ! delay slot
2538         fpadd32s %f20,%f31,%f28

2540         fand    %f28,%f44,%f24
2541         ldd     [%l5+%o3],%f32
2542         add     %l5,%o3,%l0

2544         fmuld   %f0,%f0,%f0
2545         sub     %l2,%o7,%l2

2547         fsubd   %f20,%f24,%f20
2548         srl     %l2,10,%l2

2550         fmuld   %f10,%f10,%f10
2551         ldd     [%l5+%o4],%f34
2552         add     %l5,%o4,%l1

2554         fmuld   %f0,%f32,%f4
2555         ldd     [%l0+0x10],%f6
2556         add     %fp,%o3,%o3

2558         faddd   %f20,%f22,%f20
2559         andn    %l2,0x1f,%l2

2561         fmuld   %f10,%f34,%f14
2562         ldd     [%l1+0x10],%f16
2563         add     %fp,%o4,%o4

2565         faddd   %f4,%f6,%f4
2566         ldd     [%l0+0x20],%f32

2568         fmuld   %f20,%f20,%f22
2569         add     %l2,%o5,%l2
```



```
2571         faddd   %f14,%f16,%f14
2572         ldd     [%l1+0x20],%f34

2574         fmuld   %f0,%f4,%f4
2575         ldd     [%l0+0x30],%f6

2577         fmuld   %f22,%f58,%f26
2578         ldd     [%l3+%l2],%f36

2580         fmuld   %f10,%f14,%f14
2581         ldd     [%l1+0x30],%f16

2583         faddd   %f4,%f32,%f4
2584         ldd     [%o3+x0_1],%f32

2586         faddd   %f26,%f56,%f26
2587         fmuld   %f22,%f62,%f24

2589         faddd   %f14,%f34,%f14
2590         ldd     [%o4+x1_1],%f34

2592         fmuld   %f0,%f4,%f4
2593         std     %f2,[%fp+y0_0]

2595         fmuld   %f22,%f26,%f26
2596         faddd   %f24,%f60,%f24

2598         fmuld   %f10,%f14,%f14
2599         std     %f12,[%fp+y1_0]

2601         faddd   %f4,%f6,%f4

2603         faddd   %f26,%f54,%f26
2604         fmuld   %f22,%f24,%f24
2605         ldd     [%g1+%l2],%f22

2607         faddd   %f14,%f16,%f14

2609         fmuld   %f0,%f4,%f4

2611         fmuld   %f20,%f26,%f26
2612         ldd     [%l4+%l2],%f20

2614         fmuld   %f24,%f36,%f24

2616         fmuld   %f10,%f14,%f14

2618         fmuld   %f26,%f22,%f26

2620         fmuld   %f32,%f4,%f4
2621         ldd     [%o3+y0_0],%f2

2623         fmuld   %f34,%f14,%f14
2624         ldd     [%o4+y1_0],%f12

2626         faddd   %f26,%f24,%f26

2628         faddd   %f4,%f2,%f4

2630         faddd   %f14,%f12,%f14

2632         faddd   %f26,%f20,%f26

2634         faddd   %f32,%f4,%f6
```

```
2636         faddd   %f34,%f14,%f16
2637         ba,pt   %icc,.FIXSIGN

2639 ! delay slot
2640         faddd   %f26,%f36,%f26

2642         .align  32
2643 .CASE7:
2644         fmuld   %f0,%f0,%f0
2645         ldd     [%l5+%o3],%f32
2646         add     %l5,%o3,%l0

2648         fmuld   %f10,%f10,%f10
2649         ldd     [%l5+%o4],%f34
2650         add     %l5,%o4,%l1

2652         fmuld   %f20,%f20,%f20
2653         ldd     [%l5+%o5],%f36
2654         add     %l5,%o5,%l2

2656         fmuld   %f0,%f32,%f4
2657         ldd     [%l0+0x10],%f6
2658         add     %fp,%o3,%o3

2660         fmuld   %f10,%f34,%f14
2661         ldd     [%l1+0x10],%f16
2662         add     %fp,%o4,%o4

2664         fmuld   %f20,%f36,%f24
2665         ldd     [%l2+0x10],%f26
2666         add     %fp,%o5,%o5

2668         faddd   %f4,%f6,%f4
2669         ldd     [%l0+0x20],%f32

2671         faddd   %f14,%f16,%f14
2672         ldd     [%l1+0x20],%f34

2674         faddd   %f24,%f26,%f24
2675         ldd     [%l2+0x20],%f36

2677         fmuld   %f0,%f4,%f4
2678         ldd     [%l0+0x30],%f6

2680         fmuld   %f10,%f14,%f14
2681         ldd     [%l1+0x30],%f16

2683         fmuld   %f20,%f24,%f24
2684         ldd     [%l2+0x30],%f26

2686         faddd   %f4,%f32,%f4
2687         ldd     [%o3+x0_1],%f32

2689         faddd   %f14,%f34,%f14
2690         ldd     [%o4+x1_1],%f34

2692         faddd   %f24,%f36,%f24
2693         ldd     [%o5+x2_1],%f36

2695         fmuld   %f0,%f4,%f4
2696         std     %f2,[%fp+y0_0]

2698         fmuld   %f10,%f14,%f14
2699         std     %f12,[%fp+y1_0]

2701         fmuld   %f20,%f24,%f24
```



```
2702         std     %f22,[%fp+y2_0]

2704         faddd   %f4,%f6,%f4

2706         faddd   %f14,%f16,%f14

2708         faddd   %f24,%f26,%f24

2710         fmuld   %f0,%f4,%f4

2712         fmuld   %f10,%f14,%f14

2714         fmuld   %f20,%f24,%f24

2716         fmuld   %f32,%f4,%f4
2717         ldd     [%o3+y0_0],%f2

2719         fmuld   %f34,%f14,%f14
2720         ldd     [%o4+y1_0],%f12

2722         fmuld   %f36,%f24,%f24
2723         ldd     [%o5+y2_0],%f22

2725         faddd   %f4,%f2,%f4

2727         faddd   %f14,%f12,%f14

2729         faddd   %f24,%f22,%f24

2731         faddd   %f32,%f4,%f6

2733         faddd   %f34,%f14,%f16
2734         ba,pt   %icc,.FIXSIGN

2736 ! delay slot
2737         faddd   %f36,%f24,%f26


2740         .align  32
2741 .ENDLOOP2:
2742         fmuld   %f10,%f40,%f12
2743         add     %l5,thresh,%g1
2744         faddd   %f12,%f42,%f12
2745         st      %f13,[%fp+n1]
2746         fsubd   %f12,%f42,%f12          ! n
2747         fmuld   %f12,%f46,%f14
2748         fsubd   %f10,%f14,%f14
2749         fmuld   %f12,%f48,%f16
2750         fsubd   %f14,%f16,%f10
2751         ld      [%fp+n1],%o4 ; add      %o4,1,%o4
2752         fsubd   %f14,%f10,%f34
2753         and     %o4,1,%o4
2754         fsubd   %f34,%f16,%f34
2755         fmuld   %f12,%f50,%f18
2756         sll     %o4,3,%o4
2757         fsubd   %f18,%f34,%f18
2758         ld      [%g1+%o4],%f16
2759         fsubd   %f10,%f18,%f14
2760         fsubd   %f10,%f14,%f34
2761         add     %l5,thresh+4,%o7
2762         fsubd   %f34,%f18,%f34
2763         fmuld   %f12,%f52,%f12
2764         fsubd   %f12,%f34,%f12
2765         ld      [%o7+%o4],%f18
2766         fsubd   %f14,%f12,%f10          ! x
2767         fsubd   %f14,%f10,%f14
```

```
2768         fands   %f10,%f30,%f19          ! save signbit
2769         fabsd   %f10,%f10
2770         std     %f10,[%fp+x1_1]
2771         fsubd   %f14,%f12,%f12          ! y
2772         fcmpgt32 %f16,%f10,%l1
2773         fxors   %f12,%f19,%f12
2774         fands   %f19,%f18,%f19          ! if (n & 1) clear sign bit
2775         andcc   %l1,2,%g0
2776         bne,pn  %icc,1f
2777 ! delay slot
2778         nop
2779         fpadd32s %f10,%f31,%f18
2780         ld      [%fp+x1_1],%l1
2781         fand    %f18,%f44,%f14
2782         sethi   %hi(0x3fc3c000),%o7
2783         add     %l3,8,%g1
2784         fsubd   %f10,%f14,%f10
2785         sub     %l1,%o7,%l1
2786         srl     %l1,10,%l1
2787         faddd   %f10,%f12,%f10
2788         andn    %l1,0x1f,%l1
2789         fmuld   %f10,%f10,%f12
2790         add     %l1,%o4,%l1
2791         fmuld   %f12,%f58,%f16
2792         ldd     [%l3+%l1],%f34
2793         faddd   %f16,%f56,%f16
2794         fmuld   %f12,%f62,%f14
2795         fmuld   %f12,%f16,%f16
2796         faddd   %f14,%f60,%f14
2797         faddd   %f16,%f54,%f16
2798         fmuld   %f12,%f14,%f14
2799         ldd     [%g1+%l1],%f12
2800         fmuld   %f10,%f16,%f16
2801         ldd     [%l4+%l1],%f10
2802         fmuld   %f14,%f34,%f14
2803         fmuld   %f16,%f12,%f16
2804         faddd   %f16,%f14,%f16
2805         faddd   %f16,%f10,%f16
2806         ba,pt   %icc,2f
2807         faddd   %f16,%f34,%f16
2808 1:
2809         fmuld   %f10,%f10,%f10
2810         ldd     [%l5+%o4],%f34
2811         add     %l5,%o4,%l1
2812         fmuld   %f10,%f34,%f14
2813         ldd     [%l1+0x10],%f16
2814         add     %fp,%o4,%o4
2815         faddd   %f14,%f16,%f14
2816         ldd     [%l1+0x20],%f34
2817         fmuld   %f10,%f14,%f14
2818         ldd     [%l1+0x30],%f16
2819         faddd   %f14,%f34,%f14
2820         ldd     [%o4+x1_1],%f34
2821         fmuld   %f10,%f14,%f14
2822         std     %f12,[%fp+y1_0]
2823         faddd   %f14,%f16,%f14
2824         fmuld   %f10,%f14,%f14
2825         fmuld   %f34,%f14,%f14
2826         ldd     [%o4+y1_0],%f12
2827         faddd   %f14,%f12,%f14
2828         faddd   %f34,%f14,%f16
2829 2:
2830         add     %l5,thresh-4,%g1
2831         ld      [%fp+n1],%o4 ; add      %o4,1,%o4
2832         and     %o4,2,%o4
2833         sll     %o4,2,%o4
```



```
2834         ld      [%g1+%o4],%f18
2835         fxors   %f19,%f18,%f19
2836         fors    %f16,%f19,%f16          ! tack on sign
2837         st      %f16,[%o1]
2838         st      %f17,[%o1+4]

2840 .ENDLOOP1:
2841         fmuld   %f0,%f40,%f2
2842         add     %l5,thresh,%g1
2843         faddd   %f2,%f42,%f2
2844         st      %f3,[%fp+n0]
2845         fsubd   %f2,%f42,%f2            ! n
2846         fmuld   %f2,%f46,%f4
2847         fsubd   %f0,%f4,%f4
2848         fmuld   %f2,%f48,%f6
2849         fsubd   %f4,%f6,%f0
2850         ld      [%fp+n0],%o3 ; add      %o3,1,%o3
2851         fsubd   %f4,%f0,%f32
2852         and     %o3,1,%o3
2853         fsubd   %f32,%f6,%f32
2854         fmuld   %f2,%f50,%f8
2855         sll     %o3,3,%o3
2856         fsubd   %f8,%f32,%f8
2857         ld      [%g1+%o3],%f6
2858         fsubd   %f0,%f8,%f4
2859         fsubd   %f0,%f4,%f32
2860         add     %l5,thresh+4,%o7
2861         fsubd   %f32,%f8,%f32
2862         fmuld   %f2,%f52,%f2
2863         fsubd   %f2,%f32,%f2
2864         ld      [%o7+%o3],%f8
2865         fsubd   %f4,%f2,%f0             ! x
2866         fsubd   %f4,%f0,%f4
2867         fands   %f0,%f30,%f9            ! save signbit
2868         fabsd   %f0,%f0
2869         std     %f0,[%fp+x0_1]
2870         fsubd   %f4,%f2,%f2             ! y
2871         fcmpgt32 %f6,%f0,%l0
2872         fxors   %f2,%f9,%f2
2873         fands   %f9,%f8,%f9             ! if (n & 1) clear sign bit
2874         andcc   %l0,2,%g0
2875         bne,pn  %icc,1f
2876 ! delay slot
2877         nop
2878         fpadd32s %f0,%f31,%f8
2879         ld      [%fp+x0_1],%l0
2880         fand    %f8,%f44,%f4
2881         sethi   %hi(0x3fc3c000),%o7
2882         add     %l3,8,%g1
2883         fsubd   %f0,%f4,%f0
2884         sub     %l0,%o7,%l0
2885         srl     %l0,10,%l0
2886         faddd   %f0,%f2,%f0
2887         andn    %l0,0x1f,%l0
2888         fmuld   %f0,%f0,%f2
2889         add     %l0,%o3,%l0
2890         fmuld   %f2,%f58,%f6
2891         ldd     [%l3+%l0],%f32
2892         faddd   %f6,%f56,%f6
2893         fmuld   %f2,%f62,%f4
2894         fmuld   %f2,%f6,%f6
2895         faddd   %f4,%f60,%f4
2896         faddd   %f6,%f54,%f6
2897         fmuld   %f2,%f4,%f4
2898         ldd     [%g1+%l0],%f2
2899         fmuld   %f0,%f6,%f6
```

```
2900         ldd     [%l4+%l0],%f0
2901         fmuld   %f4,%f32,%f4
2902         fmuld   %f6,%f2,%f6
2903         faddd   %f6,%f4,%f6
2904         faddd   %f6,%f0,%f6
2905         ba,pt   %icc,2f
2906         faddd   %f6,%f32,%f6
2907 1:
2908         fmuld   %f0,%f0,%f0
2909         ldd     [%l5+%o3],%f32
2910         add     %l5,%o3,%l0
2911         fmuld   %f0,%f32,%f4
2912         ldd     [%l0+0x10],%f6
2913         add     %fp,%o3,%o3
2914         faddd   %f4,%f6,%f4
2915         ldd     [%l0+0x20],%f32
2916         fmuld   %f0,%f4,%f4
2917         ldd     [%l0+0x30],%f6
2918         faddd   %f4,%f32,%f4
2919         ldd     [%o3+x0_1],%f32
2920         fmuld   %f0,%f4,%f4
2921         std     %f2,[%fp+y0_0]
2922         faddd   %f4,%f6,%f4
2923         fmuld   %f0,%f4,%f4
2924         fmuld   %f32,%f4,%f4
2925         ldd     [%o3+y0_0],%f2
2926         faddd   %f4,%f2,%f4
2927         faddd   %f32,%f4,%f6
2928 2:
2929         add     %l5,thresh-4,%g1
2930         ld      [%fp+n0],%o3 ; add      %o3,1,%o3
2931         and     %o3,2,%o3
2932         sll     %o3,2,%o3
2933         ld      [%g1+%o3],%f8
2934         fxors   %f9,%f8,%f9
2935         fors    %f6,%f9,%f6             ! tack on sign
2936         st      %f6,[%o0]
2937         st      %f7,[%o0+4]

2939 .ENDLOOP0:

2941 ! check for huge arguments remaining

2943         tst     LIM_l6
2944         be,pt   %icc,.exit
2945 ! delay slot
2946         nop

2948 ! ========== huge range (use C code) ==========

2950 #ifdef __sparcv9
2951         ldx     [%fp+xsave],%o1
2952         ldx     [%fp+ysave],%o3
2953 #else
2954         ld      [%fp+xsave],%o1
2955         ld      [%fp+ysave],%o3
2956 #endif
2957         ld      [%fp+nsave],%o0
2958         ld      [%fp+sxsave],%o2
2959         ld      [%fp+sysave],%o4
2960         sra     %o2,0,%o2               ! sign-extend for V9
2961         sra     %o4,0,%o4
2962         call    __vlibm_vcos_big
2963         mov     %l7,%o5                 ! delay slot

2965 .exit:
```



```
2966         ret
2967         restore


2970         .align  32
2971 .SKIP0:
2972         addcc   %i0,-1,%i0
2973         ble,pn  %icc,.ENDLOOP0
2974 ! delay slot, harmless if branch taken
2975         add     %i3,%i4,%i3             ! y += stridey
2976         andn    %l1,%i5,%l0             ! hx &= ~0x80000000
2977         fmovs   %f10,%f0
2978         ld      [%i1+4],%f1
2979         ba,pt   %icc,.LOOP0
2980 ! delay slot
2981         add     %i1,%i2,%i1             ! x += stridex


2984         .align  32
2985 .SKIP1:
2986         addcc   %i0,-1,%i0
2987         ble,pn  %icc,.ENDLOOP1
2988 ! delay slot, harmless if branch taken
2989         add     %i3,%i4,%i3             ! y += stridey
2990         andn    %l2,%i5,%l1             ! hx &= ~0x80000000
2991         fmovs   %f20,%f10
2992         ld      [%i1+4],%f11
2993         ba,pt   %icc,.LOOP1
2994 ! delay slot
2995         add     %i1,%i2,%i1             ! x += stridex


2998         .align  32
2999 .SKIP2:
3000         addcc   %i0,-1,%i0
3001         ble,pn  %icc,.ENDLOOP2
3002 ! delay slot, harmless if branch taken
3003         add     %i3,%i4,%i3             ! y += stridey
3004         ld      [%i1],%l2
3005         ld      [%i1],%f20
3006         ld      [%i1+4],%f21
3007         andn    %l2,%i5,%l2             ! hx &= ~0x80000000
3008         ba,pt   %icc,.LOOP2
3009 ! delay slot
3010         add     %i1,%i2,%i1             ! x += stridex


3013         .align  32
3014 .BIG0:
3015         sethi   %hi(0x7ff00000),%o7
3016         cmp     %l0,%o7
3017         bl,a,pt %icc,1f                 ! if hx < 0x7ff00000
3018 ! delay slot, annulled if branch not taken
3019         mov     %l7,LIM_l6      ! set biguns flag or
3020         fsubd   %f0,%f0,%f0             ! y = x - x
3021         st      %f0,[%o0]
3022         st      %f1,[%o0+4]
3023 1:
3024         addcc   %i0,-1,%i0
3025         ble,pn  %icc,.ENDLOOP0
3026 ! delay slot, harmless if branch taken
3027         andn    %l1,%i5,%l0             ! hx &= ~0x80000000
3028         fmovd   %f10,%f0
3029         ba,pt   %icc,.LOOP0
3030 ! delay slot
3031         add     %i1,%i2,%i1             ! x += stridex
```

```
3034         .align  32
3035 .BIG1:
3036         sethi   %hi(0x7ff00000),%o7
3037         cmp     %l1,%o7
3038         bl,a,pt %icc,1f                 ! if hx < 0x7ff00000
3039 ! delay slot, annulled if branch not taken
3040         mov     %l7,LIM_l6              ! set biguns flag or
3041         fsubd   %f10,%f10,%f10          ! y = x - x
3042         st      %f10,[%o1]
3043         st      %f11,[%o1+4]
3044 1:
3045         addcc   %i0,-1,%i0
3046         ble,pn  %icc,.ENDLOOP1
3047 ! delay slot, harmless if branch taken
3048         andn    %l2,%i5,%l1             ! hx &= ~0x80000000
3049         fmovd   %f20,%f10
3050         ba,pt   %icc,.LOOP1
3051 ! delay slot
3052         add     %i1,%i2,%i1             ! x += stridex


3055         .align  32
3056 .BIG2:
3057         sethi   %hi(0x7ff00000),%o7
3058         cmp     %l2,%o7
3059         bl,a,pt %icc,1f                 ! if hx < 0x7ff00000
3060 ! delay slot, annulled if branch not taken
3061         mov     %l7,LIM_l6              ! set biguns flag or
3062         fsubd   %f20,%f20,%f20          ! y = x - x
3063         st      %f20,[%o2]
3064         st      %f21,[%o2+4]
3065 1:
3066         addcc   %i0,-1,%i0
3067         ble,pn  %icc,.ENDLOOP2
3068 ! delay slot
3069         nop
3070         ld      [%i1],%l2
3071         ld      [%i1],%f20
3072         ld      [%i1+4],%f21
3073         andn    %l2,%i5,%l2             ! hx &= ~0x80000000
3074         ba,pt   %icc,.LOOP2
3075 ! delay slot
3076         add     %i1,%i2,%i1             ! x += stridex

3078         SET_SIZE(__vcos)
```

```
**********************************************************
   49929 Sat May 10 12:09:58 2014
new/usr/src/lib/libmvec/common/vis/__vcos_ultra3.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vcos_ultra3.S"

#include "libm.h"
#if defined(LIBMVEC_SO_BUILD)
        .weak   __vcos
        .type   __vcos,#function
        __vcos = __vcos_ultra3
#endif

        RO_DATA
        .align  64
constants:
        .word   0x42c80000,0x00000000   ! 3 * 2^44
        .word   0x43380000,0x00000000   ! 3 * 2^51
        .word   0x3fe45f30,0x6dc9c883   ! invpio2
        .word   0x3ff921fb,0x54442c00   ! pio2_1
        .word   0x3d318469,0x898cc400   ! pio2_2
        .word   0x3a71701b,0x839a2520   ! pio2_3
        .word   0xbfc55555,0x55555533   ! pp1
        .word   0x3f811111,0x10e7d53b   ! pp2
        .word   0xbf2a0167,0xe6b3cf9b   ! pp3
        .word   0xbfdfffff,0xffffff65   ! qq1
        .word   0x3fa55555,0x54f88ed0   ! qq2
        .word   0xbf56c12c,0xdd185f60   ! qq3

! local storage indices

#define xsave           STACK_BIAS-0x8
#define ysave           STACK_BIAS-0x10
#define nsave           STACK_BIAS-0x14
#define sxsave          STACK_BIAS-0x18
#define sysave          STACK_BIAS-0x1c
#define biguns          STACK_BIAS-0x20
```



```
#define nk3             STACK_BIAS-0x24
#define nk2             STACK_BIAS-0x28
#define nk1             STACK_BIAS-0x2c
#define nk0             STACK_BIAS-0x30
#define junk            STACK_BIAS-0x38
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x40

! register use

! i0  n
! i1  x
! i2  stridex
! i3  y
! i4  stridey
! i5  0x80000000

! l0  hx0
! l1  hx1
! l2  hx2
! l3  hx3
! l4  k0
! l5  k1
! l6  k2
! l7  k3

! the following are 64-bit registers in both V8+ and V9

! g1  __vlibm_TBL_sincos2
! g5  scratch

! o0  py0
! o1  py1
! o2  py2
! o3  py3
! o4  0x3e400000
! o5  0x3fe921fb,0x4099251e
! o7  scratch

! f0  hx0
! f2
! f4
! f6
! f8  hx1
! f10
! f12
! f14
! f16 hx2
! f18
! f20
! f22
! f24 hx3
! f26
! f28
! f30
! f32
! f34
! f36
! f38

#define c3two44 %f40
#define c3two51 %f42
#define invpio2 %f44
#define pio2_1  %f46
#define pio2_2  %f48
#define pio2_3  %f50
```

```
#define pp1     %f52
#define pp2     %f54
#define pp3     %f56
#define qq1     %f58
#define qq2     %f60
#define qq3     %f62

        ENTRY(__vcos_ultra3)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,constants,o0)
        PIC_SET(l7,__vlibm_TBL_sincos2,o1)
        mov     %o1,%g1
        wr      %g0,0x82,%asi           ! set %asi for non-faulting loads
#ifdef __sparcv9
        stx     %i1,[%fp+xsave]         ! save arguments
        stx     %i3,[%fp+ysave]
#else
        st      %i1,[%fp+xsave]         ! save arguments
        st      %i3,[%fp+ysave]
#endif
        st      %i0,[%fp+nsave]
        st      %i2,[%fp+sxsave]
        st      %i4,[%fp+sysave]
        st      %g0,[%fp+biguns]        ! biguns = 0
        ldd     [%o0+0x00],c3two44      ! load/set up constants
        ldd     [%o0+0x08],c3two51
        ldd     [%o0+0x10],invpio2
        ldd     [%o0+0x18],pio2_1
        ldd     [%o0+0x20],pio2_2
        ldd     [%o0+0x28],pio2_3
        ldd     [%o0+0x30],pp1
        ldd     [%o0+0x38],pp2
        ldd     [%o0+0x40],pp3
        ldd     [%o0+0x48],qq1
        ldd     [%o0+0x50],qq2
        ldd     [%o0+0x58],qq3
        sethi   %hi(0x80000000),%i5
        sethi   %hi(0x3e400000),%o4
        sethi   %hi(0x3fe921fb),%o5
        or      %o5,%lo(0x3fe921fb),%o5
        sllx    %o5,32,%o5
        sethi   %hi(0x4099251e),%o7
        or      %o7,%lo(0x4099251e),%o7
        or      %o5,%o7,%o5
        sll     %i2,3,%i2               ! scale strides
        sll     %i4,3,%i4
        add     %fp,junk,%o1            ! loop prologue
        add     %fp,junk,%o2
        add     %fp,junk,%o3
        ld      [%i1],%l0               ! *x
        ld      [%i1],%f0
        ld      [%i1+4],%f3
        andn    %l0,%i5,%l0             ! mask off sign
        add     %i1,%i2,%i1             ! x += stridex
        ba      .loop0
        nop

! 16-byte aligned
        .align  16
.loop0:
        lda     [%i1]%asi,%l1           ! preload next argument
        sub     %l0,%o4,%g5
        sub     %o5,%l0,%o7
        fabss   %f0,%f2
```



```
        lda     [%i1]%asi,%f8
        orcc    %o7,%g5,%g0
        mov     %i3,%o0                 ! py0 = y
        bl,pn   %icc,.range0            ! hx < 0x3e400000 or hx > 0x4099251e

! delay slot
        lda     [%i1+4]%asi,%f11
        addcc   %i0,-1,%i0
        add     %i3,%i4,%i3             ! y += stridey
        ble,pn  %icc,.last1

! delay slot
        andn    %l1,%i5,%l1
        add     %i1,%i2,%i1             ! x += stridex
        faddd   %f2,c3two44,%f4
        st      %f15,[%o1+4]

.loop1:
        lda     [%i1]%asi,%l2           ! preload next argument
        sub     %l1,%o4,%g5
        sub     %o5,%l1,%o7
        fabss   %f8,%f10

        lda     [%i1]%asi,%f16
        orcc    %o7,%g5,%g0
        mov     %i3,%o1                 ! py1 = y
        bl,pn   %icc,.range1            ! hx < 0x3e400000 or hx > 0x4099251e

! delay slot
        lda     [%i1+4]%asi,%f19
        addcc   %i0,-1,%i0
        add     %i3,%i4,%i3             ! y += stridey
        ble,pn  %icc,.last2

! delay slot
        andn    %l2,%i5,%l2
        add     %i1,%i2,%i1             ! x += stridex
        faddd   %f10,c3two44,%f12
        st      %f23,[%o2+4]

.loop2:
        lda     [%i1]%asi,%l3           ! preload next argument
        sub     %l2,%o4,%g5
        sub     %o5,%l2,%o7
        fabss   %f16,%f18

        lda     [%i1]%asi,%f24
        orcc    %o7,%g5,%g0
        mov     %i3,%o2                 ! py2 = y
        bl,pn   %icc,.range2            ! hx < 0x3e400000 or hx > 0x4099251e

! delay slot
        lda     [%i1+4]%asi,%f27
        addcc   %i0,-1,%i0
        add     %i3,%i4,%i3             ! y += stridey
        ble,pn  %icc,.last3

! delay slot
        andn    %l3,%i5,%l3
        add     %i1,%i2,%i1             ! x += stridex
        faddd   %f18,c3two44,%f20
        st      %f31,[%o3+4]

.loop3:
        sub     %l3,%o4,%g5
        sub     %o5,%l3,%o7
```

```
260         fabss   %f24,%f26
261         st      %f5,[%fp+nk0]

263         orcc    %o7,%g5,%g0
264         mov     %i3,%o3                 ! py3 = y
265         bl,pn   %icc,.range3            ! hx < 0x3e400000 or > hx 0x4099251e
266 ! delay slot
267         st      %f13,[%fp+nk1]

269 !!! DONE?
270 .cont:
271         srlx    %o5,32,%o7
272         add     %i3,%i4,%i3             ! y += stridey
273         fmovs   %f3,%f1
274         st      %f21,[%fp+nk2]

276         sub     %o7,%l0,%l0
277         sub     %o7,%l1,%l1
278         faddd   %f26,c3two44,%f28
279         st      %f29,[%fp+nk3]

281         sub     %o7,%l2,%l2
282         sub     %o7,%l3,%l3
283         fmovs   %f11,%f9

285         or      %l0,%l1,%l0
286         or      %l2,%l3,%l2
287         fmovs   %f19,%f17

289         fmovs   %f27,%f25
290         fmuld   %f0,invpio2,%f6         ! x * invpio2, for medium range

292         fmuld   %f8,invpio2,%f14
293         ld      [%fp+nk0],%l4

295         fmuld   %f16,invpio2,%f22
296         ld      [%fp+nk1],%l5

298         orcc    %l0,%l2,%g0
299         bl,pn   %icc,.medium
300 ! delay slot
301         fmuld   %f24,invpio2,%f30
302         ld      [%fp+nk2],%l6

304         ld      [%fp+nk3],%l7
305         sll     %l4,5,%l4               ! k
306         fcmpd   %fcc0,%f0,pio2_3        ! x < pio2_3 iff x < 0

308         sll     %l5,5,%l5
309         ldd     [%l4+%g1],%f4
310         fcmpd   %fcc1,%f8,pio2_3

312         sll     %l6,5,%l6
313         ldd     [%l5+%g1],%f12
314         fcmpd   %fcc2,%f16,pio2_3

316         sll     %l7,5,%l7
317         ldd     [%l6+%g1],%f20
318         fcmpd   %fcc3,%f24,pio2_3

320         ldd     [%l7+%g1],%f28
321         fsubd   %f2,%f4,%f2             ! x -= __vlibm_TBL_sincos2[k]

323         fsubd   %f10,%f12,%f10

325         fsubd   %f18,%f20,%f18
```



```
327         fsubd   %f26,%f28,%f26

329         fmuld   %f2,%f2,%f0             ! z = x * x

331         fmuld   %f10,%f10,%f8

333         fmuld   %f18,%f18,%f16

335         fmuld   %f26,%f26,%f24

337         fmuld   %f0,qq3,%f6

339         fmuld   %f8,qq3,%f14

341         fmuld   %f16,qq3,%f22

343         fmuld   %f24,qq3,%f30

345         faddd   %f6,qq2,%f6
346         fmuld   %f0,pp2,%f4

348         faddd   %f14,qq2,%f14
349         fmuld   %f8,pp2,%f12

351         faddd   %f22,qq2,%f22
352         fmuld   %f16,pp2,%f20

354         faddd   %f30,qq2,%f30
355         fmuld   %f24,pp2,%f28

357         fmuld   %f0,%f6,%f6
358         faddd   %f4,pp1,%f4

360         fmuld   %f8,%f14,%f14
361         faddd   %f12,pp1,%f12

363         fmuld   %f16,%f22,%f22
364         faddd   %f20,pp1,%f20

366         fmuld   %f24,%f30,%f30
367         faddd   %f28,pp1,%f28

369         faddd   %f6,qq1,%f6
370         fmuld   %f0,%f4,%f4
371         add     %l4,%g1,%l4

373         faddd   %f14,qq1,%f14
374         fmuld   %f8,%f12,%f12
375         add     %l5,%g1,%l5

377         faddd   %f22,qq1,%f22
378         fmuld   %f16,%f20,%f20
379         add     %l6,%g1,%l6

381         faddd   %f30,qq1,%f30
382         fmuld   %f24,%f28,%f28
383         add     %l7,%g1,%l7

385         fmuld   %f2,%f4,%f4

387         fmuld   %f10,%f12,%f12

389         fmuld   %f18,%f20,%f20

391         fmuld   %f26,%f28,%f28
```

```
393         fmuld   %f0,%f6,%f6
394         faddd   %f4,%f2,%f4
395         ldd     [%l4+16],%f32

397         fmuld   %f8,%f14,%f14
398         faddd   %f12,%f10,%f12
399         ldd     [%l5+16],%f34

401         fmuld   %f16,%f22,%f22
402         faddd   %f20,%f18,%f20
403         ldd     [%l6+16],%f36

405         fmuld   %f24,%f30,%f30
406         faddd   %f28,%f26,%f28
407         ldd     [%l7+16],%f38

409         fmuld   %f32,%f6,%f6
410         ldd     [%l4+8],%f2

412         fmuld   %f34,%f14,%f14
413         ldd     [%l5+8],%f10

415         fmuld   %f36,%f22,%f22
416         ldd     [%l6+8],%f18

418         fmuld   %f38,%f30,%f30
419         ldd     [%l7+8],%f26

421         fmuld   %f2,%f4,%f4

423         fmuld   %f10,%f12,%f12

425         fmuld   %f18,%f20,%f20

427         fmuld   %f26,%f28,%f28

429         fsubd   %f6,%f4,%f6
430         lda     [%i1]%asi,%l0           ! preload next argument

432         fsubd   %f14,%f12,%f14
433         lda     [%i1]%asi,%f0

435         fsubd   %f22,%f20,%f22
436         lda     [%i1+4]%asi,%f3

438         fsubd   %f30,%f28,%f30
439         andn    %l0,%i5,%l0
440         add     %i1,%i2,%i1

442         faddd   %f6,%f32,%f6
443         st      %f6,[%o0]

445         faddd   %f14,%f34,%f14
446         st      %f14,[%o1]

448         faddd   %f22,%f36,%f22
449         st      %f22,[%o2]

451         faddd   %f30,%f38,%f30
452         st      %f30,[%o3]
453         addcc   %i0,-1,%i0

455         bg,pt   %icc,.loop0
456 ! delay slot
457         st      %f7,[%o0+4]
```



```
459         ba,pt   %icc,.end
460 ! delay slot
461         nop


464         .align  16
465 .medium:
466         faddd   %f6,c3two51,%f4
467         st      %f5,[%fp+nk0]

469         faddd   %f14,c3two51,%f12
470         st      %f13,[%fp+nk1]

472         faddd   %f22,c3two51,%f20
473         st      %f21,[%fp+nk2]

475         faddd   %f30,c3two51,%f28
476         st      %f29,[%fp+nk3]

478         fsubd   %f4,c3two51,%f6

480         fsubd   %f12,c3two51,%f14

482         fsubd   %f20,c3two51,%f22

484         fsubd   %f28,c3two51,%f30

486         fmuld   %f6,pio2_1,%f2
487         ld      [%fp+nk0],%l0           ! n

489         fmuld   %f14,pio2_1,%f10
490         ld      [%fp+nk1],%l1

492         fmuld   %f22,pio2_1,%f18
493         ld      [%fp+nk2],%l2

495         fmuld   %f30,pio2_1,%f26
496         ld      [%fp+nk3],%l3

498         fsubd   %f0,%f2,%f0
499         fmuld   %f6,pio2_2,%f4
500         add     %l0,1,%l0

502         fsubd   %f8,%f10,%f8
503         fmuld   %f14,pio2_2,%f12
504         add     %l1,1,%l1

506         fsubd   %f16,%f18,%f16
507         fmuld   %f22,pio2_2,%f20
508         add     %l2,1,%l2

510         fsubd   %f24,%f26,%f24
511         fmuld   %f30,pio2_2,%f28
512         add     %l3,1,%l3

514         fsubd   %f0,%f4,%f32

516         fsubd   %f8,%f12,%f34

518         fsubd   %f16,%f20,%f36

520         fsubd   %f24,%f28,%f38

522         fsubd   %f0,%f32,%f0
523         fcmple32 %f32,pio2_3,%l4        ! x <= pio2_3 iff x < 0
```

```
525         fsubd   %f8,%f34,%f8
526         fcmple32 %f34,pio2_3,%l5

528         fsubd   %f16,%f36,%f16
529         fcmple32 %f36,pio2_3,%l6

531         fsubd   %f24,%f38,%f24
532         fcmple32 %f38,pio2_3,%l7

534         fsubd   %f0,%f4,%f0
535         fmuld   %f6,pio2_3,%f6
536         sll     %l4,30,%l4              ! if (x < 0) n = -n ^ 2

538         fsubd   %f8,%f12,%f8
539         fmuld   %f14,pio2_3,%f14
540         sll     %l5,30,%l5

542         fsubd   %f16,%f20,%f16
543         fmuld   %f22,pio2_3,%f22
544         sll     %l6,30,%l6

546         fsubd   %f24,%f28,%f24
547         fmuld   %f30,pio2_3,%f30
548         sll     %l7,30,%l7

550         fsubd   %f6,%f0,%f6
551         sra     %l4,31,%l4

553         fsubd   %f14,%f8,%f14
554         sra     %l5,31,%l5

556         fsubd   %f22,%f16,%f22
557         sra     %l6,31,%l6

559         fsubd   %f30,%f24,%f30
560         sra     %l7,31,%l7

562         fsubd   %f32,%f6,%f0            ! reduced x
563         xor     %l0,%l4,%l0

565         fsubd   %f34,%f14,%f8
566         xor     %l1,%l5,%l1

568         fsubd   %f36,%f22,%f16
569         xor     %l2,%l6,%l2

571         fsubd   %f38,%f30,%f24
572         xor     %l3,%l7,%l3

574         fabsd   %f0,%f2
575         sub     %l0,%l4,%l0

577         fabsd   %f8,%f10
578         sub     %l1,%l5,%l1

580         fabsd   %f16,%f18
581         sub     %l2,%l6,%l2

583         fabsd   %f24,%f26
584         sub     %l3,%l7,%l3

586         faddd   %f2,c3two44,%f4
587         st      %f5,[%fp+nk0]
588         and     %l4,2,%l4
```



```
590         faddd   %f10,c3two44,%f12
591         st      %f13,[%fp+nk1]
592         and     %l5,2,%l5

594         faddd   %f18,c3two44,%f20
595         st      %f21,[%fp+nk2]
596         and     %l6,2,%l6

598         faddd   %f26,c3two44,%f28
599         st      %f29,[%fp+nk3]
600         and     %l7,2,%l7

602         fsubd   %f32,%f0,%f4
603         xor     %l0,%l4,%l0

605         fsubd   %f34,%f8,%f12
606         xor     %l1,%l5,%l1

608         fsubd   %f36,%f16,%f20
609         xor     %l2,%l6,%l2

611         fsubd   %f38,%f24,%f28
612         xor     %l3,%l7,%l3

614         fzero   %f38
615         ld      [%fp+nk0],%l4

617         fsubd   %f4,%f6,%f6             ! w
618         ld      [%fp+nk1],%l5

620         fsubd   %f12,%f14,%f14
621         ld      [%fp+nk2],%l6

623         fnegd   %f38,%f38
624         ld      [%fp+nk3],%l7
625         sll     %l4,5,%l4               ! k

627         fsubd   %f20,%f22,%f22
628         sll     %l5,5,%l5

630         fsubd   %f28,%f30,%f30
631         sll     %l6,5,%l6

633         fand    %f0,%f38,%f32           ! sign bit of x
634         ldd     [%l4+%g1],%f4
635         sll     %l7,5,%l7

637         fand    %f8,%f38,%f34
638         ldd     [%l5+%g1],%f12

640         fand    %f16,%f38,%f36
641         ldd     [%l6+%g1],%f20

643         fand    %f24,%f38,%f38
644         ldd     [%l7+%g1],%f28

646         fsubd   %f2,%f4,%f2             ! x -= __vlibm_TBL_sincos2[k]

648         fsubd   %f10,%f12,%f10

650         fsubd   %f18,%f20,%f18
651         nop

653         fsubd   %f26,%f28,%f26
654         nop
```

```
656 ! 16-byte aligned
657         fmuld   %f2,%f2,%f0             ! z = x * x
658         andcc   %l0,1,%g0
659         bz,pn   %icc,.case8
660 ! delay slot
661         fxor    %f6,%f32,%f32

663         fmuld   %f10,%f10,%f8
664         andcc   %l1,1,%g0
665         bz,pn   %icc,.case4
666 ! delay slot
667         fxor    %f14,%f34,%f34

669         fmuld   %f18,%f18,%f16
670         andcc   %l2,1,%g0
671         bz,pn   %icc,.case2
672 ! delay slot
673         fxor    %f22,%f36,%f36

675         fmuld   %f26,%f26,%f24
676         andcc   %l3,1,%g0
677         bz,pn   %icc,.case1
678 ! delay slot
679         fxor    %f30,%f38,%f38

681 !.case0:
682         fmuld   %f0,qq3,%f6             ! cos(x0)

684         fmuld   %f8,qq3,%f14            ! cos(x1)

686         fmuld   %f16,qq3,%f22           ! cos(x2)

688         fmuld   %f24,qq3,%f30           ! cos(x3)

690         faddd   %f6,qq2,%f6
691         fmuld   %f0,pp2,%f4

693         faddd   %f14,qq2,%f14
694         fmuld   %f8,pp2,%f12

696         faddd   %f22,qq2,%f22
697         fmuld   %f16,pp2,%f20

699         faddd   %f30,qq2,%f30
700         fmuld   %f24,pp2,%f28

702         fmuld   %f0,%f6,%f6
703         faddd   %f4,pp1,%f4

705         fmuld   %f8,%f14,%f14
706         faddd   %f12,pp1,%f12

708         fmuld   %f16,%f22,%f22
709         faddd   %f20,pp1,%f20

711         fmuld   %f24,%f30,%f30
712         faddd   %f28,pp1,%f28

714         faddd   %f6,qq1,%f6
715         fmuld   %f0,%f4,%f4
716         add     %l4,%g1,%l4

718         faddd   %f14,qq1,%f14
719         fmuld   %f8,%f12,%f12
720         add     %l5,%g1,%l5
```



```
722         faddd   %f22,qq1,%f22
723         fmuld   %f16,%f20,%f20
724         add     %l6,%g1,%l6

726         faddd   %f30,qq1,%f30
727         fmuld   %f24,%f28,%f28
728         add     %l7,%g1,%l7

730         fmuld   %f2,%f4,%f4

732         fmuld   %f10,%f12,%f12

734         fmuld   %f18,%f20,%f20

736         fmuld   %f26,%f28,%f28

738         fmuld   %f0,%f6,%f6
739         faddd   %f4,%f32,%f4
740         ldd     [%l4+16],%f0

742         fmuld   %f8,%f14,%f14
743         faddd   %f12,%f34,%f12
744         ldd     [%l5+16],%f8

746         fmuld   %f16,%f22,%f22
747         faddd   %f20,%f36,%f20
748         ldd     [%l6+16],%f16

750         fmuld   %f24,%f30,%f30
751         faddd   %f28,%f38,%f28
752         ldd     [%l7+16],%f24

754         fmuld   %f0,%f6,%f6
755         faddd   %f4,%f2,%f4
756         ldd     [%l4+8],%f32

758         fmuld   %f8,%f14,%f14
759         faddd   %f12,%f10,%f12
760         ldd     [%l5+8],%f34

762         fmuld   %f16,%f22,%f22
763         faddd   %f20,%f18,%f20
764         ldd     [%l6+8],%f36

766         fmuld   %f24,%f30,%f30
767         faddd   %f28,%f26,%f28
768         ldd     [%l7+8],%f38

770         fmuld   %f32,%f4,%f4

772         fmuld   %f34,%f12,%f12

774         fmuld   %f36,%f20,%f20

776         fmuld   %f38,%f28,%f28

778         fsubd   %f6,%f4,%f6

780         fsubd   %f14,%f12,%f14

782         fsubd   %f22,%f20,%f22

784         fsubd   %f30,%f28,%f30

786         faddd   %f6,%f0,%f6
```

```
788         faddd   %f14,%f8,%f14

790         faddd   %f22,%f16,%f22

792         faddd   %f30,%f24,%f30
793         mov     %l0,%l4

795         fnegd   %f6,%f4
796         lda     [%i1]%asi,%l0           ! preload next argument

798         fnegd   %f14,%f12
799         lda     [%i1]%asi,%f0

801         fnegd   %f22,%f20
802         lda     [%i1+4]%asi,%f3

804         fnegd   %f30,%f28
805         andn    %l0,%i5,%l0
806         add     %i1,%i2,%i1

808         andcc   %l4,2,%g0
809         fmovdnz %icc,%f4,%f6
810         st      %f6,[%o0]

812         andcc   %l1,2,%g0
813         fmovdnz %icc,%f12,%f14
814         st      %f14,[%o1]

816         andcc   %l2,2,%g0
817         fmovdnz %icc,%f20,%f22
818         st      %f22,[%o2]

820         andcc   %l3,2,%g0
821         fmovdnz %icc,%f28,%f30
822         st      %f30,[%o3]

824         addcc   %i0,-1,%i0
825         bg,pt   %icc,.loop0
826 ! delay slot
827         st      %f7,[%o0+4]

829         ba,pt   %icc,.end
830 ! delay slot
831         nop

833         .align  16
834 .case1:
835         fmuld   %f24,pp3,%f30           ! sin(x3)

837         fmuld   %f0,qq3,%f6             ! cos(x0)

839         fmuld   %f8,qq3,%f14            ! cos(x1)

841         fmuld   %f16,qq3,%f22           ! cos(x2)

843         faddd   %f30,pp2,%f30
844         fmuld   %f24,qq2,%f28

846         faddd   %f6,qq2,%f6
847         fmuld   %f0,pp2,%f4

849         faddd   %f14,qq2,%f14
850         fmuld   %f8,pp2,%f12

852         faddd   %f22,qq2,%f22
853         fmuld   %f16,pp2,%f20
```



```
855         fmuld   %f24,%f30,%f30
856         faddd   %f28,qq1,%f28

858         fmuld   %f0,%f6,%f6
859         faddd   %f4,pp1,%f4

861         fmuld   %f8,%f14,%f14
862         faddd   %f12,pp1,%f12

864         fmuld   %f16,%f22,%f22
865         faddd   %f20,pp1,%f20

867         faddd   %f30,pp1,%f30
868         fmuld   %f24,%f28,%f28
869         add     %l7,%g1,%l7

871         faddd   %f6,qq1,%f6
872         fmuld   %f0,%f4,%f4
873         add     %l4,%g1,%l4

875         faddd   %f14,qq1,%f14
876         fmuld   %f8,%f12,%f12
877         add     %l5,%g1,%l5

879         faddd   %f22,qq1,%f22
880         fmuld   %f16,%f20,%f20
881         add     %l6,%g1,%l6

883         fmuld   %f24,%f30,%f30

885         fmuld   %f2,%f4,%f4

887         fmuld   %f10,%f12,%f12

889         fmuld   %f18,%f20,%f20

891         fmuld   %f26,%f30,%f30
892         ldd     [%l7+8],%f24

894         fmuld   %f0,%f6,%f6
895         faddd   %f4,%f32,%f4
896         ldd     [%l4+16],%f0

898         fmuld   %f8,%f14,%f14
899         faddd   %f12,%f34,%f12
900         ldd     [%l5+16],%f8

902         fmuld   %f16,%f22,%f22
903         faddd   %f20,%f36,%f20
904         ldd     [%l6+16],%f16

906         fmuld   %f24,%f28,%f28
907         faddd   %f38,%f30,%f30

909         fmuld   %f0,%f6,%f6
910         faddd   %f4,%f2,%f4
911         ldd     [%l4+8],%f32

913         fmuld   %f8,%f14,%f14
914         faddd   %f12,%f10,%f12
915         ldd     [%l5+8],%f34

917         fmuld   %f16,%f22,%f22
918         faddd   %f20,%f18,%f20
919         ldd     [%l6+8],%f36
```

```
        faddd   %f26,%f30,%f30
        ldd     [%l7+16],%f38

        fmuld   %f32,%f4,%f4

        fmuld   %f34,%f12,%f12

        fmuld   %f36,%f20,%f20

        fmuld   %f38,%f30,%f30

        fsubd   %f6,%f4,%f6

        fsubd   %f14,%f12,%f14

        fsubd   %f22,%f20,%f22

        faddd   %f30,%f28,%f30

        faddd   %f6,%f0,%f6

        faddd   %f14,%f8,%f14

        faddd   %f22,%f16,%f22

        faddd   %f30,%f24,%f30
        mov     %l0,%l4

        fnegd   %f6,%f4
        lda     [%i1]%asi,%l0           ! preload next argument

        fnegd   %f14,%f12
        lda     [%i1]%asi,%f0

        fnegd   %f22,%f20
        lda     [%i1+4]%asi,%f3

        fnegd   %f30,%f28
        andn    %l0,%i5,%l0
        add     %i1,%i2,%i1

        andcc   %l4,2,%g0
        fmovdnz %icc,%f4,%f6
        st      %f6,[%o0]

        andcc   %l1,2,%g0
        fmovdnz %icc,%f12,%f14
        st      %f14,[%o1]

        andcc   %l2,2,%g0
        fmovdnz %icc,%f20,%f22
        st      %f22,[%o2]

        andcc   %l3,2,%g0
        fmovdnz %icc,%f28,%f30
        st      %f30,[%o3]

        addcc   %i0,-1,%i0
        bg,pt   %icc,.loop0
! delay slot
        st      %f7,[%o0+4]

        ba,pt   %icc,.end
! delay slot
        nop
```



```
        .align  16
.case2:
        fmuld   %f26,%f26,%f24
        andcc   %l3,1,%g0
        bz,pn   %icc,.case3
! delay slot
        fxor    %f30,%f38,%f38

        fmuld   %f16,pp3,%f22           ! sin(x2)

        fmuld   %f0,qq3,%f6             ! cos(x0)

        fmuld   %f8,qq3,%f14            ! cos(x1)

        faddd   %f22,pp2,%f22
        fmuld   %f16,qq2,%f20

        fmuld   %f24,qq3,%f30           ! cos(x3)

        faddd   %f6,qq2,%f6
        fmuld   %f0,pp2,%f4

        faddd   %f14,qq2,%f14
        fmuld   %f8,pp2,%f12

        fmuld   %f16,%f22,%f22
        faddd   %f20,qq1,%f20

        faddd   %f30,qq2,%f30
        fmuld   %f24,pp2,%f28

        fmuld   %f0,%f6,%f6
        faddd   %f4,pp1,%f4

        fmuld   %f8,%f14,%f14
        faddd   %f12,pp1,%f12

        faddd   %f22,pp1,%f22
        fmuld   %f16,%f20,%f20
        add     %l6,%g1,%l6

        fmuld   %f24,%f30,%f30
        faddd   %f28,pp1,%f28

        faddd   %f6,qq1,%f6
        fmuld   %f0,%f4,%f4
        add     %l4,%g1,%l4

        faddd   %f14,qq1,%f14
        fmuld   %f8,%f12,%f12
        add     %l5,%g1,%l5

        fmuld   %f16,%f22,%f22

        faddd   %f30,qq1,%f30
        fmuld   %f24,%f28,%f28
        add     %l7,%g1,%l7

        fmuld   %f2,%f4,%f4

        fmuld   %f10,%f12,%f12

        fmuld   %f18,%f22,%f22
        ldd     [%l6+8],%f16
```

```
1052         fmuld   %f26,%f28,%f28

1054         fmuld   %f0,%f6,%f6
1055         faddd   %f4,%f32,%f4
1056         ldd     [%l4+16],%f0

1058         fmuld   %f8,%f14,%f14
1059         faddd   %f12,%f34,%f12
1060         ldd     [%l5+16],%f8

1062         fmuld   %f16,%f20,%f20
1063         faddd   %f36,%f22,%f22

1065         fmuld   %f24,%f30,%f30
1066         faddd   %f28,%f38,%f28
1067         ldd     [%l7+16],%f24

1069         fmuld   %f0,%f6,%f6
1070         faddd   %f4,%f2,%f4
1071         ldd     [%l4+8],%f32

1073         fmuld   %f8,%f14,%f14
1074         faddd   %f12,%f10,%f12
1075         ldd     [%l5+8],%f34

1077         faddd   %f18,%f22,%f22
1078         ldd     [%l6+16],%f36

1080         fmuld   %f24,%f30,%f30
1081         faddd   %f28,%f26,%f28
1082         ldd     [%l7+8],%f38

1084         fmuld   %f32,%f4,%f4

1086         fmuld   %f34,%f12,%f12

1088         fmuld   %f36,%f22,%f22

1090         fmuld   %f38,%f28,%f28

1092         fsubd   %f6,%f4,%f6

1094         fsubd   %f14,%f12,%f14

1096         faddd   %f22,%f20,%f22

1098         fsubd   %f30,%f28,%f30

1100         faddd   %f6,%f0,%f6

1102         faddd   %f14,%f8,%f14

1104         faddd   %f22,%f16,%f22

1106         faddd   %f30,%f24,%f30
1107         mov     %l0,%l4

1109         fnegd   %f6,%f4
1110         lda     [%i1]%asi,%l0           ! preload next argument

1112         fnegd   %f14,%f12
1113         lda     [%i1]%asi,%f0

1115         fnegd   %f22,%f20
1116         lda     [%i1+4]%asi,%f3
```



```
1118         fnegd   %f30,%f28
1119         andn    %l0,%i5,%l0
1120         add     %i1,%i2,%i1

1122         andcc   %l4,2,%g0
1123         fmovdnz %icc,%f4,%f6
1124         st      %f6,[%o0]

1126         andcc   %l1,2,%g0
1127         fmovdnz %icc,%f12,%f14
1128         st      %f14,[%o1]

1130         andcc   %l2,2,%g0
1131         fmovdnz %icc,%f20,%f22
1132         st      %f22,[%o2]

1134         andcc   %l3,2,%g0
1135         fmovdnz %icc,%f28,%f30
1136         st      %f30,[%o3]

1138         addcc   %i0,-1,%i0
1139         bg,pt   %icc,.loop0
1140 ! delay slot
1141         st      %f7,[%o0+4]

1143         ba,pt   %icc,.end
1144 ! delay slot
1145         nop

1147         .align  16
1148 .case3:
1149         fmuld   %f16,pp3,%f22           ! sin(x2)

1151         fmuld   %f24,pp3,%f30           ! sin(x3)

1153         fmuld   %f0,qq3,%f6             ! cos(x0)

1155         fmuld   %f8,qq3,%f14            ! cos(x1)

1157         faddd   %f22,pp2,%f22
1158         fmuld   %f16,qq2,%f20

1160         faddd   %f30,pp2,%f30
1161         fmuld   %f24,qq2,%f28

1163         faddd   %f6,qq2,%f6
1164         fmuld   %f0,pp2,%f4

1166         faddd   %f14,qq2,%f14
1167         fmuld   %f8,pp2,%f12

1169         fmuld   %f16,%f22,%f22
1170         faddd   %f20,qq1,%f20

1172         fmuld   %f24,%f30,%f30
1173         faddd   %f28,qq1,%f28

1175         fmuld   %f0,%f6,%f6
1176         faddd   %f4,pp1,%f4

1178         fmuld   %f8,%f14,%f14
1179         faddd   %f12,pp1,%f12

1181         faddd   %f22,pp1,%f22
1182         fmuld   %f16,%f20,%f20
1183         add     %l6,%g1,%l6
```

```
1185         faddd   %f30,pp1,%f30
1186         fmuld   %f24,%f28,%f28
1187         add     %l7,%g1,%l7

1189         faddd   %f6,qq1,%f6
1190         fmuld   %f0,%f4,%f4
1191         add     %l4,%g1,%l4

1193         faddd   %f14,qq1,%f14
1194         fmuld   %f8,%f12,%f12
1195         add     %l5,%g1,%l5

1197         fmuld   %f16,%f22,%f22

1199         fmuld   %f24,%f30,%f30

1201         fmuld   %f2,%f4,%f4

1203         fmuld   %f10,%f12,%f12

1205         fmuld   %f18,%f22,%f22
1206         ldd     [%l6+8],%f16

1208         fmuld   %f26,%f30,%f30
1209         ldd     [%l7+8],%f24

1211         fmuld   %f0,%f6,%f6
1212         faddd   %f4,%f32,%f4
1213         ldd     [%l4+16],%f0

1215         fmuld   %f8,%f14,%f14
1216         faddd   %f12,%f34,%f12
1217         ldd     [%l5+16],%f8

1219         fmuld   %f16,%f20,%f20
1220         faddd   %f36,%f22,%f22

1222         fmuld   %f24,%f28,%f28
1223         faddd   %f38,%f30,%f30

1225         fmuld   %f0,%f6,%f6
1226         faddd   %f4,%f2,%f4
1227         ldd     [%l4+8],%f32

1229         fmuld   %f8,%f14,%f14
1230         faddd   %f12,%f10,%f12
1231         ldd     [%l5+8],%f34

1233         faddd   %f18,%f22,%f22
1234         ldd     [%l6+16],%f36

1236         faddd   %f26,%f30,%f30
1237         ldd     [%l7+16],%f38

1239         fmuld   %f32,%f4,%f4

1241         fmuld   %f34,%f12,%f12

1243         fmuld   %f36,%f22,%f22

1245         fmuld   %f38,%f30,%f30

1247         fsubd   %f6,%f4,%f6

1249         fsubd   %f14,%f12,%f14
```



```
1251         faddd   %f22,%f20,%f22

1253         faddd   %f30,%f28,%f30

1255         faddd   %f6,%f0,%f6

1257         faddd   %f14,%f8,%f14

1259         faddd   %f22,%f16,%f22

1261         faddd   %f30,%f24,%f30
1262         mov     %l0,%l4

1264         fnegd   %f6,%f4
1265         lda     [%i1]%asi,%l0           ! preload next argument

1267         fnegd   %f14,%f12
1268         lda     [%i1]%asi,%f0

1270         fnegd   %f22,%f20
1271         lda     [%i1+4]%asi,%f3

1273         fnegd   %f30,%f28
1274         andn    %l0,%i5,%l0
1275         add     %i1,%i2,%i1

1277         andcc   %l4,2,%g0
1278         fmovdnz %icc,%f4,%f6
1279         st      %f6,[%o0]

1281         andcc   %l1,2,%g0
1282         fmovdnz %icc,%f12,%f14
1283         st      %f14,[%o1]

1285         andcc   %l2,2,%g0
1286         fmovdnz %icc,%f20,%f22
1287         st      %f22,[%o2]

1289         andcc   %l3,2,%g0
1290         fmovdnz %icc,%f28,%f30
1291         st      %f30,[%o3]

1293         addcc   %i0,-1,%i0
1294         bg,pt   %icc,.loop0
1295 ! delay slot
1296         st      %f7,[%o0+4]

1298         ba,pt   %icc,.end
1299 ! delay slot
1300         nop

1302         .align  16
1303 .case4:
1304         fmuld   %f18,%f18,%f16
1305         andcc   %l2,1,%g0
1306         bz,pn   %icc,.case6
1307 ! delay slot
1308         fxor    %f22,%f36,%f36

1310         fmuld   %f26,%f26,%f24
1311         andcc   %l3,1,%g0
1312         bz,pn   %icc,.case5
1313 ! delay slot
1314         fxor    %f30,%f38,%f38
```

```
1316          fmuld   %f8,pp3,%f14             ! sin(x1)

1318          fmuld   %f0,qq3,%f6              ! cos(x0)

1320          faddd   %f14,pp2,%f14
1321          fmuld   %f8,qq2,%f12

1323          fmuld   %f16,qq3,%f22            ! cos(x2)

1325          fmuld   %f24,qq3,%f30            ! cos(x3)

1327          faddd   %f6,qq2,%f6
1328          fmuld   %f0,pp2,%f4

1330          fmuld   %f8,%f14,%f14
1331          faddd   %f12,qq1,%f12

1333          faddd   %f22,qq2,%f22
1334          fmuld   %f16,pp2,%f20

1336          faddd   %f30,qq2,%f30
1337          fmuld   %f24,pp2,%f28

1339          fmuld   %f0,%f6,%f6
1340          faddd   %f4,pp1,%f4

1342          faddd   %f14,pp1,%f14
1343          fmuld   %f8,%f12,%f12
1344          add     %l5,%g1,%l5

1346          fmuld   %f16,%f22,%f22
1347          faddd   %f20,pp1,%f20

1349          fmuld   %f24,%f30,%f30
1350          faddd   %f28,pp1,%f28

1352          faddd   %f6,qq1,%f6
1353          fmuld   %f0,%f4,%f4
1354          add     %l4,%g1,%l4

1356          fmuld   %f8,%f14,%f14

1358          faddd   %f22,qq1,%f22
1359          fmuld   %f16,%f20,%f20
1360          add     %l6,%g1,%l6

1362          faddd   %f30,qq1,%f30
1363          fmuld   %f24,%f28,%f28
1364          add     %l7,%g1,%l7

1366          fmuld   %f2,%f4,%f4

1368          fmuld   %f10,%f14,%f14
1369          ldd     [%l5+8],%f8

1371          fmuld   %f18,%f20,%f20

1373          fmuld   %f26,%f28,%f28

1375          fmuld   %f0,%f6,%f6
1376          faddd   %f4,%f32,%f4
1377          ldd     [%l4+16],%f0

1379          fmuld   %f8,%f12,%f12
1380          faddd   %f34,%f14,%f14
```



```
1382          fmuld   %f16,%f22,%f22
1383          faddd   %f20,%f36,%f20
1384          ldd     [%l6+16],%f16

1386          fmuld   %f24,%f30,%f30
1387          faddd   %f28,%f38,%f28
1388          ldd     [%l7+16],%f24

1390          fmuld   %f0,%f6,%f6
1391          faddd   %f4,%f2,%f4
1392          ldd     [%l4+8],%f32

1394          faddd   %f10,%f14,%f14
1395          ldd     [%l5+16],%f34

1397          fmuld   %f16,%f22,%f22
1398          faddd   %f20,%f18,%f20
1399          ldd     [%l6+8],%f36

1401          fmuld   %f24,%f30,%f30
1402          faddd   %f28,%f26,%f28
1403          ldd     [%l7+8],%f38

1405          fmuld   %f32,%f4,%f4

1407          fmuld   %f34,%f14,%f14

1409          fmuld   %f36,%f20,%f20

1411          fmuld   %f38,%f28,%f28

1413          fsubd   %f6,%f4,%f6

1415          faddd   %f14,%f12,%f14

1417          fsubd   %f22,%f20,%f22

1419          fsubd   %f30,%f28,%f30

1421          faddd   %f6,%f0,%f6

1423          faddd   %f14,%f8,%f14

1425          faddd   %f22,%f16,%f22

1427          faddd   %f30,%f24,%f30
1428          mov     %l0,%l4

1430          fnegd   %f6,%f4
1431          lda     [%i1]%asi,%l0            ! preload next argument

1433          fnegd   %f14,%f12
1434          lda     [%i1]%asi,%f0

1436          fnegd   %f22,%f20
1437          lda     [%i1+4]%asi,%f3

1439          fnegd   %f30,%f28
1440          andn    %l0,%i5,%l0
1441          add     %i1,%i2,%i1

1443          andcc   %l4,2,%g0
1444          fmovdnz %icc,%f4,%f6
1445          st      %f6,[%o0]

1447          andcc   %l1,2,%g0
```

```
1448          fmovdnz %icc,%f12,%f14
1449          st      %f14,[%o1]

1451          andcc   %l2,2,%g0
1452          fmovdnz %icc,%f20,%f22
1453          st      %f22,[%o2]

1455          andcc   %l3,2,%g0
1456          fmovdnz %icc,%f28,%f30
1457          st      %f30,[%o3]

1459          addcc   %i0,-1,%i0
1460          bg,pt   %icc,.loop0
1461 ! delay slot
1462          st      %f7,[%o0+4]

1464          ba,pt   %icc,.end
1465 ! delay slot
1466          nop

1468          .align  16
1469 .case5:
1470          fmuld   %f8,pp3,%f14            ! sin(x1)

1472          fmuld   %f24,pp3,%f30           ! sin(x3)

1474          fmuld   %f0,qq3,%f6             ! cos(x0)

1476          faddd   %f14,pp2,%f14
1477          fmuld   %f8,qq2,%f12

1479          fmuld   %f16,qq3,%f22           ! cos(x2)

1481          faddd   %f30,pp2,%f30
1482          fmuld   %f24,qq2,%f28

1484          faddd   %f6,qq2,%f6
1485          fmuld   %f0,pp2,%f4

1487          fmuld   %f8,%f14,%f14
1488          faddd   %f12,qq1,%f12

1490          faddd   %f22,qq2,%f22
1491          fmuld   %f16,pp2,%f20

1493          fmuld   %f24,%f30,%f30
1494          faddd   %f28,qq1,%f28

1496          fmuld   %f0,%f6,%f6
1497          faddd   %f4,pp1,%f4

1499          faddd   %f14,pp1,%f14
1500          fmuld   %f8,%f12,%f12
1501          add     %l5,%g1,%l5

1503          fmuld   %f16,%f22,%f22
1504          faddd   %f20,pp1,%f20

1506          faddd   %f30,pp1,%f30
1507          fmuld   %f24,%f28,%f28
1508          add     %l7,%g1,%l7

1510          faddd   %f6,qq1,%f6
1511          fmuld   %f0,%f4,%f4
1512          add     %l4,%g1,%l4
```



```
1514          fmuld   %f8,%f14,%f14

1516          faddd   %f22,qq1,%f22
1517          fmuld   %f16,%f20,%f20
1518          add     %l6,%g1,%l6

1520          fmuld   %f24,%f30,%f30

1522          fmuld   %f2,%f4,%f4

1524          fmuld   %f10,%f14,%f14
1525          ldd     [%l5+8],%f8

1527          fmuld   %f18,%f20,%f20

1529          fmuld   %f26,%f30,%f30
1530          ldd     [%l7+8],%f24

1532          fmuld   %f0,%f6,%f6
1533          faddd   %f4,%f32,%f4
1534          ldd     [%l4+16],%f0

1536          fmuld   %f8,%f12,%f12
1537          faddd   %f34,%f14,%f14

1539          fmuld   %f16,%f22,%f22
1540          faddd   %f20,%f36,%f20
1541          ldd     [%l6+16],%f16

1543          fmuld   %f24,%f28,%f28
1544          faddd   %f38,%f30,%f30

1546          fmuld   %f0,%f6,%f6
1547          faddd   %f4,%f2,%f4
1548          ldd     [%l4+8],%f32

1550          faddd   %f10,%f14,%f14
1551          ldd     [%l5+16],%f34

1553          fmuld   %f16,%f22,%f22
1554          faddd   %f20,%f18,%f20
1555          ldd     [%l6+8],%f36

1557          faddd   %f26,%f30,%f30
1558          ldd     [%l7+16],%f38

1560          fmuld   %f32,%f4,%f4

1562          fmuld   %f34,%f14,%f14

1564          fmuld   %f36,%f20,%f20

1566          fmuld   %f38,%f30,%f30

1568          fsubd   %f6,%f4,%f6

1570          faddd   %f14,%f12,%f14

1572          fsubd   %f22,%f20,%f22

1574          faddd   %f30,%f28,%f30

1576          faddd   %f6,%f0,%f6

1578          faddd   %f14,%f8,%f14
```

```
1580         faddd   %f22,%f16,%f22

1582         faddd   %f30,%f24,%f30
1583         mov     %l0,%l4

1585         fnegd   %f6,%f4
1586         lda     [%i1]%asi,%l0           ! preload next argument

1588         fnegd   %f14,%f12
1589         lda     [%i1]%asi,%f0

1591         fnegd   %f22,%f20
1592         lda     [%i1+4]%asi,%f3

1594         fnegd   %f30,%f28
1595         andn    %l0,%i5,%l0
1596         add     %i1,%i2,%i1

1598         andcc   %l4,2,%g0
1599         fmovdnz %icc,%f4,%f6
1600         st      %f6,[%o0]

1602         andcc   %l1,2,%g0
1603         fmovdnz %icc,%f12,%f14
1604         st      %f14,[%o1]

1606         andcc   %l2,2,%g0
1607         fmovdnz %icc,%f20,%f22
1608         st      %f22,[%o2]

1610         andcc   %l3,2,%g0
1611         fmovdnz %icc,%f28,%f30
1612         st      %f30,[%o3]

1614         addcc   %i0,-1,%i0
1615         bg,pt   %icc,.loop0
1616 ! delay slot
1617         st      %f7,[%o0+4]

1619         ba,pt   %icc,.end
1620 ! delay slot
1621         nop

1623         .align  16
1624 .case6:
1625         fmuld   %f26,%f26,%f24
1626         andcc   %l3,1,%g0
1627         bz,pn   %icc,.case7
1628 ! delay slot
1629         fxor    %f30,%f38,%f38

1631         fmuld   %f8,pp3,%f14            ! sin(x1)

1633         fmuld   %f16,pp3,%f22           ! sin(x2)

1635         fmuld   %f0,qq3,%f6             ! cos(x0)

1637         faddd   %f14,pp2,%f14
1638         fmuld   %f8,qq2,%f12

1640         faddd   %f22,pp2,%f22
1641         fmuld   %f16,qq2,%f20

1643         fmuld   %f24,qq3,%f30           ! cos(x3)

1645         faddd   %f6,qq2,%f6
```



```
1646         fmuld   %f0,pp2,%f4

1648         fmuld   %f8,%f14,%f14
1649         faddd   %f12,qq1,%f12

1651         fmuld   %f16,%f22,%f22
1652         faddd   %f20,qq1,%f20

1654         faddd   %f30,qq2,%f30
1655         fmuld   %f24,pp2,%f28

1657         fmuld   %f0,%f6,%f6
1658         faddd   %f4,pp1,%f4

1660         faddd   %f14,pp1,%f14
1661         fmuld   %f8,%f12,%f12
1662         add     %l5,%g1,%l5

1664         faddd   %f22,pp1,%f22
1665         fmuld   %f16,%f20,%f20
1666         add     %l6,%g1,%l6

1668         fmuld   %f24,%f30,%f30
1669         faddd   %f28,pp1,%f28

1671         faddd   %f6,qq1,%f6
1672         fmuld   %f0,%f4,%f4
1673         add     %l4,%g1,%l4

1675         fmuld   %f8,%f14,%f14

1677         fmuld   %f16,%f22,%f22

1679         faddd   %f30,qq1,%f30
1680         fmuld   %f24,%f28,%f28
1681         add     %l7,%g1,%l7

1683         fmuld   %f2,%f4,%f4

1685         fmuld   %f10,%f14,%f14
1686         ldd     [%l5+8],%f8

1688         fmuld   %f18,%f22,%f22
1689         ldd     [%l6+8],%f16

1691         fmuld   %f26,%f28,%f28

1693         fmuld   %f0,%f6,%f6
1694         faddd   %f4,%f32,%f4
1695         ldd     [%l4+16],%f0

1697         fmuld   %f8,%f12,%f12
1698         faddd   %f34,%f14,%f14

1700         fmuld   %f16,%f20,%f20
1701         faddd   %f36,%f22,%f22

1703         fmuld   %f24,%f30,%f30
1704         faddd   %f28,%f38,%f28
1705         ldd     [%l7+16],%f24

1707         fmuld   %f0,%f6,%f6
1708         faddd   %f4,%f2,%f4
1709         ldd     [%l4+8],%f32

1711         faddd   %f10,%f14,%f14
```

```
1712          ldd     [%l5+16],%f34

1714          faddd   %f18,%f22,%f22
1715          ldd     [%l6+16],%f36

1717          fmuld   %f24,%f30,%f30
1718          faddd   %f28,%f26,%f28
1719          ldd     [%l7+8],%f38

1721          fmuld   %f32,%f4,%f4

1723          fmuld   %f34,%f14,%f14

1725          fmuld   %f36,%f22,%f22

1727          fmuld   %f38,%f28,%f28

1729          fsubd   %f6,%f4,%f6

1731          faddd   %f14,%f12,%f14

1733          faddd   %f22,%f20,%f22

1735          fsubd   %f30,%f28,%f30

1737          faddd   %f6,%f0,%f6

1739          faddd   %f14,%f8,%f14

1741          faddd   %f22,%f16,%f22

1743          faddd   %f30,%f24,%f30
1744          mov     %l0,%l4

1746          fnegd   %f6,%f4
1747          lda     [%i1]%asi,%l0           ! preload next argument

1749          fnegd   %f14,%f12
1750          lda     [%i1]%asi,%f0

1752          fnegd   %f22,%f20
1753          lda     [%i1+4]%asi,%f3

1755          fnegd   %f30,%f28
1756          andn    %l0,%i5,%l0
1757          add     %i1,%i2,%i1

1759          andcc   %l4,2,%g0
1760          fmovdnz %icc,%f4,%f6
1761          st      %f6,[%o0]

1763          andcc   %l1,2,%g0
1764          fmovdnz %icc,%f12,%f14
1765          st      %f14,[%o1]

1767          andcc   %l2,2,%g0
1768          fmovdnz %icc,%f20,%f22
1769          st      %f22,[%o2]

1771          andcc   %l3,2,%g0
1772          fmovdnz %icc,%f28,%f30
1773          st      %f30,[%o3]

1775          addcc   %i0,-1,%i0
1776          bg,pt   %icc,.loop0
1777 ! delay slot
```



```
1778          st      %f7,[%o0+4]

1780          ba,pt   %icc,.end
1781 ! delay slot
1782          nop

1784          .align  16
1785 .case7:
1786          fmuld   %f8,pp3,%f14            ! sin(x1)

1788          fmuld   %f16,pp3,%f22           ! sin(x2)

1790          fmuld   %f24,pp3,%f30           ! sin(x3)

1792          fmuld   %f0,qq3,%f6             ! cos(x0)

1794          faddd   %f14,pp2,%f14
1795          fmuld   %f8,qq2,%f12

1797          faddd   %f22,pp2,%f22
1798          fmuld   %f16,qq2,%f20

1800          faddd   %f30,pp2,%f30
1801          fmuld   %f24,qq2,%f28

1803          faddd   %f6,qq2,%f6
1804          fmuld   %f0,pp2,%f4

1806          fmuld   %f8,%f14,%f14
1807          faddd   %f12,qq1,%f12

1809          fmuld   %f16,%f22,%f22
1810          faddd   %f20,qq1,%f20

1812          fmuld   %f24,%f30,%f30
1813          faddd   %f28,qq1,%f28

1815          fmuld   %f0,%f6,%f6
1816          faddd   %f4,pp1,%f4

1818          faddd   %f14,pp1,%f14
1819          fmuld   %f8,%f12,%f12
1820          add     %l5,%g1,%l5

1822          faddd   %f22,pp1,%f22
1823          fmuld   %f16,%f20,%f20
1824          add     %l6,%g1,%l6

1826          faddd   %f30,pp1,%f30
1827          fmuld   %f24,%f28,%f28
1828          add     %l7,%g1,%l7

1830          faddd   %f6,qq1,%f6
1831          fmuld   %f0,%f4,%f4
1832          add     %l4,%g1,%l4

1834          fmuld   %f8,%f14,%f14

1836          fmuld   %f16,%f22,%f22

1838          fmuld   %f24,%f30,%f30

1840          fmuld   %f2,%f4,%f4

1842          fmuld   %f10,%f14,%f14
1843          ldd     [%l5+8],%f8
```

```
1845         fmuld   %f18,%f22,%f22
1846         ldd     [%l6+8],%f16

1848         fmuld   %f26,%f30,%f30
1849         ldd     [%l7+8],%f24

1851         fmuld   %f0,%f6,%f6
1852         faddd   %f4,%f32,%f4
1853         ldd     [%l4+16],%f0

1855         fmuld   %f8,%f12,%f12
1856         faddd   %f34,%f14,%f14

1858         fmuld   %f16,%f20,%f20
1859         faddd   %f36,%f22,%f22

1861         fmuld   %f24,%f28,%f28
1862         faddd   %f38,%f30,%f30

1864         fmuld   %f0,%f6,%f6
1865         faddd   %f4,%f2,%f4
1866         ldd     [%l4+8],%f32

1868         faddd   %f10,%f14,%f14
1869         ldd     [%l5+16],%f34

1871         faddd   %f18,%f22,%f22
1872         ldd     [%l6+16],%f36

1874         faddd   %f26,%f30,%f30
1875         ldd     [%l7+16],%f38

1877         fmuld   %f32,%f4,%f4

1879         fmuld   %f34,%f14,%f14

1881         fmuld   %f36,%f22,%f22

1883         fmuld   %f38,%f30,%f30

1885         fsubd   %f6,%f4,%f6

1887         faddd   %f14,%f12,%f14

1889         faddd   %f22,%f20,%f22

1891         faddd   %f30,%f28,%f30

1893         faddd   %f6,%f0,%f6

1895         faddd   %f14,%f8,%f14

1897         faddd   %f22,%f16,%f22

1899         faddd   %f30,%f24,%f30
1900         mov     %l0,%l4

1902         fnegd   %f6,%f4
1903         lda     [%i1]%asi,%l0           ! preload next argument

1905         fnegd   %f14,%f12
1906         lda     [%i1]%asi,%f0

1908         fnegd   %f22,%f20
1909         lda     [%i1+4]%asi,%f3
```



```
1911         fnegd   %f30,%f28
1912         andn    %l0,%i5,%l0
1913         add     %i1,%i2,%i1

1915         andcc   %l4,2,%g0
1916         fmovdnz %icc,%f4,%f6
1917         st      %f6,[%o0]

1919         andcc   %l1,2,%g0
1920         fmovdnz %icc,%f12,%f14
1921         st      %f14,[%o1]

1923         andcc   %l2,2,%g0
1924         fmovdnz %icc,%f20,%f22
1925         st      %f22,[%o2]

1927         andcc   %l3,2,%g0
1928         fmovdnz %icc,%f28,%f30
1929         st      %f30,[%o3]

1931         addcc   %i0,-1,%i0
1932         bg,pt   %icc,.loop0
1933 ! delay slot
1934         st      %f7,[%o0+4]

1936         ba,pt   %icc,.end
1937 ! delay slot
1938         nop

1940         .align  16
1941 .case8:
1942         fmuld   %f10,%f10,%f8
1943         andcc   %l1,1,%g0
1944         bz,pn   %icc,.case12
1945 ! delay slot
1946         fxor    %f14,%f34,%f34

1948         fmuld   %f18,%f18,%f16
1949         andcc   %l2,1,%g0
1950         bz,pn   %icc,.case10
1951 ! delay slot
1952         fxor    %f22,%f36,%f36

1954         fmuld   %f26,%f26,%f24
1955         andcc   %l3,1,%g0
1956         bz,pn   %icc,.case9
1957 ! delay slot
1958         fxor    %f30,%f38,%f38

1960         fmuld   %f0,pp3,%f6             ! sin(x0)

1962         faddd   %f6,pp2,%f6
1963         fmuld   %f0,qq2,%f4

1965         fmuld   %f8,qq3,%f14            ! cos(x1)

1967         fmuld   %f16,qq3,%f22           ! cos(x2)

1969         fmuld   %f24,qq3,%f30           ! cos(x3)

1971         fmuld   %f0,%f6,%f6
1972         faddd   %f4,qq1,%f4

1974         faddd   %f14,qq2,%f14
1975         fmuld   %f8,pp2,%f12
```

```
1977         faddd   %f22,qq2,%f22
1978         fmuld   %f16,pp2,%f20

1980         faddd   %f30,qq2,%f30
1981         fmuld   %f24,pp2,%f28

1983         faddd   %f6,pp1,%f6
1984         fmuld   %f0,%f4,%f4
1985         add     %l4,%g1,%l4

1987         fmuld   %f8,%f14,%f14
1988         faddd   %f12,pp1,%f12

1990         fmuld   %f16,%f22,%f22
1991         faddd   %f20,pp1,%f20

1993         fmuld   %f24,%f30,%f30
1994         faddd   %f28,pp1,%f28

1996         fmuld   %f0,%f6,%f6

1998         faddd   %f14,qq1,%f14
1999         fmuld   %f8,%f12,%f12
2000         add     %l5,%g1,%l5

2002         faddd   %f22,qq1,%f22
2003         fmuld   %f16,%f20,%f20
2004         add     %l6,%g1,%l6

2006         faddd   %f30,qq1,%f30
2007         fmuld   %f24,%f28,%f28
2008         add     %l7,%g1,%l7

2010         fmuld   %f2,%f6,%f6
2011         ldd     [%l4+8],%f0

2013         fmuld   %f10,%f12,%f12

2015         fmuld   %f18,%f20,%f20

2017         fmuld   %f26,%f28,%f28

2019         fmuld   %f0,%f4,%f4
2020         faddd   %f32,%f6,%f6

2022         fmuld   %f8,%f14,%f14
2023         faddd   %f12,%f34,%f12
2024         ldd     [%l5+16],%f8

2026         fmuld   %f16,%f22,%f22
2027         faddd   %f20,%f36,%f20
2028         ldd     [%l6+16],%f16

2030         fmuld   %f24,%f30,%f30
2031         faddd   %f28,%f38,%f28
2032         ldd     [%l7+16],%f24

2034         faddd   %f2,%f6,%f6
2035         ldd     [%l4+16],%f32

2037         fmuld   %f8,%f14,%f14
2038         faddd   %f12,%f10,%f12
2039         ldd     [%l5+8],%f34

2041         fmuld   %f16,%f22,%f22
```



```
2042         faddd   %f20,%f18,%f20
2043         ldd     [%l6+8],%f36

2045         fmuld   %f24,%f30,%f30
2046         faddd   %f28,%f26,%f28
2047         ldd     [%l7+8],%f38

2049         fmuld   %f32,%f6,%f6

2051         fmuld   %f34,%f12,%f12

2053         fmuld   %f36,%f20,%f20

2055         fmuld   %f38,%f28,%f28

2057         faddd   %f6,%f4,%f6

2059         fsubd   %f14,%f12,%f14

2061         fsubd   %f22,%f20,%f22

2063         fsubd   %f30,%f28,%f30

2065         faddd   %f6,%f0,%f6

2067         faddd   %f14,%f8,%f14

2069         faddd   %f22,%f16,%f22

2071         faddd   %f30,%f24,%f30
2072         mov     %l0,%l4

2074         fnegd   %f6,%f4
2075         lda     [%i1]%asi,%l0           ! preload next argument

2077         fnegd   %f14,%f12
2078         lda     [%i1]%asi,%f0

2080         fnegd   %f22,%f20
2081         lda     [%i1+4]%asi,%f3

2083         fnegd   %f30,%f28
2084         andn    %l0,%i5,%l0
2085         add     %i1,%i2,%i1

2087         andcc   %l4,2,%g0
2088         fmovdnz %icc,%f4,%f6
2089         st      %f6,[%o0]

2091         andcc   %l1,2,%g0
2092         fmovdnz %icc,%f12,%f14
2093         st      %f14,[%o1]

2095         andcc   %l2,2,%g0
2096         fmovdnz %icc,%f20,%f22
2097         st      %f22,[%o2]

2099         andcc   %l3,2,%g0
2100         fmovdnz %icc,%f28,%f30
2101         st      %f30,[%o3]

2103         addcc   %i0,-1,%i0
2104         bg,pt   %icc,.loop0
2105 ! delay slot
2106         st      %f7,[%o0+4]
```

```
2108         ba,pt   %icc,.end
2109 ! delay slot
2110         nop

2112         .align  16
2113 .case9:
2114         fmuld   %f0,pp3,%f6             ! sin(x0)

2116         fmuld   %f24,pp3,%f30           ! sin(x3)

2118         faddd   %f6,pp2,%f6
2119         fmuld   %f0,qq2,%f4

2121         fmuld   %f8,qq3,%f14            ! cos(x1)

2123         fmuld   %f16,qq3,%f22           ! cos(x2)

2125         faddd   %f30,pp2,%f30
2126         fmuld   %f24,qq2,%f28

2128         fmuld   %f0,%f6,%f6
2129         faddd   %f4,qq1,%f4

2131         faddd   %f14,qq2,%f14
2132         fmuld   %f8,pp2,%f12

2134         faddd   %f22,qq2,%f22
2135         fmuld   %f16,pp2,%f20

2137         fmuld   %f24,%f30,%f30
2138         faddd   %f28,qq1,%f28

2140         faddd   %f6,pp1,%f6
2141         fmuld   %f0,%f4,%f4
2142         add     %l4,%g1,%l4

2144         fmuld   %f8,%f14,%f14
2145         faddd   %f12,pp1,%f12

2147         fmuld   %f16,%f22,%f22
2148         faddd   %f20,pp1,%f20

2150         faddd   %f30,pp1,%f30
2151         fmuld   %f24,%f28,%f28
2152         add     %l7,%g1,%l7

2154         fmuld   %f0,%f6,%f6

2156         faddd   %f14,qq1,%f14
2157         fmuld   %f8,%f12,%f12
2158         add     %l5,%g1,%l5

2160         faddd   %f22,qq1,%f22
2161         fmuld   %f16,%f20,%f20
2162         add     %l6,%g1,%l6

2164         fmuld   %f24,%f30,%f30

2166         fmuld   %f2,%f6,%f6
2167         ldd     [%l4+8],%f0

2169         fmuld   %f10,%f12,%f12

2171         fmuld   %f18,%f20,%f20

2173         fmuld   %f26,%f30,%f30
```



```
2174         ldd     [%l7+8],%f24

2176         fmuld   %f0,%f4,%f4
2177         faddd   %f32,%f6,%f6

2179         fmuld   %f8,%f14,%f14
2180         faddd   %f12,%f34,%f12
2181         ldd     [%l5+16],%f8

2183         fmuld   %f16,%f22,%f22
2184         faddd   %f20,%f36,%f20
2185         ldd     [%l6+16],%f16

2187         fmuld   %f24,%f28,%f28
2188         faddd   %f38,%f30,%f30

2190         faddd   %f2,%f6,%f6
2191         ldd     [%l4+16],%f32

2193         fmuld   %f8,%f14,%f14
2194         faddd   %f12,%f10,%f12
2195         ldd     [%l5+8],%f34

2197         fmuld   %f16,%f22,%f22
2198         faddd   %f20,%f18,%f20
2199         ldd     [%l6+8],%f36

2201         faddd   %f26,%f30,%f30
2202         ldd     [%l7+16],%f38

2204         fmuld   %f32,%f6,%f6

2206         fmuld   %f34,%f12,%f12

2208         fmuld   %f36,%f20,%f20

2210         fmuld   %f38,%f30,%f30

2212         faddd   %f6,%f4,%f6

2214         fsubd   %f14,%f12,%f14

2216         fsubd   %f22,%f20,%f22

2218         faddd   %f30,%f28,%f30

2220         faddd   %f6,%f0,%f6

2222         faddd   %f14,%f8,%f14

2224         faddd   %f22,%f16,%f22

2226         faddd   %f30,%f24,%f30
2227         mov     %l0,%l4

2229         fnegd   %f6,%f4
2230         lda     [%i1]%asi,%l0           ! preload next argument

2232         fnegd   %f14,%f12
2233         lda     [%i1]%asi,%f0

2235         fnegd   %f22,%f20
2236         lda     [%i1+4]%asi,%f3

2238         fnegd   %f30,%f28
2239         andn    %l0,%i5,%l0
```

```
2240         add     %i1,%i2,%i1

2242         andcc   %l4,2,%g0
2243         fmovdnz %icc,%f4,%f6
2244         st      %f6,[%o0]

2246         andcc   %l1,2,%g0
2247         fmovdnz %icc,%f12,%f14
2248         st      %f14,[%o1]

2250         andcc   %l2,2,%g0
2251         fmovdnz %icc,%f20,%f22
2252         st      %f22,[%o2]

2254         andcc   %l3,2,%g0
2255         fmovdnz %icc,%f28,%f30
2256         st      %f30,[%o3]

2258         addcc   %i0,-1,%i0
2259         bg,pt   %icc,.loop0
2260 ! delay slot
2261         st      %f7,[%o0+4]

2263         ba,pt   %icc,.end
2264 ! delay slot
2265         nop

2267         .align  16
2268 .case10:
2269         fmuld   %f26,%f26,%f24
2270         andcc   %l3,1,%g0
2271         bz,pn   %icc,.case11
2272 ! delay slot
2273         fxor    %f30,%f38,%f38

2275         fmuld   %f0,pp3,%f6             ! sin(x0)

2277         fmuld   %f16,pp3,%f22           ! sin(x2)

2279         faddd   %f6,pp2,%f6
2280         fmuld   %f0,qq2,%f4

2282         fmuld   %f8,qq3,%f14            ! cos(x1)

2284         faddd   %f22,pp2,%f22
2285         fmuld   %f16,qq2,%f20

2287         fmuld   %f24,qq3,%f30           ! cos(x3)

2289         fmuld   %f0,%f6,%f6
2290         faddd   %f4,qq1,%f4

2292         faddd   %f14,qq2,%f14
2293         fmuld   %f8,pp2,%f12

2295         fmuld   %f16,%f22,%f22
2296         faddd   %f20,qq1,%f20

2298         faddd   %f30,qq2,%f30
2299         fmuld   %f24,pp2,%f28

2301         faddd   %f6,pp1,%f6
2302         fmuld   %f0,%f4,%f4
2303         add     %l4,%g1,%l4

2305         fmuld   %f8,%f14,%f14
```



```
2306         faddd   %f12,pp1,%f12

2308         faddd   %f22,pp1,%f22
2309         fmuld   %f16,%f20,%f20
2310         add     %l6,%g1,%l6

2312         fmuld   %f24,%f30,%f30
2313         faddd   %f28,pp1,%f28

2315         fmuld   %f0,%f6,%f6

2317         faddd   %f14,qq1,%f14
2318         fmuld   %f8,%f12,%f12
2319         add     %l5,%g1,%l5

2321         fmuld   %f16,%f22,%f22

2323         faddd   %f30,qq1,%f30
2324         fmuld   %f24,%f28,%f28
2325         add     %l7,%g1,%l7

2327         fmuld   %f2,%f6,%f6
2328         ldd     [%l4+8],%f0

2330         fmuld   %f10,%f12,%f12

2332         fmuld   %f18,%f22,%f22
2333         ldd     [%l6+8],%f16

2335         fmuld   %f26,%f28,%f28

2337         fmuld   %f0,%f4,%f4
2338         faddd   %f32,%f6,%f6

2340         fmuld   %f8,%f14,%f14
2341         faddd   %f12,%f34,%f12
2342         ldd     [%l5+16],%f8

2344         fmuld   %f16,%f20,%f20
2345         faddd   %f36,%f22,%f22

2347         fmuld   %f24,%f30,%f30
2348         faddd   %f28,%f38,%f28
2349         ldd     [%l7+16],%f24

2351         faddd   %f2,%f6,%f6
2352         ldd     [%l4+16],%f32

2354         fmuld   %f8,%f14,%f14
2355         faddd   %f12,%f10,%f12
2356         ldd     [%l5+8],%f34

2358         faddd   %f18,%f22,%f22
2359         ldd     [%l6+16],%f36

2361         fmuld   %f24,%f30,%f30
2362         faddd   %f28,%f26,%f28
2363         ldd     [%l7+8],%f38

2365         fmuld   %f32,%f6,%f6

2367         fmuld   %f34,%f12,%f12

2369         fmuld   %f36,%f22,%f22

2371         fmuld   %f38,%f28,%f28
```

```
2373         faddd   %f6,%f4,%f6

2375         fsubd   %f14,%f12,%f14

2377         faddd   %f22,%f20,%f22

2379         fsubd   %f30,%f28,%f30

2381         faddd   %f6,%f0,%f6

2383         faddd   %f14,%f8,%f14

2385         faddd   %f22,%f16,%f22

2387         faddd   %f30,%f24,%f30
2388         mov     %l0,%l4

2390         fnegd   %f6,%f4
2391         lda     [%i1]%asi,%l0           ! preload next argument

2393         fnegd   %f14,%f12
2394         lda     [%i1]%asi,%f0

2396         fnegd   %f22,%f20
2397         lda     [%i1+4]%asi,%f3

2399         fnegd   %f30,%f28
2400         andn    %l0,%i5,%l0
2401         add     %i1,%i2,%i1

2403         andcc   %l4,2,%g0
2404         fmovdnz %icc,%f4,%f6
2405         st      %f6,[%o0]

2407         andcc   %l1,2,%g0
2408         fmovdnz %icc,%f12,%f14
2409         st      %f14,[%o1]

2411         andcc   %l2,2,%g0
2412         fmovdnz %icc,%f20,%f22
2413         st      %f22,[%o2]

2415         andcc   %l3,2,%g0
2416         fmovdnz %icc,%f28,%f30
2417         st      %f30,[%o3]

2419         addcc   %i0,-1,%i0
2420         bg,pt   %icc,.loop0
2421 ! delay slot
2422         st      %f7,[%o0+4]

2424         ba,pt   %icc,.end
2425 ! delay slot
2426         nop

2428         .align  16
2429 .case11:
2430         fmuld   %f0,pp3,%f6             ! sin(x0)

2432         fmuld   %f16,pp3,%f22           ! sin(x2)

2434         fmuld   %f24,pp3,%f30           ! sin(x3)

2436         faddd   %f6,pp2,%f6
2437         fmuld   %f0,qq2,%f4
```



```
2439         fmuld   %f8,qq3,%f14            ! cos(x1)

2441         faddd   %f22,pp2,%f22
2442         fmuld   %f16,qq2,%f20

2444         faddd   %f30,pp2,%f30
2445         fmuld   %f24,qq2,%f28

2447         fmuld   %f0,%f6,%f6
2448         faddd   %f4,qq1,%f4

2450         faddd   %f14,qq2,%f14
2451         fmuld   %f8,pp2,%f12

2453         fmuld   %f16,%f22,%f22
2454         faddd   %f20,qq1,%f20

2456         fmuld   %f24,%f30,%f30
2457         faddd   %f28,qq1,%f28

2459         faddd   %f6,pp1,%f6
2460         fmuld   %f0,%f4,%f4
2461         add     %l4,%g1,%l4

2463         fmuld   %f8,%f14,%f14
2464         faddd   %f12,pp1,%f12

2466         faddd   %f22,pp1,%f22
2467         fmuld   %f16,%f20,%f20
2468         add     %l6,%g1,%l6

2470         faddd   %f30,pp1,%f30
2471         fmuld   %f24,%f28,%f28
2472         add     %l7,%g1,%l7

2474         fmuld   %f0,%f6,%f6

2476         faddd   %f14,qq1,%f14
2477         fmuld   %f8,%f12,%f12
2478         add     %l5,%g1,%l5

2480         fmuld   %f16,%f22,%f22

2482         fmuld   %f24,%f30,%f30

2484         fmuld   %f2,%f6,%f6
2485         ldd     [%l4+8],%f0

2487         fmuld   %f10,%f12,%f12

2489         fmuld   %f18,%f22,%f22
2490         ldd     [%l6+8],%f16

2492         fmuld   %f26,%f30,%f30
2493         ldd     [%l7+8],%f24

2495         fmuld   %f0,%f4,%f4
2496         faddd   %f32,%f6,%f6

2498         fmuld   %f8,%f14,%f14
2499         faddd   %f12,%f34,%f12
2500         ldd     [%l5+16],%f8

2502         fmuld   %f16,%f20,%f20
2503         faddd   %f36,%f22,%f22
```

```
2505         fmuld   %f24,%f28,%f28
2506         faddd   %f38,%f30,%f30

2508         faddd   %f2,%f6,%f6
2509         ldd     [%l4+16],%f32

2511         fmuld   %f8,%f14,%f14
2512         faddd   %f12,%f10,%f12
2513         ldd     [%l5+8],%f34

2515         faddd   %f18,%f22,%f22
2516         ldd     [%l6+16],%f36

2518         faddd   %f26,%f30,%f30
2519         ldd     [%l7+16],%f38

2521         fmuld   %f32,%f6,%f6

2523         fmuld   %f34,%f12,%f12

2525         fmuld   %f36,%f22,%f22

2527         fmuld   %f38,%f30,%f30

2529         faddd   %f6,%f4,%f6

2531         fsubd   %f14,%f12,%f14

2533         faddd   %f22,%f20,%f22

2535         faddd   %f30,%f28,%f30

2537         faddd   %f6,%f0,%f6

2539         faddd   %f14,%f8,%f14

2541         faddd   %f22,%f16,%f22

2543         faddd   %f30,%f24,%f30
2544         mov     %l0,%l4

2546         fnegd   %f6,%f4
2547         lda     [%i1]%asi,%l0           ! preload next argument

2549         fnegd   %f14,%f12
2550         lda     [%i1]%asi,%f0

2552         fnegd   %f22,%f20
2553         lda     [%i1+4]%asi,%f3

2555         fnegd   %f30,%f28
2556         andn    %l0,%i5,%l0
2557         add     %i1,%i2,%i1

2559         andcc   %l4,2,%g0
2560         fmovdnz %icc,%f4,%f6
2561         st      %f6,[%o0]

2563         andcc   %l1,2,%g0
2564         fmovdnz %icc,%f12,%f14
2565         st      %f14,[%o1]

2567         andcc   %l2,2,%g0
2568         fmovdnz %icc,%f20,%f22
2569         st      %f22,[%o2]
```



```
2571         andcc   %l3,2,%g0
2572         fmovdnz %icc,%f28,%f30
2573         st      %f30,[%o3]

2575         addcc   %i0,-1,%i0
2576         bg,pt   %icc,.loop0
2577 ! delay slot
2578         st      %f7,[%o0+4]

2580         ba,pt   %icc,.end
2581 ! delay slot
2582         nop

2584         .align  16
2585 .case12:
2586         fmuld   %f18,%f18,%f16
2587         andcc   %l2,1,%g0
2588         bz,pn   %icc,.case14
2589 ! delay slot
2590         fxor    %f22,%f36,%f36

2592         fmuld   %f26,%f26,%f24
2593         andcc   %l3,1,%g0
2594         bz,pn   %icc,.case13
2595 ! delay slot
2596         fxor    %f30,%f38,%f38

2598         fmuld   %f0,pp3,%f6             ! sin(x0)

2600         fmuld   %f8,pp3,%f14            ! sin(x1)

2602         faddd   %f6,pp2,%f6
2603         fmuld   %f0,qq2,%f4

2605         faddd   %f14,pp2,%f14
2606         fmuld   %f8,qq2,%f12

2608         fmuld   %f16,qq3,%f22           ! cos(x2)

2610         fmuld   %f24,qq3,%f30           ! cos(x3)

2612         fmuld   %f0,%f6,%f6
2613         faddd   %f4,qq1,%f4

2615         fmuld   %f8,%f14,%f14
2616         faddd   %f12,qq1,%f12

2618         faddd   %f22,qq2,%f22
2619         fmuld   %f16,pp2,%f20

2621         faddd   %f30,qq2,%f30
2622         fmuld   %f24,pp2,%f28

2624         faddd   %f6,pp1,%f6
2625         fmuld   %f0,%f4,%f4
2626         add     %l4,%g1,%l4

2628         faddd   %f14,pp1,%f14
2629         fmuld   %f8,%f12,%f12
2630         add     %l5,%g1,%l5

2632         fmuld   %f16,%f22,%f22
2633         faddd   %f20,pp1,%f20

2635         fmuld   %f24,%f30,%f30
```

```
2636         faddd   %f28,pp1,%f28

2638         fmuld   %f0,%f6,%f6

2640         fmuld   %f8,%f14,%f14

2642         faddd   %f22,qq1,%f22
2643         fmuld   %f16,%f20,%f20
2644         add     %l6,%g1,%l6

2646         faddd   %f30,qq1,%f30
2647         fmuld   %f24,%f28,%f28
2648         add     %l7,%g1,%l7

2650         fmuld   %f2,%f6,%f6
2651         ldd     [%l4+8],%f0

2653         fmuld   %f10,%f14,%f14
2654         ldd     [%l5+8],%f8

2656         fmuld   %f18,%f20,%f20

2658         fmuld   %f26,%f28,%f28

2660         fmuld   %f0,%f4,%f4
2661         faddd   %f32,%f6,%f6

2663         fmuld   %f8,%f12,%f12
2664         faddd   %f34,%f14,%f14

2666         fmuld   %f16,%f22,%f22
2667         faddd   %f20,%f36,%f20
2668         ldd     [%l6+16],%f16

2670         fmuld   %f24,%f30,%f30
2671         faddd   %f28,%f38,%f28
2672         ldd     [%l7+16],%f24

2674         faddd   %f2,%f6,%f6
2675         ldd     [%l4+16],%f32

2677         faddd   %f10,%f14,%f14
2678         ldd     [%l5+16],%f34

2680         fmuld   %f16,%f22,%f22
2681         faddd   %f20,%f18,%f20
2682         ldd     [%l6+8],%f36

2684         fmuld   %f24,%f30,%f30
2685         faddd   %f28,%f26,%f28
2686         ldd     [%l7+8],%f38

2688         fmuld   %f32,%f6,%f6

2690         fmuld   %f34,%f14,%f14

2692         fmuld   %f36,%f20,%f20

2694         fmuld   %f38,%f28,%f28

2696         faddd   %f6,%f4,%f6

2698         faddd   %f14,%f12,%f14

2700         fsubd   %f22,%f20,%f22
```



```
2702         fsubd   %f30,%f28,%f30

2704         faddd   %f6,%f0,%f6

2706         faddd   %f14,%f8,%f14

2708         faddd   %f22,%f16,%f22

2710         faddd   %f30,%f24,%f30
2711         mov     %l0,%l4

2713         fnegd   %f6,%f4
2714         lda     [%i1]%asi,%l0           ! preload next argument

2716         fnegd   %f14,%f12
2717         lda     [%i1]%asi,%f0

2719         fnegd   %f22,%f20
2720         lda     [%i1+4]%asi,%f3

2722         fnegd   %f30,%f28
2723         andn    %l0,%i5,%l0
2724         add     %i1,%i2,%i1

2726         andcc   %l4,2,%g0
2727         fmovdnz %icc,%f4,%f6
2728         st      %f6,[%o0]

2730         andcc   %l1,2,%g0
2731         fmovdnz %icc,%f12,%f14
2732         st      %f14,[%o1]

2734         andcc   %l2,2,%g0
2735         fmovdnz %icc,%f20,%f22
2736         st      %f22,[%o2]

2738         andcc   %l3,2,%g0
2739         fmovdnz %icc,%f28,%f30
2740         st      %f30,[%o3]

2742         addcc   %i0,-1,%i0
2743         bg,pt   %icc,.loop0
2744 ! delay slot
2745         st      %f7,[%o0+4]

2747         ba,pt   %icc,.end
2748 ! delay slot
2749         nop

2751         .align  16
2752 .case13:
2753         fmuld   %f0,pp3,%f6             ! sin(x0)

2755         fmuld   %f8,pp3,%f14            ! sin(x1)

2757         fmuld   %f24,pp3,%f30           ! sin(x3)

2759         faddd   %f6,pp2,%f6
2760         fmuld   %f0,qq2,%f4

2762         faddd   %f14,pp2,%f14
2763         fmuld   %f8,qq2,%f12

2765         fmuld   %f16,qq3,%f22           ! cos(x2)

2767         faddd   %f30,pp2,%f30
```

```
2768          fmuld   %f24,qq2,%f28

2770          fmuld   %f0,%f6,%f6
2771          faddd   %f4,qq1,%f4

2773          fmuld   %f8,%f14,%f14
2774          faddd   %f12,qq1,%f12

2776          faddd   %f22,qq2,%f22
2777          fmuld   %f16,pp2,%f20

2779          fmuld   %f24,%f30,%f30
2780          faddd   %f28,qq1,%f28

2782          faddd   %f6,pp1,%f6
2783          fmuld   %f0,%f4,%f4
2784          add     %l4,%g1,%l4

2786          faddd   %f14,pp1,%f14
2787          fmuld   %f8,%f12,%f12
2788          add     %l5,%g1,%l5

2790          fmuld   %f16,%f22,%f22
2791          faddd   %f20,pp1,%f20

2793          faddd   %f30,pp1,%f30
2794          fmuld   %f24,%f28,%f28
2795          add     %l7,%g1,%l7

2797          fmuld   %f0,%f6,%f6

2799          fmuld   %f8,%f14,%f14

2801          faddd   %f22,qq1,%f22
2802          fmuld   %f16,%f20,%f20
2803          add     %l6,%g1,%l6

2805          fmuld   %f24,%f30,%f30

2807          fmuld   %f2,%f6,%f6
2808          ldd     [%l4+8],%f0

2810          fmuld   %f10,%f14,%f14
2811          ldd     [%l5+8],%f8

2813          fmuld   %f18,%f20,%f20

2815          fmuld   %f26,%f30,%f30
2816          ldd     [%l7+8],%f24

2818          fmuld   %f0,%f4,%f4
2819          faddd   %f32,%f6,%f6

2821          fmuld   %f8,%f12,%f12
2822          faddd   %f34,%f14,%f14

2824          fmuld   %f16,%f22,%f22
2825          faddd   %f20,%f36,%f20
2826          ldd     [%l6+16],%f16

2828          fmuld   %f24,%f28,%f28
2829          faddd   %f38,%f30,%f30

2831          faddd   %f2,%f6,%f6
2832          ldd     [%l4+16],%f32
```



```
2834          faddd   %f10,%f14,%f14
2835          ldd     [%l5+16],%f34

2837          fmuld   %f16,%f22,%f22
2838          faddd   %f20,%f18,%f20
2839          ldd     [%l6+8],%f36

2841          faddd   %f26,%f30,%f30
2842          ldd     [%l7+16],%f38

2844          fmuld   %f32,%f6,%f6

2846          fmuld   %f34,%f14,%f14

2848          fmuld   %f36,%f20,%f20

2850          fmuld   %f38,%f30,%f30

2852          faddd   %f6,%f4,%f6

2854          faddd   %f14,%f12,%f14

2856          fsubd   %f22,%f20,%f22

2858          faddd   %f30,%f28,%f30

2860          faddd   %f6,%f0,%f6

2862          faddd   %f14,%f8,%f14

2864          faddd   %f22,%f16,%f22

2866          faddd   %f30,%f24,%f30
2867          mov     %l0,%l4

2869          fnegd   %f6,%f4
2870          lda     [%i1]%asi,%l0           ! preload next argument

2872          fnegd   %f14,%f12
2873          lda     [%i1]%asi,%f0

2875          fnegd   %f22,%f20
2876          lda     [%i1+4]%asi,%f3

2878          fnegd   %f30,%f28
2879          andn    %l0,%i5,%l0
2880          add     %i1,%i2,%i1

2882          andcc   %l4,2,%g0
2883          fmovdnz %icc,%f4,%f6
2884          st      %f6,[%o0]

2886          andcc   %l1,2,%g0
2887          fmovdnz %icc,%f12,%f14
2888          st      %f14,[%o1]

2890          andcc   %l2,2,%g0
2891          fmovdnz %icc,%f20,%f22
2892          st      %f22,[%o2]

2894          andcc   %l3,2,%g0
2895          fmovdnz %icc,%f28,%f30
2896          st      %f30,[%o3]

2898          addcc   %i0,-1,%i0
2899          bg,pt   %icc,.loop0
```

```
! delay slot
        st      %f7,[%o0+4]

        ba,pt   %icc,.end
! delay slot
        nop

        .align  16
.case14:
        fmuld   %f26,%f26,%f24
        andcc   %l3,1,%g0
        bz,pn   %icc,.case15
! delay slot
        fxor    %f30,%f38,%f38

        fmuld   %f0,pp3,%f6             ! sin(x0)

        fmuld   %f8,pp3,%f14            ! sin(x1)

        fmuld   %f16,pp3,%f22           ! sin(x2)

        faddd   %f6,pp2,%f6
        fmuld   %f0,qq2,%f4

        faddd   %f14,pp2,%f14
        fmuld   %f8,qq2,%f12

        faddd   %f22,pp2,%f22
        fmuld   %f16,qq2,%f20

        fmuld   %f24,qq3,%f30           ! cos(x3)

        fmuld   %f0,%f6,%f6
        faddd   %f4,qq1,%f4

        fmuld   %f8,%f14,%f14
        faddd   %f12,qq1,%f12

        fmuld   %f16,%f22,%f22
        faddd   %f20,qq1,%f20

        faddd   %f30,qq2,%f30
        fmuld   %f24,pp2,%f28

        faddd   %f6,pp1,%f6
        fmuld   %f0,%f4,%f4
        add     %l4,%g1,%l4

        faddd   %f14,pp1,%f14
        fmuld   %f8,%f12,%f12
        add     %l5,%g1,%l5

        faddd   %f22,pp1,%f22
        fmuld   %f16,%f20,%f20
        add     %l6,%g1,%l6

        fmuld   %f24,%f30,%f30
        faddd   %f28,pp1,%f28

        fmuld   %f0,%f6,%f6

        fmuld   %f8,%f14,%f14

        fmuld   %f16,%f22,%f22

        faddd   %f30,qq1,%f30
```



```
        fmuld   %f24,%f28,%f28
        add     %l7,%g1,%l7

        fmuld   %f2,%f6,%f6
        ldd     [%l4+8],%f0

        fmuld   %f10,%f14,%f14
        ldd     [%l5+8],%f8

        fmuld   %f18,%f22,%f22
        ldd     [%l6+8],%f16

        fmuld   %f26,%f28,%f28

        fmuld   %f0,%f4,%f4
        faddd   %f32,%f6,%f6

        fmuld   %f8,%f12,%f12
        faddd   %f34,%f14,%f14

        fmuld   %f16,%f20,%f20
        faddd   %f36,%f22,%f22

        fmuld   %f24,%f30,%f30
        faddd   %f28,%f38,%f28
        ldd     [%l7+16],%f24

        faddd   %f2,%f6,%f6
        ldd     [%l4+16],%f32

        faddd   %f10,%f14,%f14
        ldd     [%l5+16],%f34

        faddd   %f18,%f22,%f22
        ldd     [%l6+16],%f36

        fmuld   %f24,%f30,%f30
        faddd   %f28,%f26,%f28
        ldd     [%l7+8],%f38

        fmuld   %f32,%f6,%f6

        fmuld   %f34,%f14,%f14

        fmuld   %f36,%f22,%f22

        fmuld   %f38,%f28,%f28

        faddd   %f6,%f4,%f6

        faddd   %f14,%f12,%f14

        faddd   %f22,%f20,%f22

        fsubd   %f30,%f28,%f30

        faddd   %f6,%f0,%f6

        faddd   %f14,%f8,%f14

        faddd   %f22,%f16,%f22

        faddd   %f30,%f24,%f30
        mov     %l0,%l4

        fnegd   %f6,%f4
```

```
3032         lda     [%i1]%asi,%l0           ! preload next argument

3034         fnegd   %f14,%f12
3035         lda     [%i1]%asi,%f0

3037         fnegd   %f22,%f20
3038         lda     [%i1+4]%asi,%f3

3040         fnegd   %f30,%f28
3041         andn    %l0,%i5,%l0
3042         add     %i1,%i2,%i1

3044         andcc   %l4,2,%g0
3045         fmovdnz %icc,%f4,%f6
3046         st      %f6,[%o0]

3048         andcc   %l1,2,%g0
3049         fmovdnz %icc,%f12,%f14
3050         st      %f14,[%o1]

3052         andcc   %l2,2,%g0
3053         fmovdnz %icc,%f20,%f22
3054         st      %f22,[%o2]

3056         andcc   %l3,2,%g0
3057         fmovdnz %icc,%f28,%f30
3058         st      %f30,[%o3]

3060         addcc   %i0,-1,%i0
3061         bg,pt   %icc,.loop0
3062 ! delay slot
3063         st      %f7,[%o0+4]

3065         ba,pt   %icc,.end
3066 ! delay slot
3067         nop

3069         .align  16
3070 .case15:
3071         fmuld   %f0,pp3,%f6             ! sin(x0)

3073         fmuld   %f8,pp3,%f14            ! sin(x1)

3075         fmuld   %f16,pp3,%f22           ! sin(x2)

3077         fmuld   %f24,pp3,%f30           ! sin(x3)

3079         faddd   %f6,pp2,%f6
3080         fmuld   %f0,qq2,%f4

3082         faddd   %f14,pp2,%f14
3083         fmuld   %f8,qq2,%f12

3085         faddd   %f22,pp2,%f22
3086         fmuld   %f16,qq2,%f20

3088         faddd   %f30,pp2,%f30
3089         fmuld   %f24,qq2,%f28

3091         fmuld   %f0,%f6,%f6
3092         faddd   %f4,qq1,%f4

3094         fmuld   %f8,%f14,%f14
3095         faddd   %f12,qq1,%f12

3097         fmuld   %f16,%f22,%f22
```



```
3098         faddd   %f20,qq1,%f20

3100         fmuld   %f24,%f30,%f30
3101         faddd   %f28,qq1,%f28

3103         faddd   %f6,pp1,%f6
3104         fmuld   %f0,%f4,%f4
3105         add     %l4,%g1,%l4

3107         faddd   %f14,pp1,%f14
3108         fmuld   %f8,%f12,%f12
3109         add     %l5,%g1,%l5

3111         faddd   %f22,pp1,%f22
3112         fmuld   %f16,%f20,%f20
3113         add     %l6,%g1,%l6

3115         faddd   %f30,pp1,%f30
3116         fmuld   %f24,%f28,%f28
3117         add     %l7,%g1,%l7

3119         fmuld   %f0,%f6,%f6

3121         fmuld   %f8,%f14,%f14

3123         fmuld   %f16,%f22,%f22

3125         fmuld   %f24,%f30,%f30

3127         fmuld   %f2,%f6,%f6
3128         ldd     [%l4+8],%f0

3130         fmuld   %f10,%f14,%f14
3131         ldd     [%l5+8],%f8

3133         fmuld   %f18,%f22,%f22
3134         ldd     [%l6+8],%f16

3136         fmuld   %f26,%f30,%f30
3137         ldd     [%l7+8],%f24

3139         fmuld   %f0,%f4,%f4
3140         faddd   %f32,%f6,%f6

3142         fmuld   %f8,%f12,%f12
3143         faddd   %f34,%f14,%f14

3145         fmuld   %f16,%f20,%f20
3146         faddd   %f36,%f22,%f22

3148         fmuld   %f24,%f28,%f28
3149         faddd   %f38,%f30,%f30

3151         faddd   %f2,%f6,%f6
3152         ldd     [%l4+16],%f32

3154         faddd   %f10,%f14,%f14
3155         ldd     [%l5+16],%f34

3157         faddd   %f18,%f22,%f22
3158         ldd     [%l6+16],%f36

3160         faddd   %f26,%f30,%f30
3161         ldd     [%l7+16],%f38

3163         fmuld   %f32,%f6,%f6
```

```
3165         fmuld   %f34,%f14,%f14

3167         fmuld   %f36,%f22,%f22

3169         fmuld   %f38,%f30,%f30

3171         faddd   %f6,%f4,%f6

3173         faddd   %f14,%f12,%f14

3175         faddd   %f22,%f20,%f22

3177         faddd   %f30,%f28,%f30

3179         faddd   %f6,%f0,%f6

3181         faddd   %f14,%f8,%f14

3183         faddd   %f22,%f16,%f22

3185         faddd   %f30,%f24,%f30
3186         mov     %l0,%l4

3188         fnegd   %f6,%f4
3189         lda     [%i1]%asi,%l0           ! preload next argument

3191         fnegd   %f14,%f12
3192         lda     [%i1]%asi,%f0

3194         fnegd   %f22,%f20
3195         lda     [%i1+4]%asi,%f3

3197         fnegd   %f30,%f28
3198         andn    %l0,%i5,%l0
3199         add     %i1,%i2,%i1

3201         andcc   %l4,2,%g0
3202         fmovdnz %icc,%f4,%f6
3203         st      %f6,[%o0]

3205         andcc   %l1,2,%g0
3206         fmovdnz %icc,%f12,%f14
3207         st      %f14,[%o1]

3209         andcc   %l2,2,%g0
3210         fmovdnz %icc,%f20,%f22
3211         st      %f22,[%o2]

3213         andcc   %l3,2,%g0
3214         fmovdnz %icc,%f28,%f30
3215         st      %f30,[%o3]

3217         addcc   %i0,-1,%i0
3218         bg,pt   %icc,.loop0
3219 ! delay slot
3220         st      %f7,[%o0+4]

3222         ba,pt   %icc,.end
3223 ! delay slot
3224         nop


3227         .align  16
3228 .end:
3229         st      %f15,[%o1+4]
```



```
3230         st      %f23,[%o2+4]
3231         st      %f31,[%o3+4]
3232         ld      [%fp+biguns],%i5
3233         tst     %i5                     ! check for huge arguments remaining
3234         be,pt   %icc,.exit
3235 ! delay slot
3236         nop
3237 #ifdef __sparcv9
3238         ldx     [%fp+xsave],%o1
3239         ldx     [%fp+ysave],%o3
3240 #else
3241         ld      [%fp+xsave],%o1
3242         ld      [%fp+ysave],%o3
3243 #endif
3244         ld      [%fp+nsave],%o0
3245         ld      [%fp+sxsave],%o2
3246         ld      [%fp+sysave],%o4
3247         sra     %o2,0,%o2               ! sign-extend for V9
3248         sra     %o4,0,%o4
3249         call    __vlibm_vcos_big_ultra3
3250         sra     %o5,0,%o5               ! delay slot

3252 .exit:
3253         ret
3254         restore


3257         .align  16
3258 .last1:
3259         faddd   %f2,c3two44,%f4
3260         st      %f15,[%o1+4]
3261 .last1_from_range1:
3262         mov     0,%l1
3263         fzeros  %f8
3264         fzero   %f10
3265         add     %fp,junk,%o1
3266 .last2:
3267         faddd   %f10,c3two44,%f12
3268         st      %f23,[%o2+4]
3269 .last2_from_range2:
3270         mov     0,%l2
3271         fzeros  %f16
3272         fzero   %f18
3273         add     %fp,junk,%o2
3274 .last3:
3275         faddd   %f18,c3two44,%f20
3276         st      %f31,[%o3+4]
3277         st      %f5,[%fp+nk0]
3278         st      %f13,[%fp+nk1]
3279 .last3_from_range3:
3280         mov     0,%l3
3281         fzeros  %f24
3282         fzero   %f26
3283         ba,pt   %icc,.cont
3284 ! delay slot
3285         add     %fp,junk,%o3


3288         .align  16
3289 .range0:
3290         cmp     %l0,%o4
3291         bl,pt   %icc,1f                 ! hx < 0x3e400000
3292 ! delay slot, harmless if branch taken
3293         sethi   %hi(0x7ff00000),%o7
3294         cmp     %l0,%o7
3295         bl,a,pt %icc,2f                 ! branch if finite
```

```
3296 ! delay slot, squashed if branch not taken
3297         st      %o4,[%fp+biguns]        ! set biguns
3298         fzero   %f0
3299         fmuld   %f2,%f0,%f2
3300         st      %f2,[%o0]
3301         ba,pt   %icc,2f
3302 ! delay slot
3303         st      %f3,[%o0+4]
3304 1:
3305         fdtoi   %f2,%f4                 ! raise inexact if not zero
3306         sethi   %hi(0x3ff00000),%o7
3307         st      %o7,[%o0]
3308         st      %g0,[%o0+4]
3309 2:
3310         addcc   %i0,-1,%i0
3311         ble,pn  %icc,.end
3312 ! delay slot, harmless if branch taken
3313         add     %i3,%i4,%i3             ! y += stridey
3314         andn    %l1,%i5,%l0             ! hx &= ~0x80000000
3315         fmovs   %f8,%f0
3316         fmovs   %f11,%f3
3317         ba,pt   %icc,.loop0
3318 ! delay slot
3319         add     %i1,%i2,%i1             ! x += stridex


3322         .align  16
3323 .range1:
3324         cmp     %l1,%o4
3325         bl,pt   %icc,1f                 ! hx < 0x3e400000
3326 ! delay slot, harmless if branch taken
3327         sethi   %hi(0x7ff00000),%o7
3328         cmp     %l1,%o7
3329         bl,a,pt %icc,2f                 ! branch if finite
3330 ! delay slot, squashed if branch not taken
3331         st      %o4,[%fp+biguns]        ! set biguns
3332         fzero   %f8
3333         fmuld   %f10,%f8,%f10
3334         st      %f10,[%o1]
3335         ba,pt   %icc,2f
3336 ! delay slot
3337         st      %f11,[%o1+4]
3338 1:
3339         fdtoi   %f10,%f12               ! raise inexact if not zero
3340         sethi   %hi(0x3ff00000),%o7
3341         st      %o7,[%o1]
3342         st      %g0,[%o1+4]
3343 2:
3344         addcc   %i0,-1,%i0
3345         ble,pn  %icc,.last1_from_range1
3346 ! delay slot, harmless if branch taken
3347         add     %i3,%i4,%i3             ! y += stridey
3348         andn    %l2,%i5,%l1             ! hx &= ~0x80000000
3349         fmovs   %f16,%f8
3350         fmovs   %f19,%f11
3351         ba,pt   %icc,.loop1
3352 ! delay slot
3353         add     %i1,%i2,%i1             ! x += stridex


3356         .align  16
3357 .range2:
3358         cmp     %l2,%o4
3359         bl,pt   %icc,1f                 ! hx < 0x3e400000
3360 ! delay slot, harmless if branch taken
3361         sethi   %hi(0x7ff00000),%o7
```



```
3362         cmp     %l2,%o7
3363         bl,a,pt %icc,2f                 ! branch if finite
3364 ! delay slot, squashed if branch not taken
3365         st      %o4,[%fp+biguns]        ! set biguns
3366         fzero   %f16
3367         fmuld   %f18,%f16,%f18
3368         st      %f18,[%o2]
3369         ba,pt   %icc,2f
3370 ! delay slot
3371         st      %f19,[%o2+4]
3372 1:
3373         fdtoi   %f18,%f20               ! raise inexact if not zero
3374         sethi   %hi(0x3ff00000),%o7
3375         st      %o7,[%o2]
3376         st      %g0,[%o2+4]
3377 2:
3378         addcc   %i0,-1,%i0
3379         ble,pn  %icc,.last2_from_range2
3380 ! delay slot, harmless if branch taken
3381         add     %i3,%i4,%i3             ! y += stridey
3382         andn    %l3,%i5,%l2             ! hx &= ~0x80000000
3383         fmovs   %f24,%f16
3384         fmovs   %f27,%f19
3385         ba,pt   %icc,.loop2
3386 ! delay slot
3387         add     %i1,%i2,%i1             ! x += stridex


3390         .align  16
3391 .range3:
3392         cmp     %l3,%o4
3393         bl,pt   %icc,1f                 ! hx < 0x3e400000
3394 ! delay slot, harmless if branch taken
3395         sethi   %hi(0x7ff00000),%o7
3396         cmp     %l3,%o7
3397         bl,a,pt %icc,2f                 ! branch if finite
3398 ! delay slot, squashed if branch not taken
3399         st      %o4,[%fp+biguns]        ! set biguns
3400         fzero   %f24
3401         fmuld   %f26,%f24,%f26
3402         st      %f26,[%o3]
3403         ba,pt   %icc,2f
3404 ! delay slot
3405         st      %f27,[%o3+4]
3406 1:
3407         fdtoi   %f26,%f28               ! raise inexact if not zero
3408         sethi   %hi(0x3ff00000),%o7
3409         st      %o7,[%o3]
3410         st      %g0,[%o3+4]
3411 2:
3412         addcc   %i0,-1,%i0
3413         ble,pn  %icc,.last3_from_range3
3414 ! delay slot, harmless if branch taken
3415         add     %i3,%i4,%i3             ! y += stridey
3416         ld      [%i1],%l3
3417         ld      [%i1],%f24
3418         ld      [%i1+4],%f27
3419         andn    %l3,%i5,%l3             ! hx &= ~0x80000000
3420         ba,pt   %icc,.loop3
3421 ! delay slot
3422         add     %i1,%i2,%i1             ! x += stridex

3424         SET_SIZE(__vcos_ultra3)
```

```
**********************************************************
   30689 Sat May 10 12:09:58 2014
new/usr/src/lib/libmvec/common/vis/__vcosf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vcosf.S"

#include "libm.h"

        RO_DATA
        .align  64
constants:
        .word   0xbfc55554,0x60000000
        .word   0x3f811077,0xe0000000
        .word   0xbf29956b,0x60000000
        .word   0x3ff00000,0x00000000
        .word   0xbfe00000,0x00000000
        .word   0x3fa55554,0xa0000000
        .word   0xbf56c0c1,0xe0000000
        .word   0x3ef99e24,0xe0000000
        .word   0x3fe45f30,0x6dc9c883
        .word   0x43380000,0x00000000
        .word   0x3ff921fb,0x54400000
        .word   0x3dd0b461,0x1a626331
        .word   0x3f490fdb,0
        .word   0x49c90fdb,0
        .word   0x7f800000,0
        .word   0x80000000,0

#define S0              0x0
#define S1              0x08
#define S2              0x10
#define one             0x18
#define mhalf           0x20
#define C0              0x28
#define C1              0x30
#define C2              0x38
#define invpio2         0x40
```



```
#define round           0x48
#define pio2_1          0x50
#define pio2_t          0x58
#define thresh1         0x60
#define thresh2         0x68
#define inf             0x70
#define signbit         0x78

! local storage indices

#define xsave           STACK_BIAS-0x8
#define ysave           STACK_BIAS-0x10
#define nsave           STACK_BIAS-0x14
#define sxsave          STACK_BIAS-0x18
#define sysave          STACK_BIAS-0x1c
#define junk            STACK_BIAS-0x20
#define n3              STACK_BIAS-0x24
#define n2              STACK_BIAS-0x28
#define n1              STACK_BIAS-0x2c
#define n0              STACK_BIAS-0x30
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x30

! register use

! i0  n
! i1  x
! i2  stridex
! i3  y
! i4  stridey
! i5  biguns

! l0  n0
! l1  n1
! l2  n2
! l3  n3
! l4
! l5
! l6
! l7

! the following are 64-bit registers in both V8+ and V9

! g1
! g5

! o0  py0
! o1  py1
! o2  py2
! o3  py3
! o4
! o5
! o7

! f0  x0
! f2  x1
! f4  x2
! f6  x3
! f8  thresh1 (pi/4)
! f10 y0
! f12 y1
! f14 y2
! f16 y3
! f18 thresh2 (2^19 pi)
! f20
! f22
```

```
! f24
! f26
! f28 signbit
! f30
! f32
! f34
! f36
! f38 inf
! f40 S0
! f42 S1
! f44 S2
! f46 one
! f48 mhalf
! f50 C0
! f52 C1
! f54 C2
! f56 invpio2
! f58 round
! f60 pio2_1
! f62 pio2_t

        ENTRY(__vcosf)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,constants,l0)
        mov     %l0,%g1
        wr      %g0,0x82,%asi           ! set %asi for non-faulting loads
#ifdef __sparcv9
        stx     %i1,[%fp+xsave]         ! save arguments
        stx     %i3,[%fp+ysave]
#else
        st      %i1,[%fp+xsave]         ! save arguments
        st      %i3,[%fp+ysave]
#endif
        st      %i0,[%fp+nsave]
        st      %i2,[%fp+sxsave]
        st      %i4,[%fp+sysave]
        mov     0,%i5                   ! biguns = 0
        ldd     [%g1+S0],%f40           ! load constants
        ldd     [%g1+S1],%f42
        ldd     [%g1+S2],%f44
        ldd     [%g1+one],%f46
        ldd     [%g1+mhalf],%f48
        ldd     [%g1+C0],%f50
        ldd     [%g1+C1],%f52
        ldd     [%g1+C2],%f54
        ldd     [%g1+invpio2],%f56
        ldd     [%g1+round],%f58
        ldd     [%g1+pio2_1],%f60
        ldd     [%g1+pio2_t],%f62
        ldd     [%g1+thresh1],%f8
        ldd     [%g1+thresh2],%f18
        ldd     [%g1+inf],%f38
        ldd     [%g1+signbit],%f28
        sll     %i2,2,%i2               ! scale strides
        sll     %i4,2,%i4
        fzero   %f10                    ! loop prologue
        add     %fp,junk,%o0
        fzero   %f12
        add     %fp,junk,%o1
        fzero   %f14
        add     %fp,junk,%o2
        fzero   %f16
        ba      .start
        add     %fp,junk,%o3
```



```
        .align  16
! 16-byte aligned
.start:
        ld      [%i1],%f0               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        addcc   %i0,-1,%i0
        fdtos   %f10,%f10

        st      %f10,[%o0]
        mov     %i3,%o0                 ! py0 = y
        ble,pn  %icc,.last1
! delay slot
        add     %i3,%i4,%i3             ! y += stridey

        ld      [%i1],%f2               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        addcc   %i0,-1,%i0
        fdtos   %f12,%f12

        st      %f12,[%o1]
        mov     %i3,%o1                 ! py1 = y
        ble,pn  %icc,.last2
! delay slot
        add     %i3,%i4,%i3             ! y += stridey

        ld      [%i1],%f4               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        addcc   %i0,-1,%i0
        fdtos   %f14,%f14

        st      %f14,[%o2]
        mov     %i3,%o2                 ! py2 = y
        ble,pn  %icc,.last3
! delay slot
        add     %i3,%i4,%i3             ! y += stridey

        ld      [%i1],%f6               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        nop
        fdtos   %f16,%f16

        st      %f16,[%o3]
        mov     %i3,%o3                 ! py3 = y
        add     %i3,%i4,%i3             ! y += stridey
.cont:
        fabsd   %f0,%f30

        fabsd   %f2,%f32

        fabsd   %f4,%f34

        fabsd   %f6,%f36
        fcmple32 %f30,%f18,%l0

        fcmple32 %f32,%f18,%l1

        fcmple32 %f34,%f18,%l2

        fcmple32 %f36,%f18,%l3
        nop

! 16-byte aligned
        andcc   %l0,2,%g0
        bz,pn   %icc,.range0            ! branch if > 2^19 pi
! delay slot
        fcmple32 %f30,%f8,%l0
```

```
.check1:
        andcc   %l1,2,%g0
        bz,pn   %icc,.range1            ! branch if > 2^19 pi
! delay slot
        fcmple32 %f32,%f8,%l1

.check2:
        andcc   %l2,2,%g0
        bz,pn   %icc,.range2            ! branch if > 2^19 pi
! delay slot
        fcmple32 %f34,%f8,%l2

.check3:
        andcc   %l3,2,%g0
        bz,pn   %icc,.range3            ! branch if > 2^19 pi
! delay slot
        fcmple32 %f36,%f8,%l3

.checkprimary:
        fsmuld  %f0,%f0,%f30
        fstod   %f0,%f0

        fsmuld  %f2,%f2,%f32
        fstod   %f2,%f2
        and     %l0,%l1,%o4

        fsmuld  %f4,%f4,%f34
        fstod   %f4,%f4

        fsmuld  %f6,%f6,%f36
        fstod   %f6,%f6
        and     %l2,%l3,%o5

        fmuld   %f30,%f54,%f10
        and     %o4,%o5,%o5

        fmuld   %f32,%f54,%f12
        andcc   %o5,2,%g0
        bz,pn   %icc,.medium            ! branch if any argument is > pi/4
! delay slot
        nop

        fmuld   %f34,%f54,%f14

        fmuld   %f36,%f54,%f16

        fmuld   %f30,%f48,%f20
        faddd   %f10,%f52,%f10

        fmuld   %f32,%f48,%f22
        faddd   %f12,%f52,%f12

        fmuld   %f34,%f48,%f24
        faddd   %f14,%f52,%f14

        fmuld   %f36,%f48,%f26
        faddd   %f16,%f52,%f16

        fmuld   %f30,%f10,%f10
        faddd   %f20,%f46,%f20

        fmuld   %f32,%f12,%f12
        faddd   %f22,%f46,%f22

        fmuld   %f34,%f14,%f14
```



```
        faddd   %f24,%f46,%f24

        fmuld   %f36,%f16,%f16
        faddd   %f26,%f46,%f26

        fmuld   %f30,%f30,%f30
        faddd   %f10,%f50,%f10

        fmuld   %f32,%f32,%f32
        faddd   %f12,%f50,%f12

        fmuld   %f34,%f34,%f34
        faddd   %f14,%f50,%f14

        fmuld   %f36,%f36,%f36
        faddd   %f16,%f50,%f16

        fmuld   %f30,%f10,%f10

        fmuld   %f32,%f12,%f12

        fmuld   %f34,%f14,%f14

        fmuld   %f36,%f16,%f16

        faddd   %f10,%f20,%f10

        faddd   %f12,%f22,%f12

        faddd   %f14,%f24,%f14

        addcc   %i0,-1,%i0
        bg,pt   %icc,.start
! delay slot
        faddd   %f16,%f26,%f16

        ba,pt   %icc,.end
! delay slot
        nop


        .align  16
.medium:
        fmuld   %f0,%f56,%f10

        fmuld   %f2,%f56,%f12

        fmuld   %f4,%f56,%f14

        fmuld   %f6,%f56,%f16

        faddd   %f10,%f58,%f10
        st      %f11,[%fp+n0]

        faddd   %f12,%f58,%f12
        st      %f13,[%fp+n1]

        faddd   %f14,%f58,%f14
        st      %f15,[%fp+n2]

        faddd   %f16,%f58,%f16
        st      %f17,[%fp+n3]

        fsubd   %f10,%f58,%f10

        fsubd   %f12,%f58,%f12
```

```
393         fsubd   %f14,%f58,%f14

395         fsubd   %f16,%f58,%f16

397         fmuld   %f10,%f60,%f20
398         ld      [%fp+n0],%l0

400         fmuld   %f12,%f60,%f22
401         ld      [%fp+n1],%l1

403         fmuld   %f14,%f60,%f24
404         ld      [%fp+n2],%l2

406         fmuld   %f16,%f60,%f26
407         ld      [%fp+n3],%l3

409         fsubd   %f0,%f20,%f0
410         fmuld   %f10,%f62,%f30
411         add     %l0,1,%l0

413         fsubd   %f2,%f22,%f2
414         fmuld   %f12,%f62,%f32
415         add     %l1,1,%l1

417         fsubd   %f4,%f24,%f4
418         fmuld   %f14,%f62,%f34
419         add     %l2,1,%l2

421         fsubd   %f6,%f26,%f6
422         fmuld   %f16,%f62,%f36
423         add     %l3,1,%l3

425         fsubd   %f0,%f30,%f0

427         fsubd   %f2,%f32,%f2

429         fsubd   %f4,%f34,%f4

431         fsubd   %f6,%f36,%f6
432         andcc   %l0,1,%g0

434         fmuld   %f0,%f0,%f30
435         bz,pn   %icc,.case8
436 ! delay slot
437         andcc   %l1,1,%g0

439         fmuld   %f2,%f2,%f32
440         bz,pn   %icc,.case4
441 ! delay slot
442         andcc   %l2,1,%g0

444         fmuld   %f4,%f4,%f34
445         bz,pn   %icc,.case2
446 ! delay slot
447         andcc   %l3,1,%g0

449         fmuld   %f6,%f6,%f36
450         bz,pn   %icc,.case1
451 ! delay slot
452         nop

454 !.case0:
455         fmuld   %f30,%f54,%f10          ! cos(x0)
456         fzero   %f0
```



```
458         fmuld   %f32,%f54,%f12          ! cos(x1)
459         fzero   %f2

461         fmuld   %f34,%f54,%f14          ! cos(x2)
462         fzero   %f4

464         fmuld   %f36,%f54,%f16          ! cos(x3)
465         fzero   %f6

467         fmuld   %f30,%f48,%f20
468         faddd   %f10,%f52,%f10

470         fmuld   %f32,%f48,%f22
471         faddd   %f12,%f52,%f12

473         fmuld   %f34,%f48,%f24
474         faddd   %f14,%f52,%f14

476         fmuld   %f36,%f48,%f26
477         faddd   %f16,%f52,%f16

479         fmuld   %f30,%f10,%f10
480         faddd   %f20,%f46,%f20

482         fmuld   %f32,%f12,%f12
483         faddd   %f22,%f46,%f22

485         fmuld   %f34,%f14,%f14
486         faddd   %f24,%f46,%f24

488         fmuld   %f36,%f16,%f16
489         faddd   %f26,%f46,%f26

491         fmuld   %f30,%f30,%f30
492         faddd   %f10,%f50,%f10
493         and     %l0,2,%g1

495         fmuld   %f32,%f32,%f32
496         faddd   %f12,%f50,%f12
497         and     %l1,2,%g5

499         fmuld   %f34,%f34,%f34
500         faddd   %f14,%f50,%f14
501         and     %l2,2,%o4

503         fmuld   %f36,%f36,%f36
504         faddd   %f16,%f50,%f16
505         and     %l3,2,%o5

507         fmuld   %f30,%f10,%f10
508         fmovrdnz %g1,%f28,%f0

510         fmuld   %f32,%f12,%f12
511         fmovrdnz %g5,%f28,%f2

513         fmuld   %f34,%f14,%f14
514         fmovrdnz %o4,%f28,%f4

516         fmuld   %f36,%f16,%f16
517         fmovrdnz %o5,%f28,%f6

519         faddd   %f10,%f20,%f10

521         faddd   %f12,%f22,%f12

523         faddd   %f14,%f24,%f14
```

```
525         faddd   %f16,%f26,%f16

527         fxor    %f10,%f0,%f10

529         fxor    %f12,%f2,%f12

531         fxor    %f14,%f4,%f14

533         addcc   %i0,-1,%i0
534         bg,pt   %icc,.start
535 ! delay slot
536         fxor    %f16,%f6,%f16

538         ba,pt   %icc,.end
539 ! delay slot
540         nop

542         .align  16
543 .case1:
544         fmuld   %f30,%f54,%f10          ! cos(x0)
545         fzero   %f0

547         fmuld   %f32,%f54,%f12          ! cos(x1)
548         fzero   %f2

550         fmuld   %f34,%f54,%f14          ! cos(x2)
551         fzero   %f4

553         fmuld   %f36,%f44,%f16          ! sin(x3)

555         fmuld   %f30,%f48,%f20
556         faddd   %f10,%f52,%f10

558         fmuld   %f32,%f48,%f22
559         faddd   %f12,%f52,%f12

561         fmuld   %f34,%f48,%f24
562         faddd   %f14,%f52,%f14

564         fmuld   %f36,%f40,%f26
565         faddd   %f16,%f42,%f16

567         fmuld   %f30,%f10,%f10
568         faddd   %f20,%f46,%f20

570         fmuld   %f32,%f12,%f12
571         faddd   %f22,%f46,%f22

573         fmuld   %f34,%f14,%f14
574         faddd   %f24,%f46,%f24

576         fmuld   %f36,%f36,%f36
577         faddd   %f26,%f46,%f26

579         fmuld   %f30,%f30,%f30
580         faddd   %f10,%f50,%f10
581         and     %l0,2,%g1

583         fmuld   %f32,%f32,%f32
584         faddd   %f12,%f50,%f12
585         and     %l1,2,%g5

587         fmuld   %f34,%f34,%f34
588         faddd   %f14,%f50,%f14
589         and     %l2,2,%o4
```



```
591         fmuld   %f36,%f16,%f16
592         fzero   %f36

594         fmuld   %f30,%f10,%f10
595         fmovrdnz %g1,%f28,%f0

597         fmuld   %f32,%f12,%f12
598         fmovrdnz %g5,%f28,%f2

600         fmuld   %f34,%f14,%f14
601         fmovrdnz %o4,%f28,%f4

603         faddd   %f16,%f26,%f16
604         and     %l3,2,%o5

606         faddd   %f10,%f20,%f10

608         faddd   %f12,%f22,%f12

610         faddd   %f14,%f24,%f14

612         fmuld   %f6,%f16,%f16
613         fmovrdnz %o5,%f28,%f36

615         fxor    %f10,%f0,%f10

617         fxor    %f12,%f2,%f12

619         fxor    %f14,%f4,%f14

621         addcc   %i0,-1,%i0
622         bg,pt   %icc,.start
623 ! delay slot
624         fxor    %f16,%f36,%f16

626         ba,pt   %icc,.end
627 ! delay slot
628         nop

630         .align  16
631 .case2:
632         fmuld   %f6,%f6,%f36
633         bz,pn   %icc,.case3
634 ! delay slot
635         nop

637         fmuld   %f30,%f54,%f10          ! cos(x0)
638         fzero   %f0

640         fmuld   %f32,%f54,%f12          ! cos(x1)
641         fzero   %f2

643         fmuld   %f34,%f44,%f14          ! sin(x2)

645         fmuld   %f36,%f54,%f16          ! cos(x3)
646         fzero   %f6

648         fmuld   %f30,%f48,%f20
649         faddd   %f10,%f52,%f10

651         fmuld   %f32,%f48,%f22
652         faddd   %f12,%f52,%f12

654         fmuld   %f34,%f40,%f24
655         faddd   %f14,%f42,%f14
```

```
657         fmuld   %f36,%f48,%f26
658         faddd   %f16,%f52,%f16

660         fmuld   %f30,%f10,%f10
661         faddd   %f20,%f46,%f20

663         fmuld   %f32,%f12,%f12
664         faddd   %f22,%f46,%f22

666         fmuld   %f34,%f34,%f34
667         faddd   %f24,%f46,%f24

669         fmuld   %f36,%f16,%f16
670         faddd   %f26,%f46,%f26

672         fmuld   %f30,%f30,%f30
673         faddd   %f10,%f50,%f10
674         and     %l0,2,%g1

676         fmuld   %f32,%f32,%f32
677         faddd   %f12,%f50,%f12
678         and     %l1,2,%g5

680         fmuld   %f34,%f14,%f14
681         fzero   %f34

683         fmuld   %f36,%f36,%f36
684         faddd   %f16,%f50,%f16
685         and     %l3,2,%o5

687         fmuld   %f30,%f10,%f10
688         fmovrdnz %g1,%f28,%f0

690         fmuld   %f32,%f12,%f12
691         fmovrdnz %g5,%f28,%f2

693         faddd   %f14,%f24,%f14
694         and     %l2,2,%o4

696         fmuld   %f36,%f16,%f16
697         fmovrdnz %o5,%f28,%f6

699         faddd   %f10,%f20,%f10

701         faddd   %f12,%f22,%f12

703         fmuld   %f4,%f14,%f14
704         fmovrdnz %o4,%f28,%f34

706         faddd   %f16,%f26,%f16

708         fxor    %f10,%f0,%f10

710         fxor    %f12,%f2,%f12

712         fxor    %f14,%f34,%f14

714         addcc   %i0,-1,%i0
715         bg,pt   %icc,.start
716 ! delay slot
717         fxor    %f16,%f6,%f16

719         ba,pt   %icc,.end
720 ! delay slot
721         nop
```



```
723         .align  16
724 .case3:
725         fmuld   %f30,%f54,%f10          ! cos(x0)
726         fzero   %f0

728         fmuld   %f32,%f54,%f12          ! cos(x1)
729         fzero   %f2

731         fmuld   %f34,%f44,%f14          ! sin(x2)

733         fmuld   %f36,%f44,%f16          ! sin(x3)

735         fmuld   %f30,%f48,%f20
736         faddd   %f10,%f52,%f10

738         fmuld   %f32,%f48,%f22
739         faddd   %f12,%f52,%f12

741         fmuld   %f34,%f40,%f24
742         faddd   %f14,%f42,%f14

744         fmuld   %f36,%f40,%f26
745         faddd   %f16,%f42,%f16

747         fmuld   %f30,%f10,%f10
748         faddd   %f20,%f46,%f20

750         fmuld   %f32,%f12,%f12
751         faddd   %f22,%f46,%f22

753         fmuld   %f34,%f34,%f34
754         faddd   %f24,%f46,%f24

756         fmuld   %f36,%f36,%f36
757         faddd   %f26,%f46,%f26

759         fmuld   %f30,%f30,%f30
760         faddd   %f10,%f50,%f10
761         and     %l0,2,%g1

763         fmuld   %f32,%f32,%f32
764         faddd   %f12,%f50,%f12
765         and     %l1,2,%g5

767         fmuld   %f34,%f14,%f14
768         fzero   %f34

770         fmuld   %f36,%f16,%f16
771         fzero   %f36

773         fmuld   %f30,%f10,%f10
774         fmovrdnz %g1,%f28,%f0

776         fmuld   %f32,%f12,%f12
777         fmovrdnz %g5,%f28,%f2

779         faddd   %f14,%f24,%f14
780         and     %l2,2,%o4

782         faddd   %f16,%f26,%f16
783         and     %l3,2,%o5

785         faddd   %f10,%f20,%f10

787         faddd   %f12,%f22,%f12
```

```
789         fmuld   %f4,%f14,%f14
790         fmovrdnz %o4,%f28,%f34

792         fmuld   %f6,%f16,%f16
793         fmovrdnz %o5,%f28,%f36

795         fxor    %f10,%f0,%f10

797         fxor    %f12,%f2,%f12

799         fxor    %f14,%f34,%f14

801         addcc   %i0,-1,%i0
802         bg,pt   %icc,.start
803 ! delay slot
804         fxor    %f16,%f36,%f16

806         ba,pt   %icc,.end
807 ! delay slot
808         nop

810         .align  16
811 .case4:
812         fmuld   %f4,%f4,%f34
813         bz,pn   %icc,.case6
814 ! delay slot
815         andcc   %l3,1,%g0

817         fmuld   %f6,%f6,%f36
818         bz,pn   %icc,.case5
819 ! delay slot
820         nop

822         fmuld   %f30,%f54,%f10          ! cos(x0)
823         fzero   %f0

825         fmuld   %f32,%f44,%f12          ! sin(x1)

827         fmuld   %f34,%f54,%f14          ! cos(x2)
828         fzero   %f4

830         fmuld   %f36,%f54,%f16          ! cos(x3)
831         fzero   %f6

833         fmuld   %f30,%f48,%f20
834         faddd   %f10,%f52,%f10

836         fmuld   %f32,%f40,%f22
837         faddd   %f12,%f42,%f12

839         fmuld   %f34,%f48,%f24
840         faddd   %f14,%f52,%f14

842         fmuld   %f36,%f48,%f26
843         faddd   %f16,%f52,%f16

845         fmuld   %f30,%f10,%f10
846         faddd   %f20,%f46,%f20

848         fmuld   %f32,%f32,%f32
849         faddd   %f22,%f46,%f22

851         fmuld   %f34,%f14,%f14
852         faddd   %f24,%f46,%f24
```



```
854         fmuld   %f36,%f16,%f16
855         faddd   %f26,%f46,%f26

857         fmuld   %f30,%f30,%f30
858         faddd   %f10,%f50,%f10
859         and     %l0,2,%g1

861         fmuld   %f32,%f12,%f12
862         fzero   %f32

864         fmuld   %f34,%f34,%f34
865         faddd   %f14,%f50,%f14
866         and     %l2,2,%o4

868         fmuld   %f36,%f36,%f36
869         faddd   %f16,%f50,%f16
870         and     %l3,2,%o5

872         fmuld   %f30,%f10,%f10
873         fmovrdnz %g1,%f28,%f0

875         faddd   %f12,%f22,%f12
876         and     %l1,2,%g5

878         fmuld   %f34,%f14,%f14
879         fmovrdnz %o4,%f28,%f4

881         fmuld   %f36,%f16,%f16
882         fmovrdnz %o5,%f28,%f6

884         faddd   %f10,%f20,%f10

886         fmuld   %f2,%f12,%f12
887         fmovrdnz %g5,%f28,%f32

889         faddd   %f14,%f24,%f14

891         faddd   %f16,%f26,%f16

893         fxor    %f10,%f0,%f10

895         fxor    %f12,%f32,%f12

897         fxor    %f14,%f4,%f14

899         addcc   %i0,-1,%i0
900         bg,pt   %icc,.start
901 ! delay slot
902         fxor    %f16,%f6,%f16

904         ba,pt   %icc,.end
905 ! delay slot
906         nop

908         .align  16
909 .case5:
910         fmuld   %f30,%f54,%f10          ! cos(x0)
911         fzero   %f0

913         fmuld   %f32,%f44,%f12          ! sin(x1)

915         fmuld   %f34,%f54,%f14          ! cos(x2)
916         fzero   %f4

918         fmuld   %f36,%f44,%f16          ! sin(x3)
```

```
 920         fmuld   %f30,%f48,%f20
 921         faddd   %f10,%f52,%f10

 923         fmuld   %f32,%f40,%f22
 924         faddd   %f12,%f42,%f12

 926         fmuld   %f34,%f48,%f24
 927         faddd   %f14,%f52,%f14

 929         fmuld   %f36,%f40,%f26
 930         faddd   %f16,%f42,%f16

 932         fmuld   %f30,%f10,%f10
 933         faddd   %f20,%f46,%f20

 935         fmuld   %f32,%f32,%f32
 936         faddd   %f22,%f46,%f22

 938         fmuld   %f34,%f14,%f14
 939         faddd   %f24,%f46,%f24

 941         fmuld   %f36,%f36,%f36
 942         faddd   %f26,%f46,%f26

 944         fmuld   %f30,%f30,%f30
 945         faddd   %f10,%f50,%f10
 946         and     %l0,2,%g1

 948         fmuld   %f32,%f12,%f12
 949         fzero   %f32

 951         fmuld   %f34,%f34,%f34
 952         faddd   %f14,%f50,%f14
 953         and     %l2,2,%o4

 955         fmuld   %f36,%f16,%f16
 956         fzero   %f36

 958         fmuld   %f30,%f10,%f10
 959         fmovrdnz %g1,%f28,%f0

 961         faddd   %f12,%f22,%f12
 962         and     %l1,2,%g5

 964         fmuld   %f34,%f14,%f14
 965         fmovrdnz %o4,%f28,%f4

 967         faddd   %f16,%f26,%f16
 968         and     %l3,2,%o5

 970         faddd   %f10,%f20,%f10

 972         fmuld   %f2,%f12,%f12
 973         fmovrdnz %g5,%f28,%f32

 975         faddd   %f14,%f24,%f14

 977         fmuld   %f6,%f16,%f16
 978         fmovrdnz %o5,%f28,%f36

 980         fxor    %f10,%f0,%f10

 982         fxor    %f12,%f32,%f12

 984         fxor    %f14,%f4,%f14
```



```
 986         addcc   %i0,-1,%i0
 987         bg,pt   %icc,.start
 988 ! delay slot
 989         fxor    %f16,%f36,%f16

 991         ba,pt   %icc,.end
 992 ! delay slot
 993         nop

 995         .align  16
 996 .case6:
 997         fmuld   %f6,%f6,%f36
 998         bz,pn   %icc,.case7
 999 ! delay slot
1000         nop

1002         fmuld   %f30,%f54,%f10          ! cos(x0)
1003         fzero   %f0

1005         fmuld   %f32,%f44,%f12          ! sin(x1)

1007         fmuld   %f34,%f44,%f14          ! sin(x2)

1009         fmuld   %f36,%f54,%f16          ! cos(x3)
1010         fzero   %f6

1012         fmuld   %f30,%f48,%f20
1013         faddd   %f10,%f52,%f10

1015         fmuld   %f32,%f40,%f22
1016         faddd   %f12,%f42,%f12

1018         fmuld   %f34,%f40,%f24
1019         faddd   %f14,%f42,%f14

1021         fmuld   %f36,%f48,%f26
1022         faddd   %f16,%f52,%f16

1024         fmuld   %f30,%f10,%f10
1025         faddd   %f20,%f46,%f20

1027         fmuld   %f32,%f32,%f32
1028         faddd   %f22,%f46,%f22

1030         fmuld   %f34,%f34,%f34
1031         faddd   %f24,%f46,%f24

1033         fmuld   %f36,%f16,%f16
1034         faddd   %f26,%f46,%f26

1036         fmuld   %f30,%f30,%f30
1037         faddd   %f10,%f50,%f10
1038         and     %l0,2,%g1

1040         fmuld   %f32,%f12,%f12
1041         fzero   %f32

1043         fmuld   %f34,%f14,%f14
1044         fzero   %f34

1046         fmuld   %f36,%f36,%f36
1047         faddd   %f16,%f50,%f16
1048         and     %l3,2,%o5

1050         fmuld   %f30,%f10,%f10
1051         fmovrdnz %g1,%f28,%f0
```

```
1053         faddd   %f12,%f22,%f12
1054         and     %l1,2,%g5

1056         faddd   %f14,%f24,%f14
1057         and     %l2,2,%o4

1059         fmuld   %f36,%f16,%f16
1060         fmovrdnz %o5,%f28,%f6

1062         faddd   %f10,%f20,%f10

1064         fmuld   %f2,%f12,%f12
1065         fmovrdnz %g5,%f28,%f32

1067         fmuld   %f4,%f14,%f14
1068         fmovrdnz %o4,%f28,%f34

1070         faddd   %f16,%f26,%f16

1072         fxor    %f10,%f0,%f10

1074         fxor    %f12,%f32,%f12

1076         fxor    %f14,%f34,%f14

1078         addcc   %i0,-1,%i0
1079         bg,pt   %icc,.start
1080 ! delay slot
1081         fxor    %f16,%f6,%f16

1083         ba,pt   %icc,.end
1084 ! delay slot
1085         nop

1087         .align  16
1088 .case7:
1089         fmuld   %f30,%f54,%f10          ! cos(x0)
1090         fzero   %f0

1092         fmuld   %f32,%f44,%f12          ! sin(x1)

1094         fmuld   %f34,%f44,%f14          ! sin(x2)

1096         fmuld   %f36,%f44,%f16          ! sin(x3)

1098         fmuld   %f30,%f48,%f20
1099         faddd   %f10,%f52,%f10

1101         fmuld   %f32,%f40,%f22
1102         faddd   %f12,%f42,%f12

1104         fmuld   %f34,%f40,%f24
1105         faddd   %f14,%f42,%f14

1107         fmuld   %f36,%f40,%f26
1108         faddd   %f16,%f42,%f16

1110         fmuld   %f30,%f10,%f10
1111         faddd   %f20,%f46,%f20

1113         fmuld   %f32,%f32,%f32
1114         faddd   %f22,%f46,%f22

1116         fmuld   %f34,%f34,%f34
1117         faddd   %f24,%f46,%f24
```



```
1119         fmuld   %f36,%f36,%f36
1120         faddd   %f26,%f46,%f26

1122         fmuld   %f30,%f30,%f30
1123         faddd   %f10,%f50,%f10
1124         and     %l0,2,%g1

1126         fmuld   %f32,%f12,%f12
1127         fzero   %f32

1129         fmuld   %f34,%f14,%f14
1130         fzero   %f34

1132         fmuld   %f36,%f16,%f16
1133         fzero   %f36

1135         fmuld   %f30,%f10,%f10
1136         fmovrdnz %g1,%f28,%f0

1138         faddd   %f12,%f22,%f12
1139         and     %l1,2,%g5

1141         faddd   %f14,%f24,%f14
1142         and     %l2,2,%o4

1144         faddd   %f16,%f26,%f16
1145         and     %l3,2,%o5

1147         faddd   %f10,%f20,%f10

1149         fmuld   %f2,%f12,%f12
1150         fmovrdnz %g5,%f28,%f32

1152         fmuld   %f4,%f14,%f14
1153         fmovrdnz %o4,%f28,%f34

1155         fmuld   %f6,%f16,%f16
1156         fmovrdnz %o5,%f28,%f36

1158         fxor    %f10,%f0,%f10

1160         fxor    %f12,%f32,%f12

1162         fxor    %f14,%f34,%f14

1164         addcc   %i0,-1,%i0
1165         bg,pt   %icc,.start
1166 ! delay slot
1167         fxor    %f16,%f36,%f16

1169         ba,pt   %icc,.end
1170 ! delay slot
1171         nop


1174         .align  16
1175 .case8:
1176         fmuld   %f2,%f2,%f32
1177         bz,pn   %icc,.case12
1178 ! delay slot
1179         andcc   %l2,1,%g0

1181         fmuld   %f4,%f4,%f34
1182         bz,pn   %icc,.case10
1183 ! delay slot
```

```
1184         andcc   %l3,1,%g0

1186         fmuld   %f6,%f6,%f36
1187         bz,pn   %icc,.case9
1188 ! delay slot
1189         nop

1191         fmuld   %f30,%f44,%f10          ! sin(x0)

1193         fmuld   %f32,%f54,%f12          ! cos(x1)
1194         fzero   %f2

1196         fmuld   %f34,%f54,%f14          ! cos(x2)
1197         fzero   %f4

1199         fmuld   %f36,%f54,%f16          ! cos(x3)
1200         fzero   %f6

1202         fmuld   %f30,%f40,%f20
1203         faddd   %f10,%f42,%f10

1205         fmuld   %f32,%f48,%f22
1206         faddd   %f12,%f52,%f12

1208         fmuld   %f34,%f48,%f24
1209         faddd   %f14,%f52,%f14

1211         fmuld   %f36,%f48,%f26
1212         faddd   %f16,%f52,%f16

1214         fmuld   %f30,%f30,%f30
1215         faddd   %f20,%f46,%f20

1217         fmuld   %f32,%f12,%f12
1218         faddd   %f22,%f46,%f22

1220         fmuld   %f34,%f14,%f14
1221         faddd   %f24,%f46,%f24

1223         fmuld   %f36,%f16,%f16
1224         faddd   %f26,%f46,%f26

1226         fmuld   %f30,%f10,%f10
1227         fzero   %f30

1229         fmuld   %f32,%f32,%f32
1230         faddd   %f12,%f50,%f12
1231         and     %l1,2,%g5

1233         fmuld   %f34,%f34,%f34
1234         faddd   %f14,%f50,%f14
1235         and     %l2,2,%o4

1237         fmuld   %f36,%f36,%f36
1238         faddd   %f16,%f50,%f16
1239         and     %l3,2,%o5

1241         faddd   %f10,%f20,%f10
1242         and     %l0,2,%g1

1244         fmuld   %f32,%f12,%f12
1245         fmovrdnz %g5,%f28,%f2

1247         fmuld   %f34,%f14,%f14
1248         fmovrdnz %o4,%f28,%f4
```



```
1250         fmuld   %f36,%f16,%f16
1251         fmovrdnz %o5,%f28,%f6

1253         fmuld   %f0,%f10,%f10
1254         fmovrdnz %g1,%f28,%f30

1256         faddd   %f12,%f22,%f12

1258         faddd   %f14,%f24,%f14

1260         faddd   %f16,%f26,%f16

1262         fxor    %f10,%f30,%f10

1264         fxor    %f12,%f2,%f12

1266         fxor    %f14,%f4,%f14

1268         addcc   %i0,-1,%i0
1269         bg,pt   %icc,.start
1270 ! delay slot
1271         fxor    %f16,%f6,%f16

1273         ba,pt   %icc,.end
1274 ! delay slot
1275         nop

1277         .align  16
1278 .case9:
1279         fmuld   %f30,%f44,%f10          ! sin(x0)

1281         fmuld   %f32,%f54,%f12          ! cos(x1)
1282         fzero   %f2

1284         fmuld   %f34,%f54,%f14          ! cos(x2)
1285         fzero   %f4

1287         fmuld   %f36,%f44,%f16          ! sin(x3)

1289         fmuld   %f30,%f40,%f20
1290         faddd   %f10,%f42,%f10

1292         fmuld   %f32,%f48,%f22
1293         faddd   %f12,%f52,%f12

1295         fmuld   %f34,%f48,%f24
1296         faddd   %f14,%f52,%f14

1298         fmuld   %f36,%f40,%f26
1299         faddd   %f16,%f42,%f16

1301         fmuld   %f30,%f30,%f30
1302         faddd   %f20,%f46,%f20

1304         fmuld   %f32,%f12,%f12
1305         faddd   %f22,%f46,%f22

1307         fmuld   %f34,%f14,%f14
1308         faddd   %f24,%f46,%f24

1310         fmuld   %f36,%f36,%f36
1311         faddd   %f26,%f46,%f26

1313         fmuld   %f30,%f10,%f10
1314         fzero   %f30
```

```
1316         fmuld   %f32,%f32,%f32
1317         faddd   %f12,%f50,%f12
1318         and     %l1,2,%g5

1320         fmuld   %f34,%f34,%f34
1321         faddd   %f14,%f50,%f14
1322         and     %l2,2,%o4

1324         fmuld   %f36,%f16,%f16
1325         fzero   %f36

1327         faddd   %f10,%f20,%f10
1328         and     %l0,2,%g1

1330         fmuld   %f32,%f12,%f12
1331         fmovrdnz %g5,%f28,%f2

1333         fmuld   %f34,%f14,%f14
1334         fmovrdnz %o4,%f28,%f4

1336         faddd   %f16,%f26,%f16
1337         and     %l3,2,%o5

1339         fmuld   %f0,%f10,%f10
1340         fmovrdnz %g1,%f28,%f30

1342         faddd   %f12,%f22,%f12

1344         faddd   %f14,%f24,%f14

1346         fmuld   %f6,%f16,%f16
1347         fmovrdnz %o5,%f28,%f36

1349         fxor    %f10,%f30,%f10

1351         fxor    %f12,%f2,%f12

1353         fxor    %f14,%f4,%f14

1355         addcc   %i0,-1,%i0
1356         bg,pt   %icc,.start
1357 ! delay slot
1358         fxor    %f16,%f36,%f16

1360         ba,pt   %icc,.end
1361 ! delay slot
1362         nop

1364         .align  16
1365 .case10:
1366         fmuld   %f6,%f6,%f36
1367         bz,pn   %icc,.case11
1368 ! delay slot
1369         nop

1371         fmuld   %f30,%f44,%f10          ! sin(x0)

1373         fmuld   %f32,%f54,%f12          ! cos(x1)
1374         fzero   %f2

1376         fmuld   %f34,%f44,%f14          ! sin(x2)

1378         fmuld   %f36,%f54,%f16          ! cos(x3)
1379         fzero   %f6

1381         fmuld   %f30,%f40,%f20
```



```
1382         faddd   %f10,%f42,%f10

1384         fmuld   %f32,%f48,%f22
1385         faddd   %f12,%f52,%f12

1387         fmuld   %f34,%f40,%f24
1388         faddd   %f14,%f42,%f14

1390         fmuld   %f36,%f48,%f26
1391         faddd   %f16,%f52,%f16

1393         fmuld   %f30,%f30,%f30
1394         faddd   %f20,%f46,%f20

1396         fmuld   %f32,%f12,%f12
1397         faddd   %f22,%f46,%f22

1399         fmuld   %f34,%f34,%f34
1400         faddd   %f24,%f46,%f24

1402         fmuld   %f36,%f16,%f16
1403         faddd   %f26,%f46,%f26

1405         fmuld   %f30,%f10,%f10
1406         fzero   %f30

1408         fmuld   %f32,%f32,%f32
1409         faddd   %f12,%f50,%f12
1410         and     %l1,2,%g5

1412         fmuld   %f34,%f14,%f14
1413         fzero   %f34

1415         fmuld   %f36,%f36,%f36
1416         faddd   %f16,%f50,%f16
1417         and     %l3,2,%o5

1419         faddd   %f10,%f20,%f10
1420         and     %l0,2,%g1

1422         fmuld   %f32,%f12,%f12
1423         fmovrdnz %g5,%f28,%f2

1425         faddd   %f14,%f24,%f14
1426         and     %l2,2,%o4

1428         fmuld   %f36,%f16,%f16
1429         fmovrdnz %o5,%f28,%f6

1431         fmuld   %f0,%f10,%f10
1432         fmovrdnz %g1,%f28,%f30

1434         faddd   %f12,%f22,%f12

1436         fmuld   %f4,%f14,%f14
1437         fmovrdnz %o4,%f28,%f34

1439         faddd   %f16,%f26,%f16

1441         fxor    %f10,%f30,%f10

1443         fxor    %f12,%f2,%f12

1445         fxor    %f14,%f34,%f14

1447         addcc   %i0,-1,%i0
```

```
1448         bg,pt   %icc,.start
1449 ! delay slot
1450         fxor    %f16,%f6,%f16

1452         ba,pt   %icc,.end
1453 ! delay slot
1454         nop

1456         .align  16
1457 .case11:
1458         fmuld   %f30,%f44,%f10          ! sin(x0)

1460         fmuld   %f32,%f54,%f12          ! cos(x1)
1461         fzero   %f2

1463         fmuld   %f34,%f44,%f14          ! sin(x2)

1465         fmuld   %f36,%f44,%f16          ! sin(x3)

1467         fmuld   %f30,%f40,%f20
1468         faddd   %f10,%f42,%f10

1470         fmuld   %f32,%f48,%f22
1471         faddd   %f12,%f52,%f12

1473         fmuld   %f34,%f40,%f24
1474         faddd   %f14,%f42,%f14

1476         fmuld   %f36,%f40,%f26
1477         faddd   %f16,%f42,%f16

1479         fmuld   %f30,%f30,%f30
1480         faddd   %f20,%f46,%f20

1482         fmuld   %f32,%f12,%f12
1483         faddd   %f22,%f46,%f22

1485         fmuld   %f34,%f34,%f34
1486         faddd   %f24,%f46,%f24

1488         fmuld   %f36,%f36,%f36
1489         faddd   %f26,%f46,%f26

1491         fmuld   %f30,%f10,%f10
1492         fzero   %f30

1494         fmuld   %f32,%f32,%f32
1495         faddd   %f12,%f50,%f12
1496         and     %l1,2,%g5

1498         fmuld   %f34,%f14,%f14
1499         fzero   %f34

1501         fmuld   %f36,%f16,%f16
1502         fzero   %f36

1504         faddd   %f10,%f20,%f10
1505         and     %l0,2,%g1

1507         fmuld   %f32,%f12,%f12
1508         fmovrdnz %g5,%f28,%f2

1510         faddd   %f14,%f24,%f14
1511         and     %l2,2,%o4

1513         faddd   %f16,%f26,%f16
```



```
1514         and     %l3,2,%o5

1516         fmuld   %f0,%f10,%f10
1517         fmovrdnz %g1,%f28,%f30

1519         faddd   %f12,%f22,%f12

1521         fmuld   %f4,%f14,%f14
1522         fmovrdnz %o4,%f28,%f34

1524         fmuld   %f6,%f16,%f16
1525         fmovrdnz %o5,%f28,%f36

1527         fxor    %f10,%f30,%f10

1529         fxor    %f12,%f2,%f12

1531         fxor    %f14,%f34,%f14

1533         addcc   %i0,-1,%i0
1534         bg,pt   %icc,.start
1535 ! delay slot
1536         fxor    %f16,%f36,%f16

1538         ba,pt   %icc,.end
1539 ! delay slot
1540         nop

1542         .align  16
1543 .case12:
1544         fmuld   %f4,%f4,%f34
1545         bz,pn   %icc,.case14
1546 ! delay slot
1547         andcc   %l3,1,%g0

1549         fmuld   %f6,%f6,%f36
1550         bz,pn   %icc,.case13
1551 ! delay slot
1552         nop

1554         fmuld   %f30,%f44,%f10          ! sin(x0)

1556         fmuld   %f32,%f44,%f12          ! sin(x1)

1558         fmuld   %f34,%f54,%f14          ! cos(x2)
1559         fzero   %f4

1561         fmuld   %f36,%f54,%f16          ! cos(x3)
1562         fzero   %f6

1564         fmuld   %f30,%f40,%f20
1565         faddd   %f10,%f42,%f10

1567         fmuld   %f32,%f40,%f22
1568         faddd   %f12,%f42,%f12

1570         fmuld   %f34,%f48,%f24
1571         faddd   %f14,%f52,%f14

1573         fmuld   %f36,%f48,%f26
1574         faddd   %f16,%f52,%f16

1576         fmuld   %f30,%f30,%f30
1577         faddd   %f20,%f46,%f20

1579         fmuld   %f32,%f32,%f32
```

```
1580         faddd   %f22,%f46,%f22

1582         fmuld   %f34,%f14,%f14
1583         faddd   %f24,%f46,%f24

1585         fmuld   %f36,%f16,%f16
1586         faddd   %f26,%f46,%f26

1588         fmuld   %f30,%f10,%f10
1589         fzero   %f30

1591         fmuld   %f32,%f12,%f12
1592         fzero   %f32

1594         fmuld   %f34,%f34,%f34
1595         faddd   %f14,%f50,%f14
1596         and     %l2,2,%o4

1598         fmuld   %f36,%f36,%f36
1599         faddd   %f16,%f50,%f16
1600         and     %l3,2,%o5

1602         faddd   %f10,%f20,%f10
1603         and     %l0,2,%g1

1605         faddd   %f12,%f22,%f12
1606         and     %l1,2,%g5

1608         fmuld   %f34,%f14,%f14
1609         fmovrdnz %o4,%f28,%f4

1611         fmuld   %f36,%f16,%f16
1612         fmovrdnz %o5,%f28,%f6

1614         fmuld   %f0,%f10,%f10
1615         fmovrdnz %g1,%f28,%f30

1617         fmuld   %f2,%f12,%f12
1618         fmovrdnz %g5,%f28,%f32

1620         faddd   %f14,%f24,%f14

1622         faddd   %f16,%f26,%f16

1624         fxor    %f10,%f30,%f10

1626         fxor    %f12,%f32,%f12

1628         fxor    %f14,%f4,%f14

1630         addcc   %i0,-1,%i0
1631         bg,pt   %icc,.start
1632 ! delay slot
1633         fxor    %f16,%f6,%f16

1635         ba,pt   %icc,.end
1636 ! delay slot
1637         nop

1639         .align  16
1640 .case13:
1641         fmuld   %f30,%f44,%f10          ! sin(x0)

1643         fmuld   %f32,%f44,%f12          ! sin(x1)

1645         fmuld   %f34,%f54,%f14          ! cos(x2)
```



```
1646         fzero   %f4

1648         fmuld   %f36,%f44,%f16          ! sin(x3)

1650         fmuld   %f30,%f40,%f20
1651         faddd   %f10,%f42,%f10

1653         fmuld   %f32,%f40,%f22
1654         faddd   %f12,%f42,%f12

1656         fmuld   %f34,%f48,%f24
1657         faddd   %f14,%f52,%f14

1659         fmuld   %f36,%f40,%f26
1660         faddd   %f16,%f42,%f16

1662         fmuld   %f30,%f30,%f30
1663         faddd   %f20,%f46,%f20

1665         fmuld   %f32,%f32,%f32
1666         faddd   %f22,%f46,%f22

1668         fmuld   %f34,%f14,%f14
1669         faddd   %f24,%f46,%f24

1671         fmuld   %f36,%f36,%f36
1672         faddd   %f26,%f46,%f26

1674         fmuld   %f30,%f10,%f10
1675         fzero   %f30

1677         fmuld   %f32,%f12,%f12
1678         fzero   %f32

1680         fmuld   %f34,%f34,%f34
1681         faddd   %f14,%f50,%f14
1682         and     %l2,2,%o4

1684         fmuld   %f36,%f16,%f16
1685         fzero   %f36

1687         faddd   %f10,%f20,%f10
1688         and     %l0,2,%g1

1690         faddd   %f12,%f22,%f12
1691         and     %l1,2,%g5

1693         fmuld   %f34,%f14,%f14
1694         fmovrdnz %o4,%f28,%f4

1696         faddd   %f16,%f26,%f16
1697         and     %l3,2,%o5

1699         fmuld   %f0,%f10,%f10
1700         fmovrdnz %g1,%f28,%f30

1702         fmuld   %f2,%f12,%f12
1703         fmovrdnz %g5,%f28,%f32

1705         faddd   %f14,%f24,%f14

1707         fmuld   %f6,%f16,%f16
1708         fmovrdnz %o5,%f28,%f36

1710         fxor    %f10,%f30,%f10
```

```
1712         fxor    %f12,%f32,%f12

1714         fxor    %f14,%f4,%f14

1716         addcc   %i0,-1,%i0
1717         bg,pt   %icc,.start
1718 ! delay slot
1719         fxor    %f16,%f36,%f16

1721         ba,pt   %icc,.end
1722 ! delay slot
1723         nop

1725         .align  16
1726 .case14:
1727         fmuld   %f6,%f6,%f36
1728         bz,pn   %icc,.case15
1729 ! delay slot
1730         nop

1732         fmuld   %f30,%f44,%f10          ! sin(x0)

1734         fmuld   %f32,%f44,%f12          ! sin(x1)

1736         fmuld   %f34,%f44,%f14          ! sin(x2)

1738         fmuld   %f36,%f54,%f16          ! cos(x3)
1739         fzero   %f6

1741         fmuld   %f30,%f40,%f20
1742         faddd   %f10,%f42,%f10

1744         fmuld   %f32,%f40,%f22
1745         faddd   %f12,%f42,%f12

1747         fmuld   %f34,%f40,%f24
1748         faddd   %f14,%f42,%f14

1750         fmuld   %f36,%f48,%f26
1751         faddd   %f16,%f52,%f16

1753         fmuld   %f30,%f30,%f30
1754         faddd   %f20,%f46,%f20

1756         fmuld   %f32,%f32,%f32
1757         faddd   %f22,%f46,%f22

1759         fmuld   %f34,%f34,%f34
1760         faddd   %f24,%f46,%f24

1762         fmuld   %f36,%f16,%f16
1763         faddd   %f26,%f46,%f26

1765         fmuld   %f30,%f10,%f10
1766         fzero   %f30

1768         fmuld   %f32,%f12,%f12
1769         fzero   %f32

1771         fmuld   %f34,%f14,%f14
1772         fzero   %f34

1774         fmuld   %f36,%f36,%f36
1775         faddd   %f16,%f50,%f16
1776         and     %l3,2,%o5
```



```
1778         faddd   %f10,%f20,%f10
1779         and     %l0,2,%g1

1781         faddd   %f12,%f22,%f12
1782         and     %l1,2,%g5

1784         faddd   %f14,%f24,%f14
1785         and     %l2,2,%o4

1787         fmuld   %f36,%f16,%f16
1788         fmovrdnz %o5,%f28,%f6

1790         fmuld   %f0,%f10,%f10
1791         fmovrdnz %g1,%f28,%f30

1793         fmuld   %f2,%f12,%f12
1794         fmovrdnz %g5,%f28,%f32

1796         fmuld   %f4,%f14,%f14
1797         fmovrdnz %o4,%f28,%f34

1799         faddd   %f16,%f26,%f16

1801         fxor    %f10,%f30,%f10

1803         fxor    %f12,%f32,%f12

1805         fxor    %f14,%f34,%f14

1807         addcc   %i0,-1,%i0
1808         bg,pt   %icc,.start
1809 ! delay slot
1810         fxor    %f16,%f6,%f16

1812         ba,pt   %icc,.end
1813 ! delay slot
1814         nop

1816         .align  16
1817 .case15:
1818         fmuld   %f30,%f44,%f10          ! sin(x0)

1820         fmuld   %f32,%f44,%f12          ! sin(x1)

1822         fmuld   %f34,%f44,%f14          ! sin(x2)

1824         fmuld   %f36,%f44,%f16          ! sin(x3)

1826         fmuld   %f30,%f40,%f20
1827         faddd   %f10,%f42,%f10

1829         fmuld   %f32,%f40,%f22
1830         faddd   %f12,%f42,%f12

1832         fmuld   %f34,%f40,%f24
1833         faddd   %f14,%f42,%f14

1835         fmuld   %f36,%f40,%f26
1836         faddd   %f16,%f42,%f16

1838         fmuld   %f30,%f30,%f30
1839         faddd   %f20,%f46,%f20

1841         fmuld   %f32,%f32,%f32
1842         faddd   %f22,%f46,%f22
```

```
1844         fmuld   %f34,%f34,%f34
1845         faddd   %f24,%f46,%f24

1847         fmuld   %f36,%f36,%f36
1848         faddd   %f26,%f46,%f26

1850         fmuld   %f30,%f10,%f10
1851         fzero   %f30

1853         fmuld   %f32,%f12,%f12
1854         fzero   %f32

1856         fmuld   %f34,%f14,%f14
1857         fzero   %f34

1859         fmuld   %f36,%f16,%f16
1860         fzero   %f36

1862         faddd   %f10,%f20,%f10
1863         and     %l0,2,%g1

1865         faddd   %f12,%f22,%f12
1866         and     %l1,2,%g5

1868         faddd   %f14,%f24,%f14
1869         and     %l2,2,%o4

1871         faddd   %f16,%f26,%f16
1872         and     %l3,2,%o5

1874         fmuld   %f0,%f10,%f10
1875         fmovrdnz %g1,%f28,%f30

1877         fmuld   %f2,%f12,%f12
1878         fmovrdnz %g5,%f28,%f32

1880         fmuld   %f4,%f14,%f14
1881         fmovrdnz %o4,%f28,%f34

1883         fmuld   %f6,%f16,%f16
1884         fmovrdnz %o5,%f28,%f36

1886         fxor    %f10,%f30,%f10

1888         fxor    %f12,%f32,%f12

1890         fxor    %f14,%f34,%f14

1892         addcc   %i0,-1,%i0
1893         bg,pt   %icc,.start
1894 ! delay slot
1895         fxor    %f16,%f36,%f16

1897         ba,pt   %icc,.end
1898 ! delay slot
1899         nop


1902         .align  32
1903 .end:
1904         fdtos   %f10,%f10
1905         st      %f10,[%o0]
1906         fdtos   %f12,%f12
1907         st      %f12,[%o1]
1908         fdtos   %f14,%f14
1909         st      %f14,[%o2]
```



```
1910         fdtos   %f16,%f16
1911         tst     %i5                     ! check for huge arguments remaining
1912         be,pt   %icc,.exit
1913 ! delay slot
1914         st      %f16,[%o3]
1915 #ifdef __sparcv9
1916         ldx     [%fp+xsave],%o1
1917         ldx     [%fp+ysave],%o3
1918 #else
1919         ld      [%fp+xsave],%o1
1920         ld      [%fp+ysave],%o3
1921 #endif
1922         ld      [%fp+nsave],%o0
1923         ld      [%fp+sxsave],%o2
1924         ld      [%fp+sysave],%o4
1925         sra     %o2,0,%o2               ! sign-extend for V9
1926         call    __vlibm_vcos_bigf
1927         sra     %o4,0,%o4               ! delay slot

1929 .exit:
1930         ret
1931         restore


1934         .align  32
1935 .last1:
1936         fdtos   %f12,%f12
1937         st      %f12,[%o1]
1938         fzeros  %f2
1939         add     %fp,junk,%o1
1940 .last2:
1941         fdtos   %f14,%f14
1942         st      %f14,[%o2]
1943         fzeros  %f4
1944         add     %fp,junk,%o2
1945 .last3:
1946         fdtos   %f16,%f16
1947         st      %f16,[%o3]
1948         fzeros  %f6
1949         ba,pt   %icc,.cont
1950 ! delay slot
1951         add     %fp,junk,%o3


1954         .align  16
1955 .range0:
1956         fcmpgt32 %f38,%f30,%l0
1957         andcc   %l0,2,%g0
1958         bnz,a,pt %icc,1f                ! branch if finite
1959 ! delay slot, squashed if branch not taken
1960         mov     1,%i5                   ! set biguns
1961         fzeros  %f1
1962         fmuls   %f0,%f1,%f0
1963         st      %f0,[%o0]
1964 1:
1965         addcc   %i0,-1,%i0
1966         ble,pn  %icc,1f
1967 ! delay slot
1968         nop
1969         ld      [%i1],%f0
1970         add     %i1,%i2,%i1
1971         mov     %i3,%o0
1972         add     %i3,%i4,%i3
1973         fabsd   %f0,%f30
1974         fcmple32 %f30,%f18,%l0
1975         andcc   %l0,2,%g0
```

```
1976         bz,pn   %icc,.range0
1977 ! delay slot
1978         nop
1979         ba,pt   %icc,.check1
1980 ! delay slot
1981         fcmple32 %f30,%f8,%l0
1982 1:
1983         fzero   %f0                     ! set up dummy argument
1984         add     %fp,junk,%o0
1985         mov     2,%l0
1986         ba,pt   %icc,.check1
1987 ! delay slot
1988         fzero   %f30


1991         .align  16
1992 .range1:
1993         fcmpgt32 %f38,%f32,%l1
1994         andcc   %l1,2,%g0
1995         bnz,a,pt %icc,1f                ! branch if finite
1996 ! delay slot, squashed if branch not taken
1997         mov     1,%i5                   ! set biguns
1998         fzeros  %f3
1999         fmuls   %f2,%f3,%f2
2000         st      %f2,[%o1]
2001 1:
2002         addcc   %i0,-1,%i0
2003         ble,pn  %icc,1f
2004 ! delay slot
2005         nop
2006         ld      [%i1],%f2
2007         add     %i1,%i2,%i1
2008         mov     %i3,%o1
2009         add     %i3,%i4,%i3
2010         fabsd   %f2,%f32
2011         fcmple32 %f32,%f18,%l1
2012         andcc   %l1,2,%g0
2013         bz,pn   %icc,.range1
2014 ! delay slot
2015         nop
2016         ba,pt   %icc,.check2
2017 ! delay slot
2018         fcmple32 %f32,%f8,%l1
2019 1:
2020         fzero   %f2                     ! set up dummy argument
2021         add     %fp,junk,%o1
2022         mov     2,%l1
2023         ba,pt   %icc,.check2
2024 ! delay slot
2025         fzero   %f32


2028         .align  16
2029 .range2:
2030         fcmpgt32 %f38,%f34,%l2
2031         andcc   %l2,2,%g0
2032         bnz,a,pt %icc,1f                ! branch if finite
2033 ! delay slot, squashed if branch not taken
2034         mov     1,%i5                   ! set biguns
2035         fzeros  %f5
2036         fmuls   %f4,%f5,%f4
2037         st      %f4,[%o2]
2038 1:
2039         addcc   %i0,-1,%i0
2040         ble,pn  %icc,1f
2041 ! delay slot
```



```
2042         nop
2043         ld      [%i1],%f4
2044         add     %i1,%i2,%i1
2045         mov     %i3,%o2
2046         add     %i3,%i4,%i3
2047         fabsd   %f4,%f34
2048         fcmple32 %f34,%f18,%l2
2049         andcc   %l2,2,%g0
2050         bz,pn   %icc,.range2
2051 ! delay slot
2052         nop
2053         ba,pt   %icc,.check3
2054 ! delay slot
2055         fcmple32 %f34,%f8,%l2
2056 1:
2057         fzero   %f4                     ! set up dummy argument
2058         add     %fp,junk,%o2
2059         mov     2,%l2
2060         ba,pt   %icc,.check3
2061 ! delay slot
2062         fzero   %f34


2065         .align  16
2066 .range3:
2067         fcmpgt32 %f38,%f36,%l3
2068         andcc   %l3,2,%g0
2069         bnz,a,pt %icc,1f                ! branch if finite
2070 ! delay slot, squashed if branch not taken
2071         mov     1,%i5                   ! set biguns
2072         fzeros  %f7
2073         fmuls   %f6,%f7,%f6
2074         st      %f6,[%o3]
2075 1:
2076         addcc   %i0,-1,%i0
2077         ble,pn  %icc,1f
2078 ! delay slot
2079         nop
2080         ld      [%i1],%f6
2081         add     %i1,%i2,%i1
2082         mov     %i3,%o3
2083         add     %i3,%i4,%i3
2084         fabsd   %f6,%f36
2085         fcmple32 %f36,%f18,%l3
2086         andcc   %l3,2,%g0
2087         bz,pn   %icc,.range3
2088 ! delay slot
2089         nop
2090         ba,pt   %icc,.checkprimary
2091 ! delay slot
2092         fcmple32 %f36,%f8,%l3
2093 1:
2094         fzero   %f6                     ! set up dummy argument
2095         add     %fp,junk,%o3
2096         mov     2,%l3
2097         ba,pt   %icc,.checkprimary
2098 ! delay slot
2099         fzero   %f36

2101         SET_SIZE(__vcosf)
```

```
**********************************************************
   30877 Sat May 10 12:09:58 2014
new/usr/src/lib/libmvec/common/vis/__vexp.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vexp.S"

#include "libm.h"

        RO_DATA

/*********************************************************************
 * vexp() algorithm is from mopt:f_exp.c.  Basics are included here
 * to supplement comments within this file.  vexp() has been unrolled
 * to a depth of 3.  Only element 0 is documented.
 *
 * Note 1: INVLN2_256, LN2_256H, and LN2_256L were originally scaled by
 *      2^44 to allow *2^k w/o shifting within the FP registers.  These
 *      had to be removed for CHEETAH to avoid the fdtox of a very large
 *      number, which would trap to kernel (2^52).
 *
 * Let  x = (k + j/256)ln2 + r
 * then exp(x) = exp(ln2^(k+j/256)) * exp(r)
 *             = 2^k * 2^(j/256) * exp(r)
 * where r is polynomial approximation
 *      exp(r) = 1 + r + r^2*B1 + r^3*B2 + r^4*B3
 *             = 1 + r*(1+r*(B1+r*(B2+r*B3)))
 *      let
 *      p = r*(1+r*(B1+r*(B2+r*B3)))    ! notice, not quite exp(r)
 *      q = 2^(j/256) (high 64 bits)
 *      t = 2^(j/256) (extra precision) ! both from _TBL_exp_z[]
 *      then
 *      2^(j/256) * exp(r) = (q+t)(1+p) ~ q + ( t + q*p )
 *      then actual computation is 2^k * ( q + ( t + q*p ) )
 *
 *********************************************************************/

        .align  16
```



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396         .word   0xbc9dd679,0x2e582524
397         .word   0x3ff925c3,0x53aa2fe2
398         .word   0xbc83455f,0xa639db7f
399         .word   0x3ff93737,0xb0cdc5e5
400         .word   0xbc675fc7,0x81b57ebc
401         .word   0x3ff948b8,0x2b5f98e5
402         .word   0xbc8dc3d6,0x797d2d99
403         .word   0x3ff95a44,0xcbc8520f
404         .word   0xbc764b7c,0x96a5f039
405         .word   0x3ff96bdd,0x9a7670b3
406         .word   0xbc5ba596,0x7f19c896
407         .word   0x3ff97d82,0x9fde4e50
408         .word   0xbc9d185b,0x7c1b85d0
409         .word   0x3ff98f33,0xe47a22a2
410         .word   0x3c7cabda,0xa24c78ed
411         .word   0x3ff9a0f1,0x70ca07ba
412         .word   0xbc9173bd,0x91cee632
413         .word   0x3ff9b2bb,0x4d53fe0d
414         .word   0xbc9dd84e,0x4df6d518
415         .word   0x3ff9c491,0x82a3f090
416         .word   0x3c7c7c46,0xb071f2be
417         .word   0x3ff9d674,0x194bb8d5
418         .word   0xbc9516be,0xa3dd8233
419         .word   0x3ff9e863,0x19e32323
420         .word   0x3c7824ca,0x78e64c6e
421         .word   0x3ff9fa5e,0x8d07f29e
422         .word   0xbc84a9ce,0xaaf1face
423         .word   0x3ffa0c66,0x7b5de565
424         .word   0xbc935949,0x5d1cd533
425         .word   0x3ffa1e7a,0xed8eb8bb
426         .word   0x3c9c6618,0xee8be70e
427         .word   0x3ffa309b,0xec4a2d33
428         .word   0x3c96305c,0x7ddc36ab
429         .word   0x3ffa42c9,0x80460ad8
430         .word   0xbc9aa780,0x589fb120
431         .word   0x3ffa5503,0xb23e255d
432         .word   0xbc9d2f6e,0xdb8d41e1
433         .word   0x3ffa674a,0x8af46052
434         .word   0x3c650f56,0x30670366
435         .word   0x3ffa799e,0x1330b358
436         .word   0x3c9bcb7e,0xcac563c6
437         .word   0x3ffa8bfe,0x53c12e59
438         .word   0xbc94f867,0xb2ba15a8
439         .word   0x3ffa9e6b,0x5579fdbf
440         .word   0x3c90fac9,0x0ef7fd31
441         .word   0x3ffab0e5,0x21356eba
442         .word   0x3c889c31,0xdae94544
443         .word   0x3ffac36b,0xbfd3f37a
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448         .word   0x3c97a1cd,0x345dcc81
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451         .word   0x3ffb0e07,0x298db666
452         .word   0xbc9bdef5,0x4c80e425
453         .word   0x3ffb20ce,0x6c9a8952
454         .word   0x3c94dd02,0x4a0756cc
455         .word   0x3ffb33a2,0xb84f15fb
456         .word   0xbc62805e,0x3084d708
457         .word   0x3ffb4684,0x15b749b1
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458         .word   0xbc7f763d,0xe9df7c90
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461         .word   0x3ffb6c6e,0x29f1c52a
462         .word   0x3c92a8f3,0x52883f6e
463         .word   0x3ffb7f76,0xf2fb5e47
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466         .word   0xbc9b7216,0x54cb65c6
467         .word   0x3ffba5b0,0x30a1064a
468         .word   0xbc9efcd3,0x0e54292e
469         .word   0x3ffbb8e0,0xb79a6f1f
470         .word   0xbc3f52d1,0xc9696205
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472         .word   0x3c823dd0,0x7a2d9e84
473         .word   0x3ffbdf69,0xc3f3a207
474         .word   0xbc3c2623,0x60ea5b52
475         .word   0x3ffbf2c2,0x5bd71e09
476         .word   0xbc9efdca,0x3f6b9c73
477         .word   0x3ffc0628,0x6141b33d
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479         .word   0x3ffc199b,0xdd85529c
480         .word   0x3c811065,0x895048dd
481         .word   0x3ffc2d1c,0xd9fa652c
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487         .word   0x3ffc67f1,0x2e57d14b
488         .word   0x3c92884d,0xff483cad
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490         .word   0xbc8e76bb,0xbe255559
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493         .word   0x3ffca340,0x5751c4db
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495         .word   0x3ffcb720,0xdcef9069
496         .word   0x3c7503cb,0xd1e949db
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511         .word   0x3ffd5818,0xdcfba487
512         .word   0x3c82ed02,0xd75b3706
513         .word   0x3ffd6c76,0xe862e6d3
514         .word   0x3c5fe87a,0x4a8165a0
515         .word   0x3ffd80e3,0x16c98398
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519         .word   0x3ffda9e6,0x03db3285
520         .word   0x3c9c2300,0x696db532
521         .word   0x3ffdbe7c,0xd63a8315
522         .word   0xbc9b76f1,0x926b8be4
523         .word   0x3ffdd321,0xf301b460
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524         .word   0x3c92da57,0x78f018c2
525         .word   0x3ffde7d5,0x641c0658
526         .word   0xbc9ca552,0x8e79ba8f
527         .word   0x3ffdfc97,0x337b9b5f
528         .word   0xbc91a5cd,0x4f184b5c
529         .word   0x3ffe1167,0x6b197d17
530         .word   0xbc72b529,0xbd5c7f44
531         .word   0x3ffe2646,0x14f5a129
532         .word   0xbc97b627,0x817a1496
533         .word   0x3ffe3b33,0x3b16ee12
534         .word   0xbc99f4a4,0x31fdc68a
535         .word   0x3ffe502e,0xe78b3ff6
536         .word   0x3c839e89,0x80a9cc8f
537         .word   0x3ffe6539,0x24676d76
538         .word   0xbc863ff8,0x7522b734
539         .word   0x3ffe7a51,0xfbc74c83
540         .word   0x3c92d522,0xca0c8de2
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543         .word   0x3ffea4af,0xa2a490da
544         .word   0xbc9e9c23,0x179c2893
545         .word   0x3ffeb9f4,0x867cca6e
546         .word   0x3c94832f,0x2293e4f2
547         .word   0x3ffecf48,0x2d8e67f1
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557         .word   0x3fff3ac9,0x48dd7274
558         .word   0xbc795a5a,0x3ed837de
559         .word   0x3fff5076,0x5b6e4540
560         .word   0x3c99d3e1,0x2dd8a18b
561         .word   0x3fff6632,0x798844f8
562         .word   0x3c9fa37b,0x3539343e
563         .word   0x3fff7bfd,0xad9cbe14
564         .word   0xbc9dbb12,0xd006350a
565         .word   0x3fff91d8,0x02243c89
566         .word   0xbc612ea8,0xa779f689
567         .word   0x3fffa7c1,0x819e90d8
568         .word   0x3c874853,0xf3a5931e
569         .word   0x3fffbdba,0x3692d514
570         .word   0xbc796773,0x15098eb6
571         .word   0x3fffd3c2,0x2b8f71f1
572         .word   0x3c62eb74,0x966579e7
573         .word   0x3fffe9d9,0x6b2a23d9
574         .word   0x3c74a603,0x7442fde3

576         .align  16
577 constants:
578         .word   0x3ef00000,0x00000000
579         .word   0x40862e42,0xfefa39ef
580         .word   0x01000000,0x00000000
581         .word   0x7f000000,0x00000000
582         .word   0x80000000,0x00000000
583         .word   0x43f00000,0x00000000 ! scaling 2^12 two96
584         .word   0xfff00000,0x00000000
585         .word   0x3ff00000,0x00000000
586         .word   0x3fdfffff,0xfffffff6
587         .word   0x3fc55555,0x721a1d14
588         .word   0x3fa55555,0x6e0896af
589         .word   0x41371547,0x652b82fe ! scaling 2^12 invln2_256
```



```
590         .word   0x3ea62e42,0xfee00000 ! scaling 2^(-12) ln2_256h
591         .word   0x3caa39ef,0x35793c76 ! scaling 2^(-12) ln2_256l

593         ! base set w/o scaling
594         ! .word 0x43300000,0x00000000 ! scaling  two96
595         ! .word 0x40771547,0x652b82fe ! scaling  invln2_256
596         ! .word 0x3f662e42,0xfee00000 ! scaling  ln2_256h
597         ! .word 0x3d6a39ef,0x35793c76 ! scaling  ln2_256l

599 #define ox3ef           0x0
600 #define thresh          0x8
601 #define tiny            0x10
602 #define huge            0x18
603 #define signbit         0x20
604 #define two96           0x28
605 #define neginf          0x30
606 #define one             0x38
607 #define B1OFF           0x40
608 #define B2OFF           0x48
609 #define B3OFF           0x50
610 #define invln2_256      0x58
611 #define ln2_256h        0x60
612 #define ln2_256l        0x68

614 ! local storage indices

616 #define m2              STACK_BIAS-0x4
617 #define m1              STACK_BIAS-0x8
618 #define m0              STACK_BIAS-0xc
619 #define jnk             STACK_BIAS-0x20
620 ! sizeof temp storage - must be a multiple of 16 for V9
621 #define tmps            0x20

623 ! register use

625 ! i0  n
626 ! i1  x
627 ! i2  stridex
628 ! i3  y
629 ! i4  stridey
630 ! i5  0x80000000

632 ! g1  TBL

634 ! l0  m0
635 ! l1  m1
636 ! l2  m2
637 ! l3  j0,oy0
638 ! l4  j1,oy1
639 ! l5  j2,oy2
640 ! l6  0x3e300000
641 ! l7  0x40862e41

643 ! o0  py0
644 ! o1  py1
645 ! o2  py2
646 ! o3  scratch
647 ! o4  scratch
648 ! o5  0x40874910
649 ! o7  0x7ff00000

651 ! f0  x0
652 ! f2
653 ! f4
654 ! f6
655 ! f8
```

```
656 ! f10 x1
657 ! f12
658 ! f14
659 ! f16
660 ! f18
661 ! f20 x2
662 ! f22
663 ! f24
664 ! f26
665 ! f28
666 ! f30
667 ! f32
668 ! f34
669 ! f36 0x3ef0...
670 ! f38 thresh
671 ! f40 tiny
672 ! f42 huge
673 ! f44 signbit
674 ! f46 two96
675 ! f48 neginf
676 ! f50 one
677 ! f52 B1
678 ! f54 B2
679 ! f56 B3
680 ! f58 invln2_256
681 ! f60 ln2_256h
682 ! f62 ln2_256l
683 #define BOUNDRY %f36
684 #define THRESH %f38
685 #define TINY %f40
686 #define HUGE %f42
687 #define SIGNBIT %f44
688 #define TWO96 %f46
689 #define NEGINF %f48
690 #define ONE %f50
691 #define B1 %f52
692 #define B2 %f54
693 #define B3 %f56
694 #define INVLN2_256 %f58
695 #define LN2_256H %f60
696 #define LN2_256L %f62

698         ENTRY(__vexp)
699         save    %sp,-SA(MINFRAME)-tmps,%sp
700         PIC_SETUP(l7)
701         PIC_SET(l7,constants,o3)
702         PIC_SET(l7,TBL,o0)
703         mov     %o0,%g1
704         wr      %g0,0x82,%asi           ! set %asi for non-faulting loads

706         sethi   %hi(0x80000000),%i5
707         sethi   %hi(0x3e300000),%l6
708         sethi   %hi(0x40862e41),%l7
709         or      %l7,%lo(0x40862e41),%l7
710         sethi   %hi(0x40874910),%o5
711         or      %o5,%lo(0x40874910),%o5
712         sethi   %hi(0x7ff00000),%o7
713         ldd     [%o3+ox3ef],BOUNDRY
714         ldd     [%o3+thresh],THRESH
715         ldd     [%o3+tiny],TINY
716         ldd     [%o3+huge],HUGE
717         ldd     [%o3+signbit],SIGNBIT
718         ldd     [%o3+two96],TWO96
719         ldd     [%o3+neginf],NEGINF
720         ldd     [%o3+one],ONE
721         ldd     [%o3+B1OFF],B1
```



```
722         ldd     [%o3+B2OFF],B2
723         ldd     [%o3+B3OFF],B3
724         ldd     [%o3+invln2_256],INVLN2_256
725         ldd     [%o3+ln2_256h],LN2_256H
726         ldd     [%o3+ln2_256l],LN2_256L
727         sll     %i2,3,%i2               ! scale strides
728         sll     %i4,3,%i4
729         add     %fp,jnk,%l3             ! precondition loop
730         add     %fp,jnk,%l4
731         add     %fp,jnk,%l5
732         ld      [%i1],%l0               ! hx = *x
733         ld      [%i1],%f0
734         ld      [%i1+4],%f1
735         andn    %l0,%i5,%l0             ! hx &= ~0x80000000
736         ba      .loop0
737         add     %i1,%i2,%i1             ! x += stridex

739         .align  16
740 ! -- 16 byte aligned
741 .loop0:
742         lda     [%i1]%asi,%l1           ! preload next argument
743         sub     %l0,%l6,%o3
744         sub     %l7,%l0,%o4
745         fand    %f0,SIGNBIT,%f2         ! get sign bit

747         lda     [%i1]%asi,%f10
748         orcc    %o3,%o4,%g0
749         mov     %i3,%o0                 ! py0 = y
750         bl,pn   %icc,.range0            ! if hx < 0x3e300000 or > 0x40862e41

752 ! delay slot
753         lda     [%i1+4]%asi,%f11
754         addcc   %i0,-1,%i0
755         add     %i3,%i4,%i3             ! y += stridey
756         ble,pn  %icc,.endloop1

758 ! delay slot
759         andn    %l1,%i5,%l1
760         add     %i1,%i2,%i1             ! x += stridex
761         for     %f2,TWO96,%f2           ! used to strip least sig bits
762         fmuld   %f0,INVLN2_256,%f4      ! x/ (ln2/256)  , creating k

764 .loop1:
765         lda     [%i1]%asi,%l2           ! preload next argument
766         sub     %l1,%l6,%o3
767         sub     %l7,%l1,%o4
768         fand    %f10,SIGNBIT,%f12

770         lda     [%i1]%asi,%f20
771         orcc    %o3,%o4,%g0
772         mov     %i3,%o1                 ! py1 = y
773         bl,pn   %icc,.range1            ! if hx < 0x3e300000 or > 0x40862e41

775 ! delay slot
776         lda     [%i1+4]%asi,%f21
777         addcc   %i0,-1,%i0
778         add     %i3,%i4,%i3             ! y += stridey
779         ble,pn  %icc,.endloop2

781 ! delay slot
782         andn    %l2,%i5,%l2
783         add     %i1,%i2,%i1             ! x += stridex
784         for     %f12,TWO96,%f12
785         fmuld   %f10,INVLN2_256,%f14

787 .loop2:
```

```
788         sub     %l2,%l6,%o3
789         sub     %l7,%l2,%o4
790         fand    %f20,SIGNBIT,%f22
791         fmuld   %f20,INVLN2_256,%f24            ! okay to put this here; for ali

793         orcc    %o3,%o4,%g0
794         bl,pn   %icc,.range2            ! if hx < 0x3e300000 or > 0x40862e41
795 ! delay slot
796         for     %f22,TWO96,%f22
797         faddd   %f4,%f2,%f4             ! creating k+j/256, sra to zero bits

799 .cont:
800         faddd   %f14,%f12,%f14
801         mov     %i3,%o2                 ! py2 = y

803         faddd   %f24,%f22,%f24
804         add     %i3,%i4,%i3             ! y += stridey

806         ! BUBBLE USIII

808         fsubd   %f4,%f2,%f8             ! creating k+j/256: sll
809         st      %f6,[%l3]               ! store previous loop x0

811         fsubd   %f14,%f12,%f18
812         st      %f7,[%l3+4]             ! store previous loop x0

814         fsubd   %f24,%f22,%f28
815         st      %f16,[%l4]

817         ! BUBBLE USIII

819         fmuld   %f8,LN2_256H,%f2        ! closest LN2_256 to x
820         st      %f17,[%l4+4]

822         fmuld   %f18,LN2_256H,%f12
823         st      %f26,[%l5]

825         fmuld   %f28,LN2_256H,%f22
826         st      %f27,[%l5+4]

828         ! BUBBLE USIII

830         fsubd   %f0,%f2,%f0             ! r = x - p*LN2_256H
831         fmuld   %f8,LN2_256L,%f4        ! closest LN2_256 to x , added prec

833         fsubd   %f10,%f12,%f10
834         fmuld   %f18,LN2_256L,%f14

836         fsubd   %f20,%f22,%f20
837         fmuld   %f28,LN2_256L,%f24

839         ! BUBBLE USIII

841         fsubd   %f0,%f4,%f0             ! r -= p*LN2_256L

843         fsubd   %f10,%f14,%f10

845         fsubd   %f20,%f24,%f20

847 !!!!!!!!!!!!!!!!!! New polynomial reorder starts here

849         ! Alternate polynomial grouping allowing non-sequential calc of p
850         ! OLD : p = r * ( 1 + r * ( B1 + r * ( B2 + r * B3) ) )
851         ! NEW : p = r * [ (1+r*B1) + (r*r) * ( B2 + r * B3) ) ]
852         !
853         ! let               SLi        Ri           SRi         be accumulators
```



```
855         fmuld   %f0,B3,%f2      ! SR1 = r1 * B3
856         fdtoi   %f8,%f8                         ! convert k+j/256 to int
857         st      %f8,[%fp+m0]                    ! store k, to shift return/use

859         fmuld   %f10,B3,%f12    ! SR2 = r2 * B3
860         fdtoi   %f18,%f18                       ! convert k+j/256 to int
861         st      %f18,[%fp+m1]                   ! store k, to shift return/use

863         fmuld   %f20,B3,%f22    ! SR3 = r3 * B3
864         fdtoi   %f28,%f28                       ! convert k+j/256 to int
865         st      %f28,[%fp+m2]                   ! store k, to shift return/use

867         fmuld   %f0,%f0,%f4     ! R1 = r1 * r1

869         fmuld   %f10,%f10,%f14  ! R2 = r2 * r2
870         faddd   %f2,B2,%f2      ! SR1 += B2

872         fmuld   %f20,%f20,%f24  ! R3 = r3 * r3
873         faddd   %f12,B2,%f12    ! SR2 += B2

875         faddd   %f22,B2,%f22    ! SR3 += B2
876         fmuld   %f0,B1,%f6      ! SL1 = r1 * B1

878         fmuld   %f10,B1,%f32    ! SL2 = r2 * B1
879         fand    %f8,NEGINF,%f8
880         ! best here for RAW BYPASS
881         ld      [%fp+m0],%l0                    ! get nonshifted k into intreg

883         fmuld   %f20,B1,%f34    ! SL3 = r3 * B1
884         fand    %f18,NEGINF,%f18
885         ld      [%fp+m1],%l1                    ! get nonshifted k into intreg

887         fmuld   %f4,%f2,%f4     ! R1 = R1 * SR1
888         fand    %f28,NEGINF,%f28
889         ld      [%fp+m2],%l2                    ! get nonshifted k into intreg

891         fmuld   %f14,%f12,%f14  ! R2 = R2 * SR2
892         faddd   %f6,ONE,%f6     ! SL1 += 1

894         fmuld   %f24,%f22,%f24  ! R3 = R3 * SR3
895         faddd   %f32,ONE,%f32   ! SL2 += 1
896         sra     %l0,8,%l3                       ! shift k tobe offset 256-8byte

898         faddd   %f34,ONE,%f34   ! SL3 += 1
899         sra     %l1,8,%l4                       ! shift k tobe offset 256-8byte
900         sra     %l2,8,%l5                       ! shift k tobe offset 256-8byte

902         ! BUBBLE in USIII
903         and     %l3,0xff0,%l3
904         and     %l4,0xff0,%l4



908         faddd   %f6,%f4,%f6     ! R1 = SL1 + R1
909         ldd     [%g1+%l3],%f4                   ! tbl[j]
910         add     %l3,8,%l3                       ! inc j
911         and     %l5,0xff0,%l5


914         faddd   %f32,%f14,%f32  ! R2 = SL2 + R2
915         ldd     [%g1+%l4],%f14                  ! tbl[j]
916         add     %l4,8,%l4                       ! inc j
917         sra     %l0,20,%o3

919         faddd   %f34,%f24,%f34  ! R3 = SL3 + R3
```

```
920         ldd     [%g1+%l5],%f24                  ! tbl[j]
921         add     %l5,8,%l5                       ! inc j
922         sra     %l1,20,%l1

924         ! BUBBLE in USIII
925         ldd     [%g1+%l4],%f16          ! tbl[j+1]
926         add     %o3,1021,%o3            ! inc j

928         fmuld   %f0,%f6,%f0     ! p1 = r1 * R1
929         ldd     [%g1+%l3],%f6           ! tbl[j+1]
930         add     %l1,1021,%l1            ! inc j
931         sra     %l2,20,%l2

933         fmuld   %f10,%f32,%f10  ! p2 = r2 * R2
934         ldd     [%g1+%l5],%f26          ! tbl[j+1]
935         add     %l2,1021,%l2            ! inc j

937         fmuld   %f20,%f34,%f20  ! p3 = r3 * R3

939
940



943 !!!!!!!!!!!!!!!!!! poly-reorder - ends here

945         fmuld   %f0,%f4,%f0             ! start exp(x) = exp(r) * tbl[j]
946         mov     %o0,%l3

948         fmuld   %f10,%f14,%f10
949         mov     %o1,%l4

951         fmuld   %f20,%f24,%f20
952         mov     %o2,%l5

954         faddd   %f0,%f6,%f6             ! cont exp(x) : apply tbl[j] high bits
955         lda     [%i1]%asi,%l0           ! preload next argument

957         faddd   %f10,%f16,%f16
958         lda     [%i1]%asi,%f0

960         faddd   %f20,%f26,%f26
961         lda     [%i1+4]%asi,%f1

963         faddd   %f6,%f4,%f6             ! cont exp(x) : apply tbl[j+1] low bits
964         add     %i1,%i2,%i1             ! x += stridex

966         faddd   %f16,%f14,%f16
967         andn    %l0,%i5,%l0
968         or      %o3,%l1,%o4

970 ! -- 16 byte aligned
971         orcc    %o4,%l2,%o4
972         bl,pn   %icc,.small
973 ! delay slot
974         faddd   %f26,%f24,%f26

976         fpadd32 %f6,%f8,%f6             ! done exp(x) : apply 2^k
977         fpadd32 %f16,%f18,%f16


980         addcc   %i0,-1,%i0
981         bg,pn   %icc,.loop0
982 ! delay slot
983         fpadd32 %f26,%f28,%f26

985         ba,pt   %icc,.endloop0
```



```
986 ! delay slot
987         nop


990         .align  16
991 .small:
992         tst     %o3
993         bge,pt  %icc,1f
994 ! delay slot
995         fpadd32 %f6,%f8,%f6
996         fpadd32 %f6,BOUNDRY,%f6
997         fmuld   %f6,TINY,%f6
998 1:
999         tst     %l1
1000        bge,pt  %icc,1f
1001 ! delay slot
1002        fpadd32 %f16,%f18,%f16
1003        fpadd32 %f16,BOUNDRY,%f16
1004        fmuld   %f16,TINY,%f16
1005 1:
1006        tst     %l2
1007        bge,pt  %icc,1f
1008 ! delay slot
1009        fpadd32 %f26,%f28,%f26
1010        fpadd32 %f26,BOUNDRY,%f26
1011        fmuld   %f26,TINY,%f26
1012 1:
1013        addcc   %i0,-1,%i0
1014        bg,pn   %icc,.loop0
1015 ! delay slot
1016        nop
1017        ba,pt   %icc,.endloop0
1018 ! delay slot
1019        nop


1022 .endloop2:
1023        for     %f12,TWO96,%f12
1024        fmuld   %f10,INVLN2_256,%f14
1025        faddd   %f14,%f12,%f14
1026        fsubd   %f14,%f12,%f18
1027        fmuld   %f18,LN2_256H,%f12
1028        fsubd   %f10,%f12,%f10
1029        fmuld   %f18,LN2_256L,%f14
1030        fsubd   %f10,%f14,%f10
1031        fmuld   %f10,B3,%f12
1032        fdtoi   %f18,%f18
1033        st      %f18,[%fp+m1]
1034        fmuld   %f10,%f10,%f14
1035        faddd   %f12,B2,%f12
1036        fmuld   %f10,B1,%f32
1037        fand    %f18,NEGINF,%f18
1038        ld      [%fp+m1],%l1
1039        fmuld   %f14,%f12,%f14
1040        faddd   %f32,ONE,%f32
1041        sra     %l1,8,%o4
1042        and     %o4,0xff0,%o4
1043        faddd   %f32,%f14,%f32
1044        ldd     [%g1+%o4],%f14
1045        add     %o4,8,%o4
1046        sra     %l1,20,%l1
1047        ldd     [%g1+%o4],%f30
1048        addcc   %l1,1021,%l1
1049        fmuld   %f10,%f32,%f10
1050        fmuld   %f10,%f14,%f10
1051        faddd   %f10,%f30,%f30
```

```
1052         faddd   %f30,%f14,%f30
1053         bge,pt  %icc,1f
1054 ! delay slot
1055         fpadd32 %f30,%f18,%f30
1056         fpadd32 %f30,BOUNDRY,%f30
1057         fmuld   %f30,TINY,%f30
1058 1:
1059         st      %f30,[%o1]
1060         st      %f31,[%o1+4]

1062 .endloop1:
1063         for     %f2,TWO96,%f2
1064         fmuld   %f0,INVLN2_256,%f4
1065         faddd   %f4,%f2,%f4
1066         fsubd   %f4,%f2,%f8
1067         fmuld   %f8,LN2_256H,%f2
1068         fsubd   %f0,%f2,%f0
1069         fmuld   %f8,LN2_256L,%f4
1070         fsubd   %f0,%f4,%f0
1071         fmuld   %f0,B3,%f2
1072         fdtoi   %f8,%f8
1073         st      %f8,[%fp+m0]
1074         fmuld   %f0,%f0,%f4
1075         faddd   %f2,B2,%f2
1076         fmuld   %f0,B1,%f32
1077         fand    %f8,NEGINF,%f8
1078         ld      [%fp+m0],%l0
1079         fmuld   %f4,%f2,%f4
1080         faddd   %f32,ONE,%f32
1081         sra     %l0,8,%o4
1082         and     %o4,0xff0,%o4
1083         faddd   %f32,%f4,%f32
1084         ldd     [%g1+%o4],%f4
1085         add     %o4,8,%o4
1086         sra     %l0,20,%o3
1087         ldd     [%g1+%o4],%f30
1088         addcc   %o3,1021,%o3
1089         fmuld   %f0,%f32,%f0
1090         fmuld   %f0,%f4,%f0
1091         faddd   %f0,%f30,%f30
1092         faddd   %f30,%f4,%f30
1093         bge,pt  %icc,1f
1094 ! delay slot
1095         fpadd32 %f30,%f8,%f30
1096         fpadd32 %f30,BOUNDRY,%f30
1097         fmuld   %f30,TINY,%f30
1098 1:
1099         st      %f30,[%o0]
1100         st      %f31,[%o0+4]

1102 .endloop0:
1103         st      %f6,[%l3]
1104         st      %f7,[%l3+4]
1105         st      %f16,[%l4]
1106         st      %f17,[%l4+4]
1107         st      %f26,[%l5]
1108         st      %f27,[%l5+4]
1109         ret
1110         restore


1113 .range0:
1114         cmp     %l0,%l6
1115         bl,a,pt %icc,3f                 ! if x is tiny
1116 ! delay slot, annulled if branch not taken
1117         faddd   %f0,ONE,%f4
```



```
1119         cmp     %l0,%o5
1120         bg,pt   %icc,1f                 ! if x is huge, inf, nan
1121 ! delay slot
1122         nop

1124         fcmpd   %fcc0,%f0,THRESH
1125         fbg,a,pt %fcc0,3f               ! if x is huge and positive
1126 ! delay slot, annulled if branch not taken
1127         fmuld   HUGE,HUGE,%f4

1129 ! x is near the extremes but within range; return to the loop
1130         addcc   %i0,-1,%i0
1131         add     %i3,%i4,%i3             ! y += stridey
1132         ble,pn  %icc,.endloop1
1133 ! delay slot
1134         andn    %l1,%i5,%l1
1135         add     %i1,%i2,%i1             ! x += stridex
1136         for     %f2,TWO96,%f2
1137         ba,pt   %icc,.loop1
1138 ! delay slot
1139         fmuld   %f0,INVLN2_256,%f4

1141 1:
1142         cmp     %l0,%o7
1143         bl,pn   %icc,2f                 ! if x is finite
1144 ! delay slot
1145         nop
1146         fzero   %f4
1147         fcmpd   %fcc0,%f0,NEGINF
1148         fmovdne %fcc0,%f0,%f4
1149         ba,pt   %icc,3f
1150         fmuld   %f4,%f4,%f4             ! x*x or zero*zero
1151 2:
1152         fmovd   HUGE,%f4
1153         fcmpd   %fcc0,%f0,ONE
1154         fmovdl  %fcc0,TINY,%f4
1155         fmuld   %f4,%f4,%f4             ! huge*huge or tiny*tiny
1156 3:
1157         st      %f4,[%o0]
1158         andn    %l1,%i5,%l0
1159         add     %i1,%i2,%i1             ! x += stridex
1160         fmovd   %f10,%f0
1161         st      %f5,[%o0+4]
1162         addcc   %i0,-1,%i0
1163         bg,pt   %icc,.loop0
1164 ! delay slot
1165         add     %i3,%i4,%i3             ! y += stridey
1166         ba,pt   %icc,.endloop0
1167 ! delay slot
1168         nop


1171 .range1:
1172         cmp     %l1,%l6
1173         bl,a,pt %icc,3f                 ! if x is tiny
1174 ! delay slot, annulled if branch not taken
1175         faddd   %f10,ONE,%f14

1177         cmp     %l1,%o5
1178         bg,pt   %icc,1f                 ! if x is huge, inf, nan
1179 ! delay slot
1180         nop

1182         fcmpd   %fcc0,%f10,THRESH
1183         fbg,a,pt %fcc0,3f               ! if x is huge and positive
```

```
1184 ! delay slot, annulled if branch not taken
1185         fmuld   HUGE,HUGE,%f14

1187 ! x is near the extremes but within range; return to the loop
1188         addcc   %i0,-1,%i0
1189         add     %i3,%i4,%i3             ! y += stridey
1190         ble,pn  %icc,.endloop2
1191 ! delay slot
1192         andn    %l2,%i5,%l2
1193         add     %i1,%i2,%i1             ! x += stridex
1194         for     %f12,TWO96,%f12
1195         ba,pt   %icc,.loop2
1196 ! delay slot
1197         fmuld   %f10,INVLN2_256,%f14

1199 1:
1200         cmp     %l1,%o7
1201         bl,pn   %icc,2f                 ! if x is finite
1202 ! delay slot
1203         nop
1204         fzero   %f14
1205         fcmpd   %fcc0,%f10,NEGINF
1206         fmovdne %fcc0,%f10,%f14
1207         ba,pt   %icc,3f
1208         fmuld   %f14,%f14,%f14          ! x*x or zero*zero
1209 2:
1210         fmovd   HUGE,%f14
1211         fcmpd   %fcc0,%f10,ONE
1212         fmovdl  %fcc0,TINY,%f14
1213         fmuld   %f14,%f14,%f14          ! huge*huge or tiny*tiny
1214 3:
1215         st      %f14,[%o1]
1216         andn    %l2,%i5,%l1
1217         add     %i1,%i2,%i1             ! x += stridex
1218         fmovd   %f20,%f10
1219         st      %f15,[%o1+4]
1220         addcc   %i0,-1,%i0
1221         bg,pt   %icc,.loop1
1222 ! delay slot
1223         add     %i3,%i4,%i3             ! y += stridey
1224         ba,pt   %icc,.endloop1
1225 ! delay slot
1226         nop


1229 .range2:
1230         cmp     %l2,%l6
1231         bl,a,pt %icc,3f                 ! if x is tiny
1232 ! delay slot, annulled if branch not taken
1233         faddd   %f20,ONE,%f24

1235         cmp     %l2,%o5
1236         bg,pt   %icc,1f                 ! if x is huge, inf, nan
1237 ! delay slot
1238         nop

1240         fcmpd   %fcc0,%f20,THRESH
1241         fbg,a,pt %fcc0,3f               ! if x is huge and positive
1242 ! delay slot, annulled if branch not taken
1243         fmuld   HUGE,HUGE,%f24

1245 ! x is near the extremes but within range; return to the loop
1246         ba,pt   %icc,.cont
1247 ! delay slot
1248         faddd   %f4,%f2,%f4
```



```
1250 1:
1251         cmp     %l2,%o7
1252         bl,pn   %icc,2f                 ! if x is finite
1253 ! delay slot
1254         nop
1255         fzero   %f24
1256         fcmpd   %fcc0,%f20,NEGINF
1257         fmovdne %fcc0,%f20,%f24
1258         ba,pt   %icc,3f
1259         fmuld   %f24,%f24,%f24          ! x*x or zero*zero
1260 2:
1261         fmovd   HUGE,%f24
1262         fcmpd   %fcc0,%f20,ONE
1263         fmovdl  %fcc0,TINY,%f24
1264         fmuld   %f24,%f24,%f24          ! huge*huge or tiny*tiny
1265 3:
1266         st      %f24,[%i3]
1267         st      %f25,[%i3+4]
1268         lda     [%i1]%asi,%l2           ! preload next argument
1269         lda     [%i1]%asi,%f20
1270         lda     [%i1+4]%asi,%f21
1271         andn    %l2,%i5,%l2
1272         add     %i1,%i2,%i1             ! x += stridex
1273         addcc   %i0,-1,%i0
1274         bg,pt   %icc,.loop2
1275 ! delay slot
1276         add     %i3,%i4,%i3             ! y += stridey
1277         ba,pt   %icc,.endloop2
1278 ! delay slot
1279         nop

1281         SET_SIZE(__vexp)
```

```
**********************************************************
   44123 Sat May 10 12:09:58 2014
new/usr/src/lib/libmvec/common/vis/__vexpf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vexpf.S"

#include "libm.h"

        RO_DATA
        .align  64
!!  2^(i/256) - ((i & 0xf0) << 44), i = [0, 255]
.CONST_TBL:
        .word   0x3ff00000, 0x00000000, 0x3ff00b1a, 0xfa5abcbf
        .word   0x3ff0163d, 0xa9fb3335, 0x3ff02168, 0x143b0281
        .word   0x3ff02c9a, 0x3e778061, 0x3ff037d4, 0x2e11bbcc
        .word   0x3ff04315, 0xe86e7f85, 0x3ff04e5f, 0x72f654b1
        .word   0x3ff059b0, 0xd3158574, 0x3ff0650a, 0x0e3c1f89
        .word   0x3ff0706b, 0x29ddf6de, 0x3ff07bd4, 0x2b72a836
        .word   0x3ff08745, 0x18759bc8, 0x3ff092bd, 0xf66607e0
        .word   0x3ff09e3e, 0xcac6f383, 0x3ff0a9c7, 0x9b1f3919
        .word   0x3fefb558, 0x6cf9890f, 0x3fefc0f1, 0x45e46c85
        .word   0x3fefcc92, 0x2b7247f7, 0x3fefd83b, 0x23395dec
        .word   0x3fefe3ec, 0x32d3d1a2, 0x3fefefa5, 0x5fdfa9c5
        .word   0x3feffb66, 0xaffed31b, 0x3ff00730, 0x28d7233e
        .word   0x3ff01301, 0xd0125b51, 0x3ff01edb, 0xab5e2ab6
        .word   0x3ff02abd, 0xc06c31cc, 0x3ff036a8, 0x14f204ab
        .word   0x3ff0429a, 0xaea92de0, 0x3ff04e95, 0x934f312e
        .word   0x3ff05a98, 0xc8a58e51, 0x3ff066a4, 0x5471c3c2
        .word   0x3fef72b8, 0x3c7d517b, 0x3fef7ed4, 0x8695bbc0
        .word   0x3fef8af9, 0x388c8dea, 0x3fef9726, 0x58375d2f
        .word   0x3fefa35b, 0xeb6fcb75, 0x3fefaf99, 0xf8138a1c
        .word   0x3fefbbe0, 0x84045cd4, 0x3fefc82f, 0x95281c6b
        .word   0x3fefd487, 0x3168b9aa, 0x3fefe0e7, 0x5eb44027
        .word   0x3fefed50, 0x22fcd91d, 0x3feff9c1, 0x8438ce4d
        .word   0x3ff0063b, 0x88628cd6, 0x3ff012be, 0x3578a819
        .word   0x3ff01f49, 0x917ddc96, 0x3ff02bdd, 0xa27912d1
        .word   0x3fef387a, 0x6e756238, 0x3fef451f, 0xfb82140a
```



```
        .word   0x3fef51ce, 0x4fb2a63f, 0x3fef5e85, 0x711ece75
        .word   0x3fef6b45, 0x65e27cdd, 0x3fef780e, 0x341ddf29
        .word   0x3fef84df, 0xe1f56381, 0x3fef91ba, 0x7591bb70
        .word   0x3fef9e9d, 0xf51fdee1, 0x3fefab8a, 0x66d10f13
        .word   0x3fefb87f, 0xd0dad990, 0x3fefc57e, 0x39771b2f
        .word   0x3fefd285, 0xa6e4030b, 0x3fefdf96, 0x1f641589
        .word   0x3fefecaf, 0xa93e2f56, 0x3feff9d2, 0x4abd886b
        .word   0x3fef06fe, 0x0a31b715, 0x3fef1432, 0xedeeb2fd
        .word   0x3fef2170, 0xfc4cd831, 0x3fef2eb8, 0x3ba8ea32
        .word   0x3fef3c08, 0xb26416ff, 0x3fef4962, 0x66e3fa2d
        .word   0x3fef56c5, 0x5f929ff1, 0x3fef6431, 0xa2de883b
        .word   0x3fef71a7, 0x373aa9cb, 0x3fef7f26, 0x231e754a
        .word   0x3fef8cae, 0x6d05d866, 0x3fef9a40, 0x1b7140ef
        .word   0x3fefa7db, 0x34e59ff7, 0x3fefb57f, 0xbfec6cf4
        .word   0x3fefc32d, 0xc313a8e5, 0x3fefd0e5, 0x44ede173
        .word   0x3feedea6, 0x4c123422, 0x3feeec70, 0xdf1c5175
        .word   0x3feefa45, 0x04ac801c, 0x3fef0822, 0xc367a024
        .word   0x3fef160a, 0x21f72e2a, 0x3fef23fb, 0x2709468a
        .word   0x3fef31f5, 0xd950a897, 0x3fef3ffa, 0x3f84b9d4
        .word   0x3fef4e08, 0x6061892d, 0x3fef5c20, 0x42a7d232
        .word   0x3fef6a41, 0xed1d0057, 0x3fef786d, 0x668b3237
        .word   0x3fef86a2, 0xb5c13cd0, 0x3fef94e1, 0xe192aed2
        .word   0x3fefa32a, 0xf0d7d3de, 0x3fefb17d, 0xea6db7d7
        .word   0x3feebfda, 0xd5362a27, 0x3feece41, 0xb817c114
        .word   0x3feedcb2, 0x99fddd0d, 0x3feeeb2d, 0x81d8abff
        .word   0x3feef9b2, 0x769d2ca7, 0x3fef0841, 0x7f4531ee
        .word   0x3fef16da, 0xa2cf6642, 0x3fef257d, 0xe83f4eef
        .word   0x3fef342b, 0x569d4f82, 0x3fef42e2, 0xf4f6ad27
        .word   0x3fef51a4, 0xca5d920f, 0x3fef6070, 0xdde910d2
        .word   0x3fef6f47, 0x36b527da, 0x3fef7e27, 0xdbe2c4cf
        .word   0x3fef8d12, 0xd497c7fd, 0x3fef9c08, 0x27ff07cc
        .word   0x3feeab07, 0xdd485429, 0x3feeba11, 0xfba87a03
        .word   0x3feec926, 0x8a5946b7, 0x3feed845, 0x90998b93
        .word   0x3feee76f, 0x15ad2148, 0x3feef6a3, 0x20dceb71
        .word   0x3fef05e1, 0xb976dc09, 0x3fef152a, 0xe6cdf6f4
        .word   0x3fef247e, 0xb03a5585, 0x3fef33dd, 0x1d1929fd
        .word   0x3fef4346, 0x34ccc320, 0x3fef52b9, 0xfebc8fb7
        .word   0x3fef6238, 0x82552225, 0x3fef71c1, 0xc70833f6
        .word   0x3fef8155, 0xd44ca973, 0x3fef90f4, 0xb19e9538
        .word   0x3feea09e, 0x667f3bcd, 0x3feeb052, 0xfa75173e
        .word   0x3feec012, 0x750bdabf, 0x3feecfdc, 0xddd47645
        .word   0x3feedfb2, 0x3c651a2f, 0x3feeef92, 0x98593ae5
        .word   0x3feeff7d, 0xf9519484, 0x3fef0f74, 0x66f42e87
        .word   0x3fef1f75, 0xe8ec5f74, 0x3fef2f82, 0x86ead08a
        .word   0x3fef3f9a, 0x48a58174, 0x3fef4fbd, 0x35d7cbfd
        .word   0x3fef5feb, 0x564267c9, 0x3fef7024, 0xb1ab6e09
        .word   0x3fef8069, 0x4fde5d3f, 0x3fef90b9, 0x38ac1cf6
        .word   0x3feea114, 0x73eb0187, 0x3feeb17b, 0x0976cfdb
        .word   0x3feec1ed, 0x0130c132, 0x3feed26a, 0x62ff86f0
        .word   0x3feee2f3, 0x36cf4e62, 0x3feef387, 0x8491c491
        .word   0x3fef0427, 0x543e1a12, 0x3fef14d2, 0xadd106d9
        .word   0x3fef2589, 0x994cce13, 0x3fef364c, 0x1eb941f7
        .word   0x3fef471a, 0x4623c7ad, 0x3fef57f4, 0x179f5b21
        .word   0x3fef68d9, 0x9b4492ed, 0x3fef79ca, 0xd931a436
        .word   0x3fef8ac7, 0xd98a6699, 0x3fef9bd0, 0xa478580f
        .word   0x3feeace5, 0x422aa0db, 0x3feebe05, 0xbad61778
        .word   0x3feecf32, 0x16b5448c, 0x3feee06a, 0x5e0866d9
        .word   0x3feef1ae, 0x99157736, 0x3fef02fe, 0xd0282c8a
        .word   0x3fef145b, 0x0b91ffc6, 0x3fef25c3, 0x53aa2fe2
        .word   0x3fef3737, 0xb0cdc5e5, 0x3fef48b8, 0x2b5f98e5
        .word   0x3fef5a44, 0xcbc8520f, 0x3fef6bdd, 0x9a7670b3
        .word   0x3fef7d82, 0x9fde4e50, 0x3fef8f33, 0xe47a22a2
        .word   0x3fefa0f1, 0x70ca07ba, 0x3fefb2bb, 0x4d53fe0d
        .word   0x3feec491, 0x82a3f090, 0x3feed674, 0x194bb8d5
        .word   0x3feee863, 0x19e32323, 0x3feefa5e, 0x8d07f29e
        .word   0x3fef0c66, 0x7b5de565, 0x3fef1e7a, 0xed8eb8bb
```

```
128         .word   0x3fef309b, 0xec4a2d33, 0x3fef42c9, 0x80460ad8
129         .word   0x3fef5503, 0xb23e255d, 0x3fef674a, 0x8af46052
130         .word   0x3fef799e, 0x1330b358, 0x3fef8bfe, 0x53c12e59
131         .word   0x3fef9e6b, 0x5579fdbf, 0x3fefb0e5, 0x21356eba
132         .word   0x3fefc36b, 0xbfd3f37a, 0x3fefd5ff, 0x3a3c2774
133         .word   0x3feee89f, 0x995ad3ad, 0x3feefb4c, 0xe622f2ff
134         .word   0x3fef0e07, 0x298db666, 0x3fef20ce, 0x6c9a8952
135         .word   0x3fef33a2, 0xb84f15fb, 0x3fef4684, 0x15b749b1
136         .word   0x3fef5972, 0x8de5593a, 0x3fef6c6e, 0x29f1c52a
137         .word   0x3fef7f76, 0xf2fb5e47, 0x3fef928c, 0xf22749e4
138         .word   0x3fefa5b0, 0x30a1064a, 0x3fefb8e0, 0xb79a6f1f
139         .word   0x3fefcc1e, 0x904bc1d2, 0x3fefdf69, 0xc3f3a207
140         .word   0x3feff2c2, 0x5bd71e09, 0x3ff00628, 0x6141b33d
141         .word   0x3fef199b, 0xdd85529c, 0x3fef2d1c, 0xd9fa652c
142         .word   0x3fef40ab, 0x5fffd07a, 0x3fef5447, 0x78fafb22
143         .word   0x3fef67f1, 0x2e57d14b, 0x3fef7ba8, 0x8988c933
144         .word   0x3fef8f6d, 0x9406e7b5, 0x3fefa340, 0x5751c4db
145         .word   0x3fefb720, 0xdcef9069, 0x3fefcb0f, 0x2e6d1675
146         .word   0x3fefdf0b, 0x555dc3fa, 0x3feff315, 0x5b5bab74
147         .word   0x3ff0072d, 0x4a07897c, 0x3ff01b53, 0x2b08c968
148         .word   0x3ff02f87, 0x080d89f2, 0x3ff043c8, 0xeacaa1d6
149         .word   0x3fef5818, 0xdcfba487, 0x3fef6c76, 0xe862e6d3
150         .word   0x3fef80e3, 0x16c98398, 0x3fef955d, 0x71ff6075
151         .word   0x3fefa9e6, 0x03db3285, 0x3fefbe7c, 0xd63a8315
152         .word   0x3fefd321, 0xf301b460, 0x3fefe7d5, 0x641c0658
153         .word   0x3feffc97, 0x337b9b5f, 0x3ff01167, 0x6b197d17
154         .word   0x3ff02646, 0x14f5a129, 0x3ff03b33, 0x3b16ee12
155         .word   0x3ff0502e, 0xe78b3ff6, 0x3ff06539, 0x24676d76
156         .word   0x3ff07a51, 0xfbc74c83, 0x3ff08f79, 0x77cdb740
157         .word   0x3fefa4af, 0xa2a490da, 0x3fefb9f4, 0x867cca6e
158         .word   0x3fefcf48, 0x2d8e67f1, 0x3fefe4aa, 0xa2188510
159         .word   0x3feffa1b, 0xee615a27, 0x3ff00f9c, 0x1cb6412a
160         .word   0x3ff0252b, 0x376bba97, 0x3ff03ac9, 0x48dd7274
161         .word   0x3ff05076, 0x5b6e4540, 0x3ff06632, 0x798844f8
162         .word   0x3ff07bfd, 0xad9cbe14, 0x3ff091d8, 0x02243c89
163         .word   0x3ff0a7c1, 0x819e90d8, 0x3ff0bdba, 0x3692d514
164         .word   0x3ff0d3c2, 0x2b8f71f1, 0x3ff0e9d9, 0x6b2a23d9

166         .word   0x7149f2ca, 0x0da24260  ! 1.0e30f, 1.0e-30f
167         .word   0x3ecebfbe, 0x9d182250  ! KA2 = 3.665566716607838332 61e-06
168         .word   0x3f662e43, 0xe2528362  ! KA1 = 2.707607828213929 80564e-03
169         .word   0x40771547, 0x652b82fe  ! K256ONLN2 = 369.3299304675746271
170         .word   0x42aeac4f, 0x42b17218  ! THRESHOLD = 87.3365402f
171                                         ! THRESHOLDL = 88.7228394f
172 ! local storage indices

174 #define tmp0            STACK_BIAS-32
175 #define tmp1            STACK_BIAS-28
176 #define tmp2            STACK_BIAS-24
177 #define tmp3            STACK_BIAS-20
178 #define tmp4            STACK_BIAS-16
179 #define tmp5            STACK_BIAS-12
180 #define tmp6            STACK_BIAS-8
181 #define tmp7            STACK_BIAS-4

183 ! sizeof temp storage - must be a multiple of 16 for V9
184 #define tmps            0x20

186 #define I5_THRESHOLD    %i5
187 #define G1_CONST_TBL    %g5
188 #define G5_CONST        %g1

190 #define F62_K256ONLN2   %f62
191 #define F60_KA2         %f60
192 #define F58_KA1         %f58
```



```
194 #define THRESHOLDL      %f0

196 ! register use
197 ! i0  n
198 ! i1  x
199 ! i2  stridex
200 ! i3  y
201 ! i4  stridey

203 ! i5  0x42aeac4f (87.3365402f)

205 ! g1  CONST_TBL
206 ! g5  0x7fffffff

208 ! f62 K256ONLN2 = 369.3299304675746271
209 ! f60 KA2 = 3.665566716607838332 61e-06
210 ! f58 KA1 = 2.707607828213929 80564e-03


213 !               !!!!!  Algorithm  !!!!!
214 !
215 !  double y, dtmp, drez;
216 !  int k, sign, Xi;
217 !  float X, Y;
218 !  int THRESHOLD = 0x42aeac4f; /* 87.3365402f */
219 !  float THRESHOLDL = 88.7228394f;
220 !  double KA2 = 3.665566716607838332 61e-06;
221 !  double KA1 = 2.707607828213929 80564e-03;
222 !  double K256ONLN2 = 369.3299304675746271;
223 !  char *CONST_TBL;
224 !
225 !  X  = px[0];
226 !  Xi = ((int*)px)[0];
227 !  ax = Xi & 0x7fffffff;
228 !
229 !  if (ax > THRESHOLD) {
230 !    sign = ((unsigned)Xi >> 29) & 4;
231 !    if (ax >= 0x7f800000) {      /* Inf or NaN */
232 !      if (ax > 0x7f800000) {     /* NaN */
233 !        Y = X * X;               /* NaN -> NaN */
234 !        return Y;
235 !      }
236 !      Y = (sign) ? zero : X;     /* +Inf -> +Inf , -Inf -> zero */
237 !      return Y;
238 !    }
239 !
240 !    if ( X < 0.0f || X >= THRESHOLDL ) {
241 !      Y = ((float*)(CONST_TBL + 2048 + sign))[0];
242 !         /* Xi >= THRESHOLDL : Y = 1.0e+30f */
243 !         /* Xi < -THRESHOLD  : Y = 1.0e-30f */
244 !      Y =  Y * Y;
245 !         /* Xi >= THRESHOLDL : +Inf + overflow  */
246 !         /* Xi < -THRESHOLD  : +0 + underflow */
247 !      return Y;
248 !    }
249 !  }
250 !  vis_write_gsr(12 << 3);
251 !  y = (double) X;
252 !  y = K256ONLN2 * y;
253 !  k = (int) y;
254 !  dtmp = (double) k;
255 !  y -= dtmp;
256 !  dtmp = y * KA2;
257 !  dtmp += KA1;
258 !  y *= dtmp;
259 !  y = (y * KA2 + KA1) * y;
```

```
!  ((int*)&drez)[0] = k;
!  ((int*)&drez)[1] = 0;
!  ((float*)&drez)[0] = vis_fpackfix(drez);
!  k &= 255;
!  k <<= 3;
!  dtmp = ((double*)(CONST_TBL + k))[0];
!  drez = vis_fpadd32(drez,dtmp);
!  y *= drez;
!  y += drez;
!  Y = (float) y;
!
!
!  fstod %f16,%f40                      ! y = (double) X
!  fmuld F62_K256ONLN2,%f40,%f40        ! y *= K256ONLN2
!  fdtoi %f40,%f16                      ! k = (int) y
!  st  %f16,[%fp+tmp0]                  ! store k
!  fitod %f16,%f34                      ! dtmp = (double) k
!  fpackfix  %f16,%f16                  ! ((float*)&drez)[0] = vis_fpackfix(drez
!  fsubd %f40,%f34,%f40                 ! y -= dtmp
!  fmuld F60_KA2,%f40,%f34              ! dtmp = y * KA2
!  faddd F58_KA1,%f34,%f34              ! dtmp += KA1
!  ld  [%fp+tmp0],%o0                   ! load k
!  fmuld %f34,%f40,%f40                 ! y *= dtmp
!  and %o0,255,%o0                      ! k &= 255
!  sll  %o0,3,%o0                       ! k <<= 3
!  ldd [G1_CONST_TBL+%o0],%f34          ! dtmp = ((double*)(CONST_TBL + k))[0]
!  fpadd32 %f16,%f34,%f34               ! drez = vis_fpadd32(drez,dtmp)
!  fmuld %f34,%f40,%f40                 ! y *= drez
!  faddd %f34,%f40,%f40                 ! y += drez
!  fdtos %f40,%f26                      ! (float) y
!----------------------------------------------------------------------

        ENTRY(__vexpf)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,g5)

        wr      %g0,0x82,%asi           ! set %asi for non-faulting loads
        wr      %g0,0x60,%gsr

        sll     %i2,2,%i2
        sll     %i4,2,%i4

        ldd     [G1_CONST_TBL+2056],F60_KA2
        sethi   %hi(0x7ffffc00),G5_CONST
        ldd     [G1_CONST_TBL+2064],F58_KA1
        add     G5_CONST,1023,G5_CONST
        ldd     [G1_CONST_TBL+2072],F62_K256ONLN2
        ld      [G1_CONST_TBL+2080],I5_THRESHOLD
        ld      [G1_CONST_TBL+2084],THRESHOLDL

        subcc   %i0,8,%i0
        bneg,pn %icc,.tail
        fzeros  %f3

.main_loop_preload:

! preload 8 elements and get absolute values
        ld      [%i1],%l0               ! (0) Xi = ((int*)px)[0]
        fzeros  %f5
        ld      [%i1],%f16              ! (0) X = px[0]
        fzeros  %f7
        add     %i1,%i2,%o5             ! px += stridex
        ld      [%o5],%l1               ! (1) Xi = ((int*)px)[0]
        and     %l0,G5_CONST,%l0        ! (0) ax = Xi & 0x7fffffff
        fzeros  %f9
```



```
        ld      [%o5],%f2               ! (1) X = px[0]
        fzeros  %f11
        add     %o5,%i2,%i1             ! px += stridex
        ld      [%i1],%l2               ! (2) Xi = ((int*)px)[0]
        and     %l1,G5_CONST,%l1        ! (1) ax = Xi & 0x7fffffff
        fzeros  %f13
        ld      [%i1],%f4               ! (2) X = px[0]
        fzeros  %f15
        add     %i1,%i2,%o5             ! px += stridex
        ld      [%o5],%l3               ! (3) Xi = ((int*)px)[0]
        and     %l2,G5_CONST,%l2        ! (2) ax = Xi & 0x7fffffff
        fzeros  %f17
        ld      [%o5],%f6               ! (3) X = px[0]
        add     %o5,%i2,%o0             ! px += stridex
        ld      [%o0],%l4               ! (4) Xi = ((int*)px)[0]
        and     %l3,G5_CONST,%l3        ! (3) ax = Xi & 0x7fffffff
        add     %o0,%i2,%o1             ! px += stridex
        ld      [%o1],%l5               ! (5) Xi = ((int*)px)[0]
        add     %o1,%i2,%o2             ! px += stridex
        ld      [%o2],%l6               ! (6) Xi = ((int*)px)[0]
        and     %l4,G5_CONST,%l4        ! (4) ax = Xi & 0x7fffffff
        add     %o2,%i2,%o3             ! px += stridex
        ld      [%o3],%l7               ! (7) Xi = ((int*)px)[0]
        add     %o3,%i2,%i1             ! px += stridex
        and     %l5,G5_CONST,%l5        ! (5) ax = Xi & 0x7fffffff
        and     %l6,G5_CONST,%l6        ! (6) ax = Xi & 0x7fffffff
        ba      .main_loop
        and     %l7,G5_CONST,%l7        ! (7) ax = Xi & 0x7fffffff

        .align  16
.main_loop:
        cmp     %l0,I5_THRESHOLD
        bg,pn   %icc,.spec0             ! (0) if (ax > THRESHOLD)
        lda     [%o0]%asi,%f8           ! (4) X = px[0]
        fstod   %f16,%f40               ! (0) y = (double) X
.spec0_cont:
        cmp     %l1,I5_THRESHOLD
        bg,pn   %icc,.spec1             ! (1) if (ax > THRESHOLD)
        lda     [%o1]%asi,%f10          ! (5) X = px[0]
        fstod   %f2,%f42                ! (1) y = (double) X
.spec1_cont:
        cmp     %l2,I5_THRESHOLD
        bg,pn   %icc,.spec2             ! (2) if (ax > THRESHOLD)
        lda     [%o2]%asi,%f12          ! (6) X = px[0]
        fstod   %f4,%f44                ! (2) y = (double) X
.spec2_cont:
        cmp     %l3,I5_THRESHOLD
        bg,pn   %icc,.spec3             ! (3) if (ax > THRESHOLD)
        lda     [%o3]%asi,%f14          ! (7) X = px[0]
        fstod   %f6,%f46                ! (3) y = (double) X
.spec3_cont:
        cmp     %l4,I5_THRESHOLD
        bg,pn   %icc,.spec4             ! (4) if (ax > THRESHOLD)
        fmuld   F62_K256ONLN2,%f40,%f40 ! (0) y *= K256ONLN2
        fstod   %f8,%f48                ! (4) y = (double) X
.spec4_cont:
        cmp     %l5,I5_THRESHOLD
        bg,pn   %icc,.spec5             ! (5) if (ax > THRESHOLD)
        fmuld   F62_K256ONLN2,%f42,%f42 ! (1) y *= K256ONLN2
        fstod   %f10,%f50               ! (5) y = (double) X
.spec5_cont:
        cmp     %l6,I5_THRESHOLD
        bg,pn   %icc,.spec6             ! (6) if (ax > THRESHOLD)
        fmuld   F62_K256ONLN2,%f44,%f44 ! (2) y *= K256ONLN2
        fstod   %f12,%f52               ! (6) y = (double) X
.spec6_cont:
```

```
392         cmp     %l7,I5_THRESHOLD
393         bg,pn   %icc,.spec7             ! (7) if (ax > THRESHOLD)
394         fmuld   F62_K256ONLN2,%f46,%f46 ! (3) y *= K256ONLN2
395         fstod   %f14,%f54               ! (7) y = (double) X
396 .spec7_cont:
397         fdtoi   %f40,%f16               ! (0) k = (int) y
398         st      %f16,[%fp+tmp0]
399         fmuld   F62_K256ONLN2,%f48,%f48 ! (4) y *= K256ONLN2

401         fdtoi   %f42,%f2                ! (1) k = (int) y
402         st      %f2,[%fp+tmp1]
403         fmuld   F62_K256ONLN2,%f50,%f50 ! (5) y *= K256ONLN2

405         fdtoi   %f44,%f4                ! (2) k = (int) y
406         st      %f4,[%fp+tmp2]
407         fmuld   F62_K256ONLN2,%f52,%f52 ! (6) y *= K256ONLN2

409         fdtoi   %f46,%f6                ! (3) k = (int) y
410         st      %f6,[%fp+tmp3]
411         fmuld   F62_K256ONLN2,%f54,%f54 ! (7) y *= K256ONLN2

413         fdtoi   %f48,%f8                ! (4) k = (int) y
414         st      %f8,[%fp+tmp4]

416         fdtoi   %f50,%f10               ! (5) k = (int) y
417         st      %f10,[%fp+tmp5]

419         fitod   %f16,%f34               ! (0) dtmp = (double) k
420         fpackfix        %f16,%f16       ! (0) ((float*)&drez)[0] = vis_fpackfix(
421         nop
422         nop

424         fdtoi   %f52,%f12               ! (6) k = (int) y
425         st      %f12,[%fp+tmp6]

427         fdtoi   %f54,%f14               ! (7) k = (int) y
428         st      %f14,[%fp+tmp7]

430         lda     [%i1]%asi,%l0           ! (8) Xi = ((int*)px)[0]
431         add     %i1,%i2,%o5             ! px += stridex
432         fitod   %f2,%f18                ! (1) dtmp = (double) k
433         fpackfix        %f2,%f2         ! (1) ((float*)&drez)[0] = vis_fpackfix(

435         lda     [%o5]%asi,%l1           ! (9) Xi = ((int*)px)[0]
436         add     %o5,%i2,%i1             ! px += stridex
437         fitod   %f4,%f20                ! (2) dtmp = (double) k
438         fpackfix        %f4,%f4         ! (2) ((float*)&drez)[0] = vis_fpackfix(

440         lda     [%i1]%asi,%l2           ! (10) Xi = ((int*)px)[0]
441         add     %i1,%i2,%o5             ! px += stridex
442         fitod   %f6,%f22                ! (3) dtmp = (double) k
443         fpackfix        %f6,%f6         ! (3) ((float*)&drez)[0] = vis_fpackfix(

445         lda     [%o5]%asi,%l3           ! (11) Xi = ((int*)px)[0]
446         add     %o5,%i2,%i1             ! px += stridex
447         fitod   %f8,%f24                ! (4) dtmp = (double) k
448         fpackfix        %f8,%f8         ! (4) ((float*)&drez)[0] = vis_fpackfix(

450         fitod   %f10,%f26               ! (5) dtmp = (double) k
451         fpackfix        %f10,%f10       ! (5) ((float*)&drez)[0] = vis_fpackfix(

453         fitod   %f12,%f28               ! (6) dtmp = (double) k
454         fpackfix        %f12,%f12       ! (6) ((float*)&drez)[0] = vis_fpackfix(

456         fitod   %f14,%f30               ! (7) dtmp = (double) k
457         fpackfix        %f14,%f14       ! (7) ((float*)&drez)[0] = vis_fpackfix(
```



```
459         ld      [%fp+tmp0],%o0          ! (0) load k
460         and     %l0,G5_CONST,%l0        ! (8) ax = Xi & 0x7fffffff
461         fsubd   %f40,%f34,%f40          ! (0) y -= dtmp

463         ld      [%fp+tmp1],%o1          ! (1) load k
464         and     %l1,G5_CONST,%l1        ! (9) ax = Xi & 0x7fffffff
465         fsubd   %f42,%f18,%f42          ! (1) y -= dtmp

467         ld      [%fp+tmp2],%o2          ! (2) load k
468         and     %l2,G5_CONST,%l2        ! (10) ax = Xi & 0x7fffffff
469         and     %o0,255,%o0             ! (0) k &= 255
470         fsubd   %f44,%f20,%f44          ! (2) y -= dtmp

472         ld      [%fp+tmp3],%o3          ! (3) load k
473         and     %o1,255,%o1             ! (1) k &= 255
474         fsubd   %f46,%f22,%f46          ! (3) y -= dtmp

476         sll     %o0,3,%o0               ! (0) k <<= 3
477         sll     %o1,3,%o1               ! (1) k <<= 3
478         fmuld   F60_KA2,%f40,%f34       ! (0) dtmp = y * KA2
479         fsubd   %f48,%f24,%f48          ! (4) y -= dtmp

481         and     %l3,G5_CONST,%l3        ! (11) ax = Xi & 0x7fffffff
482         and     %o2,255,%o2             ! (2) k &= 255
483         fmuld   F60_KA2,%f42,%f18       ! (1) dtmp = y * KA2
484         fsubd   %f50,%f26,%f50          ! (5) y -= dtmp

486         sll     %o2,3,%o2               ! (2) k <<= 3
487         fmuld   F60_KA2,%f44,%f20       ! (2) dtmp = y * KA2
488         fsubd   %f52,%f28,%f52          ! (6) y -= dtmp

490         ld      [%fp+tmp4],%o4          ! (4) load k
491         and     %o3,255,%o3             ! (3) k &= 255
492         fmuld   F60_KA2,%f46,%f22       ! (3) dtmp = y * KA2
493         fsubd   %f54,%f30,%f54          ! (7) y -= dtmp

495         ld      [%fp+tmp5],%o5          ! (5) load k
496         sll     %o3,3,%o3               ! (3) k <<= 3
497         fmuld   F60_KA2,%f48,%f24       ! (4) dtmp = y * KA2
498         faddd   F58_KA1,%f34,%f34       ! (0) dtmp += KA1

500         ld      [%fp+tmp6],%o7          ! (6) load k
501         and     %o4,255,%o4             ! (4) k &= 255
502         fmuld   F60_KA2,%f50,%f26       ! (5) dtmp = y * KA2
503         faddd   F58_KA1,%f18,%f18       ! (1) dtmp += KA1

505         ld      [%fp+tmp7],%l4          ! (7) load k
506         and     %o5,255,%o5             ! (5) k &= 255
507         fmuld   F60_KA2,%f52,%f28       ! (6) dtmp = y * KA2
508         faddd   F58_KA1,%f20,%f20       ! (2) dtmp += KA1

510         sll     %o5,3,%o5               ! (5) k <<= 3
511         fmuld   F60_KA2,%f54,%f30       ! (7) dtmp = y * KA2
512         faddd   F58_KA1,%f22,%f22       ! (3) dtmp += KA1

514         fmuld   %f34,%f40,%f40          ! (0) y *= dtmp
515         ldd     [G1_CONST_TBL+%o0],%f34 ! (0) dtmp = ((double*)(CONST_TBL + k))[
516         and     %l4,255,%l4             ! (7) k &= 255
517         faddd   F58_KA1,%f24,%f24       ! (4) dtmp += KA1

519         fmuld   %f18,%f42,%f42          ! (1) y *= dtmp
520         ldd     [G1_CONST_TBL+%o1],%f18 ! (1) dtmp = ((double*)(CONST_TBL + k))[
521         sll     %l4,3,%l4               ! (7) k <<= 3
522         faddd   F58_KA1,%f26,%f26       ! (5) dtmp += KA1
```

```
524         fmuld   %f20,%f44,%f44          ! (2) y *= dtmp
525         ldd     [G1_CONST_TBL+%o2],%f20 ! (2) dtmp = ((double*)(CONST_TBL + k))[
526         faddd   F58_KA1,%f28,%f28       ! (6) dtmp += KA1

528         fmuld   %f22,%f46,%f46          ! (3) y *= dtmp
529         ldd     [G1_CONST_TBL+%o3],%f22 ! (3) dtmp = ((double*)(CONST_TBL + k))[
530         sll     %o4,3,%o4               ! (4) k <<= 3
531         faddd   F58_KA1,%f30,%f30       ! (7) dtmp += KA1

533         fmuld   %f24,%f48,%f48          ! (4) y *= dtmp
534         ldd     [G1_CONST_TBL+%o4],%f24 ! (4) dtmp = ((double*)(CONST_TBL + k))[
535         and     %o7,255,%o7             ! (6) k &= 255
536         fpadd32 %f16,%f34,%f34          ! (0) drez = vis_fpadd32(drez,dtmp)

538         fmuld   %f26,%f50,%f50          ! (5) y *= dtmp
539         ldd     [G1_CONST_TBL+%o5],%f26 ! (5) dtmp = ((double*)(CONST_TBL + k))[
540         sll     %o7,3,%o7               ! (6) k <<= 3
541         fpadd32 %f2,%f18,%f18           ! (1) drez = vis_fpadd32(drez,dtmp)

543         fmuld   %f28,%f52,%f52          ! (6) y *= dtmp
544         ldd     [G1_CONST_TBL+%o7],%f28 ! (6) dtmp = ((double*)(CONST_TBL + k))[
545         sll     %i2,2,%o0
546         fpadd32 %f4,%f20,%f20           ! (2) drez = vis_fpadd32(drez,dtmp)

548         fmuld   %f30,%f54,%f54          ! (7) y *= dtmp
549         ldd     [G1_CONST_TBL+%l4],%f30 ! (7) dtmp = ((double*)(CONST_TBL + k))[
550         sub     %i1,%o0,%o0
551         fpadd32 %f6,%f22,%f22           ! (3) drez = vis_fpadd32(drez,dtmp)

553         lda     [%i1]%asi,%l4           ! (12) Xi = ((int*)px)[0]
554         add     %i1,%i2,%o1             ! px += stridex
555         fpadd32 %f8,%f24,%f24           ! (4) drez = vis_fpadd32(drez,dtmp)
556         fmuld   %f34,%f40,%f40          ! (0) y *= drez

558         lda     [%o1]%asi,%l5           ! (13) Xi = ((int*)px)[0]
559         add     %o1,%i2,%o2             ! px += stridex
560         fpadd32 %f10,%f26,%f26          ! (5)  drez = vis_fpadd32(drez,dtmp)
561         fmuld   %f18,%f42,%f42          ! (1)  y *= drez

563         lda     [%o2]%asi,%l6           ! (14) Xi = ((int*)px)[0]
564         add     %o2,%i2,%o3             ! px += stridex
565         fpadd32 %f12,%f28,%f28          ! (6)  drez = vis_fpadd32(drez,dtmp)
566         fmuld   %f20,%f44,%f44          ! (2)  y *= drez

568         lda     [%o3]%asi,%l7           ! (15) Xi = ((int*)px)[0]
569         add     %o3,%i2,%i1             ! px += stridex
570         fpadd32 %f14,%f30,%f30          ! (7)  drez = vis_fpadd32(drez,dtmp)
571         fmuld   %f22,%f46,%f46          ! (3)  y *= drez

573         lda     [%o0]%asi,%f16          ! (8)  X = px[0]
574         add     %o0,%i2,%o5
575         fmuld   %f24,%f48,%f48          ! (4)  y *= drez
576         faddd   %f34,%f40,%f40          ! (0)  y += drez

578         lda     [%o5]%asi,%f2           ! (9)  X = px[0]
579         add     %o5,%i2,%o0
580         fmuld   %f26,%f50,%f50          ! (5)  y *= drez
581         faddd   %f18,%f42,%f42          ! (1)  y += drez

583         lda     [%o0]%asi,%f4           ! (10) X = px[0]
584         add     %o0,%i2,%o5
585         fmuld   %f28,%f52,%f52          ! (6)  y *= drez
586         faddd   %f20,%f44,%f44          ! (2)  y += drez

588         lda     [%o5]%asi,%f6           ! (11) X = px[0]
589         add     %o5,%i2,%o0
```



```
590         fmuld   %f30,%f54,%f54          ! (7)  y *= drez
591         faddd   %f22,%f46,%f46          ! (3)  y += drez

593         and     %l4,G5_CONST,%l4        ! (12) ax = Xi & 0x7fffffff
594         faddd   %f24,%f48,%f48          ! (4)  y += drez

596         and     %l5,G5_CONST,%l5        ! (13) ax = Xi & 0x7fffffff
597         faddd   %f26,%f50,%f50          ! (5)  y += drez

599         and     %l6,G5_CONST,%l6        ! (14) ax = Xi & 0x7fffffff
600         faddd   %f28,%f52,%f52          ! (6)  y += drez

602         and     %l7,G5_CONST,%l7        ! (15) ax = Xi & 0x7fffffff
603         faddd   %f30,%f54,%f54          ! (7)  y += drez

605         fdtos   %f40,%f26               ! (0) (float) y
606         st      %f26,[%i3]
607         add     %i3,%i4,%o4             ! py += stridey

609         fdtos   %f42,%f18               ! (1) (float) y
610         st      %f18,[%o4]
611         add     %o4,%i4,%i3             ! py += stridey

613         fdtos   %f44,%f20               ! (2) (float) y
614         st      %f20,[%i3]
615         add     %i3,%i4,%o4             ! py += stridey

617         fdtos   %f46,%f22               ! (3) (float) y
618         st      %f22,[%o4]
619         add     %o4,%i4,%i3             ! py += stridey

621         fdtos   %f48,%f24               ! (4) (float) y
622         st      %f24,[%i3]
623         subcc   %i0,8,%i0
624         add     %i3,%i4,%o4             ! py += stridey

626         fdtos   %f50,%f26               ! (5) (float) y
627         st      %f26,[%o4]
628         add     %o4,%i4,%o5             ! py += stridey
629         add     %i4,%i4,%o7

631         fdtos   %f52,%f28               ! (6) (float) y
632         st      %f28,[%o5]
633         add     %o5,%i4,%o4             ! py += stridey
634         add     %o5,%o7,%i3             ! py += stridey

636         fdtos   %f54,%f30               ! (7) (float) y
637         st      %f30,[%o4]
638         bpos,pt %icc,.main_loop
639         nop
640 .after_main_loop:
641         sll     %i2,3,%o2
642         sub     %i1,%o2,%i1

644 .tail:
645         add     %i0,8,%i0
646         subcc   %i0,1,%i0
647         bneg,pn %icc,.exit

649         ld      [%i1],%l0
650         ld      [%i1],%f2
651         add     %i1,%i2,%i1

653 .tail_loop:
654         and     %l0,G5_CONST,%l1
655         cmp     %l1,I5_THRESHOLD
```

```
656         bg,pn   %icc,.tail_spec
657         nop
658 .tail_spec_cont:
659         fstod   %f2,%f40
660         fmuld   F62_K256ONLN2,%f40,%f40
661         fdtoi   %f40,%f2
662         st      %f2,[%fp+tmp0]
663         fitod   %f2,%f16
664         fpackfix        %f2,%f2
665         fsubd   %f40,%f16,%f40
666         fmuld   F60_KA2,%f40,%f16
667         faddd   F58_KA1,%f16,%f16
668         ld      [%fp+tmp0],%o0
669         fmuld   %f16,%f40,%f40
670         and     %o0,255,%o0
671         sll     %o0,3,%o0
672         ldd     [G1_CONST_TBL+%o0],%f16
673         fpadd32 %f2,%f16,%f16
674         lda     [%i1]%asi,%l0
675         fmuld   %f16,%f40,%f40
676         lda     [%i1]%asi,%f2
677         faddd   %f16,%f40,%f40
678         add     %i1,%i2,%i1
679         fdtos   %f40,%f16
680         st      %f16,[%i3]
681         add     %i3,%i4,%i3
682         subcc   %i0,1,%i0
683         bpos,pt %icc,.tail_loop
684         nop

686 .exit:
687         ret
688         restore

690 .tail_spec:
691         sethi   %hi(0x7f800000),%o4
692         cmp     %l1,%o4
693         bl,pt   %icc,.tail_spec_out_of_range
694         nop

696         srl     %l0,29,%l0
697         ble,pn  %icc,.tail_spec_inf
698         andcc   %l0,4,%g0

700 ! NaN -> NaN

702         fmuls   %f2,%f2,%f2
703         ba      .tail_spec_exit
704         st      %f2,[%i3]

706 .tail_spec_inf:
707         be,a,pn %icc,.tail_spec_exit
708         st      %f2,[%i3]

710         ba      .tail_spec_exit
711         st      %f3,[%i3]

713 .tail_spec_out_of_range:
714         fcmpes  %fcc0,%f2,%f3
715         fcmpes  %fcc1,%f2,THRESHOLDL
716         fbl,pn  %fcc0,1f                ! if ( X < 0.0f )
717         nop
718         fbl,pt  %fcc1,.tail_spec_cont   ! if ( X < THRESHOLDL )
719         nop
720 1:
721         srl     %l0,29,%l0
```



```
722         and     %l0,4,%l0
723         add     %l0,2048,%l0
724         ld      [G1_CONST_TBL+%l0],%f2
725         fmuls   %f2,%f2,%f2
726         st      %f2,[%i3]

728 .tail_spec_exit:
729         lda     [%i1]%asi,%l0
730         lda     [%i1]%asi,%f2
731         add     %i1,%i2,%i1

733         subcc   %i0,1,%i0
734         bpos,pt %icc,.tail_loop
735         add     %i3,%i4,%i3
736         ba      .exit
737         nop

739         .align  16
740 .spec0:
741         sethi   %hi(0x7f800000),%o5
742         cmp     %l0,%o5
743         bl,pt   %icc,.spec0_out_of_range
744         sll     %i2,3,%o4

746         ble,pn  %icc,.spec0_inf
747         sub     %i1,%o4,%o4

749 ! NaN -> NaN

751         fmuls   %f16,%f16,%f16
752         ba      .spec0_exit
753         st      %f16,[%i3]

755 .spec0_inf:
756         ld      [%o4],%l0
757         srl     %l0,29,%l0
758         andcc   %l0,4,%l0
759         be,a,pn %icc,.spec0_exit
760         st      %f16,[%i3]

762         ba      .spec0_exit
763         st      %f3,[%i3]

765 .spec0_out_of_range:
766         fcmpes  %fcc0,%f16,%f3
767         fcmpes  %fcc1,%f16,THRESHOLDL
768         fbl,a,pn        %fcc0,1f                ! if ( X < 0.0f )
769         fstod   %f16,%f40                       ! (0) y = (double) X
770         fbl,a,pt        %fcc1,.spec0_cont       ! if ( X < THRESHOLDL )
771         fstod   %f16,%f40                       ! (0) y = (double) X
772 1:
773         sub     %i1,%o4,%o4
774         ld      [%o4],%l0
775         srl     %l0,29,%l0
776         and     %l0,4,%l0
777         add     %l0,2048,%l0
778         ld      [G1_CONST_TBL+%l0],%f16
779         fmuls   %f16,%f16,%f16
780         st      %f16,[%i3]

782 .spec0_exit:
783         fmovs   %f2,%f16
784         mov     %l1,%l0
785         fmovs   %f4,%f2
786         mov     %l2,%l1
787         fmovs   %f6,%f4
```

```
788         mov     %l3,%l2
789         fmovs   %f8,%f6
790         mov     %l4,%l3
791         mov     %l5,%l4
792         mov     %l6,%l5
793         mov     %l7,%l6
794         lda     [%i1]%asi,%l7
795         add     %i1,%i2,%i1
796         mov     %o1,%o0
797         mov     %o2,%o1
798         mov     %o3,%o2
799         and     %l7,G5_CONST,%l7
800         add     %o2,%i2,%o3

802         subcc   %i0,1,%i0
803         bpos,pt %icc,.main_loop
804         add     %i3,%i4,%i3
805         ba      .after_main_loop
806         nop

808         .align  16
809 .spec1:
810         sethi   %hi(0x7f800000),%o5
811         cmp     %l1,%o5
812         bge,pn  %icc,1f
813         nop
814         fcmpes  %fcc0,%f2,%f3
815         fcmpes  %fcc1,%f2,THRESHOLDL
816         fbl,a,pn        %fcc0,1f                ! if ( X < 0.0f )
817         fstod   %f2,%f42                        ! (1) y = (double) X
818         fbl,a,pt        %fcc1,.spec1_cont       ! if ( X < THRESHOLDL )
819         fstod   %f2,%f42                        ! (1) y = (double) X
820 1:
821         fmuld   F62_K256ONLN2,%f40,%f40
822         fdtoi   %f40,%f16
823         st      %f16,[%fp+tmp0]
824         fitod   %f16,%f34
825         fpackfix        %f16,%f16
826         fsubd   %f40,%f34,%f40
827         fmuld   F60_KA2,%f40,%f34
828         faddd   F58_KA1,%f34,%f34
829         ld      [%fp+tmp0],%o0
830         fmuld   %f34,%f40,%f40
831         and     %o0,255,%o0
832         sll     %o0,3,%o0
833         ldd     [G1_CONST_TBL+%o0],%f34
834         fpadd32 %f16,%f34,%f34
835         fmuld   %f34,%f40,%f40
836         faddd   %f34,%f40,%f40
837         fdtos   %f40,%f26
838         st      %f26,[%i3]
839         add     %i3,%i4,%i3

841         cmp     %l1,%o5
842         bl,pt   %icc,.spec1_out_of_range
843         sll     %i2,3,%o4

845         ble,pn  %icc,.spec1_inf
846         sub     %i1,%o4,%o4

848 ! NaN -> NaN

850         fmuls   %f2,%f2,%f2
851         ba      .spec1_exit
852         st      %f2,[%i3]
```



```
854 .spec1_inf:
855         add     %o4,%i2,%o4
856         ld      [%o4],%l0
857         srl     %l0,29,%l0
858         andcc   %l0,4,%l0
859         be,a,pn %icc,.spec1_exit
860         st      %f2,[%i3]

862         ba      .spec1_exit
863         st      %f3,[%i3]

865 .spec1_out_of_range:
866         sub     %i1,%o4,%o4
867         add     %o4,%i2,%o4
868         ld      [%o4],%l0
869         srl     %l0,29,%l0
870         and     %l0,4,%l0
871         add     %l0,2048,%l0
872         ld      [G1_CONST_TBL+%l0],%f2
873         fmuls   %f2,%f2,%f2
874         st      %f2,[%i3]

876 .spec1_exit:
877         fmovs   %f4,%f16
878         mov     %l2,%l0
879         fmovs   %f6,%f2
880         mov     %l3,%l1
881         fmovs   %f8,%f4
882         mov     %l4,%l2
883         fmovs   %f10,%f6
884         mov     %l5,%l3
885         mov     %l6,%l4
886         mov     %l7,%l5
887         lda     [%i1]%asi,%l6
888         add     %i1,%i2,%i1
889         lda     [%i1]%asi,%l7
890         add     %i1,%i2,%i1
891         and     %l6,G5_CONST,%l6
892         and     %l7,G5_CONST,%l7
893         mov     %o2,%o0
894         mov     %o3,%o1
895         add     %o1,%i2,%o2
896         add     %o2,%i2,%o3

898         subcc   %i0,2,%i0
899         bpos,pt %icc,.main_loop
900         add     %i3,%i4,%i3
901         ba      .after_main_loop
902         nop

904         .align  16
905 .spec2:
906         sethi   %hi(0x7f800000),%o5
907         cmp     %l2,%o5
908         bge,pn  %icc,1f
909         nop
910         fcmpes  %fcc0,%f4,%f3
911         fcmpes  %fcc1,%f4,THRESHOLDL
912         fbl,a,pn        %fcc0,1f                ! if ( X < 0.0f )
913         fstod   %f4,%f44                        ! (2) y = (double) X
914         fbl,a,pt        %fcc1,.spec2_cont       ! if ( X < THRESHOLDL )
915         fstod   %f4,%f44                        ! (2) y = (double) X
916 1:
917         fmuld   F62_K256ONLN2,%f40,%f40

919         fmuld   F62_K256ONLN2,%f42,%f42
```

```
921         fdtoi   %f40,%f16
922         st      %f16,[%fp+tmp0]

924         fdtoi   %f42,%f2
925         st      %f2,[%fp+tmp1]

927         fitod   %f16,%f34
928         fpackfix        %f16,%f16

930         fitod   %f2,%f18
931         fpackfix        %f2,%f2

933         fsubd   %f40,%f34,%f40

935         fsubd   %f42,%f18,%f42

937         fmuld   F60_KA2,%f40,%f34

939         fmuld   F60_KA2,%f42,%f18

941         faddd   F58_KA1,%f34,%f34

943         faddd   F58_KA1,%f18,%f18

945         ld      [%fp+tmp0],%o0
946         fmuld   %f34,%f40,%f40

948         ld      [%fp+tmp1],%o1
949         fmuld   %f18,%f42,%f42

951         and     %o0,255,%o0

953         and     %o1,255,%o1

955         sll     %o0,3,%o0

957         sll     %o1,3,%o1

959         ldd     [G1_CONST_TBL+%o0],%f34

961         ldd     [G1_CONST_TBL+%o1],%f18

963         fpadd32 %f16,%f34,%f34

965         fpadd32 %f2,%f18,%f18

967         fmuld   %f34,%f40,%f40

969         fmuld   %f18,%f42,%f42

971         faddd   %f34,%f40,%f40

973         faddd   %f18,%f42,%f42

975         fdtos   %f40,%f26
976         st      %f26,[%i3]
977         add     %i3,%i4,%o4

979         fdtos   %f42,%f18
980         st      %f18,[%o4]
981         add     %o4,%i4,%i3

983         cmp     %l2,%o5
984         sll     %i2,1,%o5
985         bl,pt   %icc,.spec2_out_of_range
```



```
986         sll     %i2,2,%o4

988         ble,pn  %icc,.spec2_inf
989         add     %o4,%o5,%o4

991 ! NaN -> NaN

993         fmuls   %f4,%f4,%f4
994         ba      .spec2_exit
995         st      %f4,[%i3]

997 .spec2_inf:
998         sub     %i1,%o4,%o4
999         ld      [%o4],%l0
1000        srl     %l0,29,%l0
1001        andcc   %l0,4,%l0
1002        be,a,pn %icc,.spec2_exit
1003        st      %f4,[%i3]

1005        ba      .spec2_exit
1006        st      %f3,[%i3]

1008 .spec2_out_of_range:
1009        add     %o4,%o5,%o4
1010        sub     %i1,%o4,%o4
1011        ld      [%o4],%l0
1012        srl     %l0,29,%l0
1013        and     %l0,4,%l0
1014        add     %l0,2048,%l0
1015        ld      [G1_CONST_TBL+%l0],%f2
1016        fmuls   %f2,%f2,%f2
1017        st      %f2,[%i3]

1019 .spec2_exit:
1020        fmovs   %f6,%f16
1021        mov     %l3,%l0
1022        mov     %o3,%o0
1023        fmovs   %f8,%f2
1024        mov     %l4,%l1
1025        add     %o0,%i2,%o1
1026        fmovs   %f10,%f4
1027        mov     %l5,%l2
1028        add     %o1,%i2,%o2
1029        fmovs   %f12,%f6
1030        mov     %l6,%l3
1031        mov     %l7,%l4
1032        lda     [%i1]%asi,%l5
1033        add     %i1,%i2,%i1
1034        add     %o2,%i2,%o3
1035        lda     [%i1]%asi,%l6
1036        add     %i1,%i2,%i1
1037        lda     [%i1]%asi,%l7
1038        add     %i1,%i2,%i1
1039        and     %l5,G5_CONST,%l5
1040        and     %l6,G5_CONST,%l6
1041        and     %l7,G5_CONST,%l7

1043        subcc   %i0,3,%i0
1044        bpos,pt %icc,.main_loop
1045        add     %i3,%i4,%i3
1046        ba      .after_main_loop
1047        nop
1048 .spec3:
1049        sethi   %hi(0x7f800000),%o5
1050        cmp     %l3,%o5
1051        bge,pn  %icc,1f
```

```
1052         nop
1053         fcmpes  %fcc0,%f6,%f3
1054         fcmpes  %fcc1,%f6,THRESHOLDL
1055         fbl,a,pn        %fcc0,1f                ! if ( X < 0.0f )
1056         fstod   %f6,%f46                        ! (3) y = (double) X
1057         fbl,a,pt        %fcc1,.spec3_cont       ! if ( X < THRESHOLDL )
1058         fstod   %f6,%f46                        ! (3) y = (double) X
1059 1:
1060         fmuld   F62_K256ONLN2,%f40,%f40

1062         fmuld   F62_K256ONLN2,%f42,%f42

1064         fmuld   F62_K256ONLN2,%f44,%f44

1066         fdtoi   %f40,%f16
1067         st      %f16,[%fp+tmp0]

1069         fdtoi   %f42,%f2
1070         st      %f2,[%fp+tmp1]

1072         fdtoi   %f44,%f4
1073         st      %f4,[%fp+tmp2]

1075         fitod   %f16,%f34
1076         fpackfix        %f16,%f16

1078         fitod   %f2,%f18
1079         fpackfix        %f2,%f2

1081         fitod   %f4,%f20
1082         fpackfix        %f4,%f4

1084         fsubd   %f40,%f34,%f40

1086         fsubd   %f42,%f18,%f42

1088         fsubd   %f44,%f20,%f44

1090         fmuld   F60_KA2,%f40,%f34

1092         fmuld   F60_KA2,%f42,%f18

1094         fmuld   F60_KA2,%f44,%f20

1096         faddd   F58_KA1,%f34,%f34

1098         faddd   F58_KA1,%f18,%f18

1100         faddd   F58_KA1,%f20,%f20

1102         ld      [%fp+tmp0],%o0
1103         fmuld   %f34,%f40,%f40

1105         ld      [%fp+tmp1],%o1
1106         fmuld   %f18,%f42,%f42

1108         ld      [%fp+tmp2],%o2
1109         fmuld   %f20,%f44,%f44

1111         and     %o0,255,%o0
1112         and     %o1,255,%o1

1114         and     %o2,255,%o2
1115         sll     %o0,3,%o0

1117         sll     %o1,3,%o1
```



```
1118         sll     %o2,3,%o2

1120         ldd     [G1_CONST_TBL+%o0],%f34

1122         ldd     [G1_CONST_TBL+%o1],%f18

1124         ldd     [G1_CONST_TBL+%o2],%f20

1126         fpadd32 %f16,%f34,%f34

1128         fpadd32 %f2,%f18,%f18

1130         fpadd32 %f4,%f20,%f20

1132         fmuld   %f34,%f40,%f40

1134         fmuld   %f18,%f42,%f42

1136         fmuld   %f20,%f44,%f44

1138         faddd   %f34,%f40,%f40

1140         faddd   %f18,%f42,%f42

1142         faddd   %f20,%f44,%f44

1144         fdtos   %f40,%f26
1145         st      %f26,[%i3]
1146         add     %i3,%i4,%o4

1148         fdtos   %f42,%f18
1149         st      %f18,[%o4]
1150         add     %o4,%i4,%i3

1152         fdtos   %f44,%f20
1153         st      %f20,[%i3]
1154         add     %i3,%i4,%i3

1156         cmp     %l3,%o5
1157         bl,pt   %icc,.spec3_out_of_range
1158         sll     %i2,2,%o4

1160         ble,pn  %icc,.spec3_inf
1161         add     %o4,%i2,%o4

1163 ! NaN -> NaN

1165         fmuls   %f6,%f6,%f6
1166         ba      .spec3_exit
1167         st      %f6,[%i3]

1169 .spec3_inf:
1170         sub     %i1,%o4,%o4
1171         ld      [%o4],%l0
1172         srl     %l0,29,%l0
1173         andcc   %l0,4,%l0
1174         be,a,pn %icc,.spec3_exit
1175         st      %f6,[%i3]

1177         ba      .spec3_exit
1178         st      %f3,[%i3]

1180 .spec3_out_of_range:
1181         add     %o4,%i2,%o4
1182         sub     %i1,%o4,%o4
1183         ld      [%o4],%l0
```

```
1184         srl     %l0,29,%l0
1185         and     %l0,4,%l0
1186         add     %l0,2048,%l0
1187         ld      [G1_CONST_TBL+%l0],%f2
1188         fmuls   %f2,%f2,%f2
1189         st      %f2,[%i3]

1191 .spec3_exit:
1192         fmovs   %f8,%f16
1193         mov     %l4,%l0
1194         fmovs   %f10,%f2
1195         mov     %l5,%l1
1196         fmovs   %f12,%f4
1197         mov     %l6,%l2
1198         fmovs   %f14,%f6
1199         mov     %l7,%l3
1200         mov     %i1,%o0
1201         lda     [%o0]%asi,%l4
1202         add     %o0,%i2,%o1
1203         lda     [%o1]%asi,%l5
1204         add     %o1,%i2,%o2
1205         lda     [%o2]%asi,%l6
1206         add     %o2,%i2,%o3
1207         lda     [%o3]%asi,%l7
1208         add     %o3,%i2,%i1
1209         and     %l4,G5_CONST,%l4
1210         and     %l5,G5_CONST,%l5
1211         and     %l6,G5_CONST,%l6
1212         and     %l7,G5_CONST,%l7

1214         subcc   %i0,4,%i0
1215         bpos,pt %icc,.main_loop
1216         add     %i3,%i4,%i3
1217         ba      .after_main_loop
1218         nop

1220         .align  16
1221 .spec4:
1222         sethi   %hi(0x7f800000),%o5
1223         cmp     %l4,%o5
1224         bge,pn  %icc,1f
1225         nop
1226         fcmpes  %fcc0,%f8,%f3
1227         fcmpes  %fcc1,%f8,THRESHOLDL
1228         fbl,a,pn        %fcc0,1f                ! if ( X < 0.0f )
1229         fstod   %f8,%f48                        ! (4) y = (double) X
1230         fbl,a,pt        %fcc1,.spec4_cont       ! if ( X < THRESHOLDL )
1231         fstod   %f8,%f48                        ! (4) y = (double) X
1232 1:
1233         fmuld   F62_K256ONLN2,%f42,%f42

1235         fmuld   F62_K256ONLN2,%f44,%f44

1237         fmuld   F62_K256ONLN2,%f46,%f46

1239         fdtoi   %f40,%f16
1240         st      %f16,[%fp+tmp0]

1242         fdtoi   %f42,%f2
1243         st      %f2,[%fp+tmp1]

1245         fdtoi   %f44,%f4
1246         st      %f4,[%fp+tmp2]

1248         fdtoi   %f46,%f6
1249         st      %f6,[%fp+tmp3]
```



```
1251         fitod   %f16,%f34
1252         fpackfix        %f16,%f16

1254         fitod   %f2,%f18
1255         fpackfix        %f2,%f2

1257         fitod   %f4,%f20
1258         fpackfix        %f4,%f4

1260         fitod   %f6,%f22
1261         fpackfix        %f6,%f6

1263         fsubd   %f40,%f34,%f40

1265         fsubd   %f42,%f18,%f42

1267         fsubd   %f44,%f20,%f44

1269         fsubd   %f46,%f22,%f46

1271         fmuld   F60_KA2,%f40,%f34

1273         fmuld   F60_KA2,%f42,%f18

1275         fmuld   F60_KA2,%f44,%f20

1277         fmuld   F60_KA2,%f46,%f22

1279         faddd   F58_KA1,%f34,%f34

1281         faddd   F58_KA1,%f18,%f18

1283         faddd   F58_KA1,%f20,%f20

1285         faddd   F58_KA1,%f22,%f22

1287         ld      [%fp+tmp0],%o0
1288         fmuld   %f34,%f40,%f40

1290         ld      [%fp+tmp1],%o1
1291         fmuld   %f18,%f42,%f42

1293         ld      [%fp+tmp2],%o2
1294         fmuld   %f20,%f44,%f44

1296         ld      [%fp+tmp3],%o3
1297         fmuld   %f22,%f46,%f46

1299         and     %o0,255,%o0
1300         and     %o1,255,%o1

1302         and     %o2,255,%o2
1303         and     %o3,255,%o3

1305         sll     %o0,3,%o0
1306         sll     %o1,3,%o1

1308         sll     %o2,3,%o2
1309         sll     %o3,3,%o3

1311         ldd     [G1_CONST_TBL+%o0],%f34

1313         ldd     [G1_CONST_TBL+%o1],%f18

1315         ldd     [G1_CONST_TBL+%o2],%f20
```

```
1317         ldd     [G1_CONST_TBL+%o3],%f22

1319         fpadd32 %f16,%f34,%f34

1321         fpadd32 %f2,%f18,%f18

1323         fpadd32 %f4,%f20,%f20

1325         fpadd32 %f6,%f22,%f22

1327         fmuld   %f34,%f40,%f40

1329         fmuld   %f18,%f42,%f42

1331         fmuld   %f20,%f44,%f44

1333         fmuld   %f22,%f46,%f46

1335         faddd   %f34,%f40,%f40

1337         faddd   %f18,%f42,%f42

1339         faddd   %f20,%f44,%f44

1341         faddd   %f22,%f46,%f46

1343         fdtos   %f40,%f26
1344         st      %f26,[%i3]
1345         add     %i3,%i4,%o4

1347         fdtos   %f42,%f18
1348         st      %f18,[%o4]
1349         add     %o4,%i4,%i3

1351         fdtos   %f44,%f20
1352         st      %f20,[%i3]
1353         add     %i3,%i4,%o4

1355         fdtos   %f46,%f22
1356         st      %f22,[%o4]
1357         add     %o4,%i4,%i3

1359         cmp     %l4,%o5
1360         bl,pt   %icc,.spec4_out_of_range
1361         sll     %i2,2,%o4

1363         ble,pn  %icc,.spec4_inf
1364         sub     %i1,%o4,%o4

1366 ! NaN -> NaN

1368         fmuls   %f8,%f8,%f8
1369         ba      .spec4_exit
1370         st      %f8,[%i3]

1372 .spec4_inf:
1373         ld      [%o4],%l0
1374         srl     %l0,29,%l0
1375         andcc   %l0,4,%l0
1376         be,a,pn %icc,.spec4_exit
1377         st      %f8,[%i3]

1379         ba      .spec4_exit
1380         st      %f3,[%i3]
```



```
1382 .spec4_out_of_range:
1383         sub     %i1,%o4,%o4
1384         ld      [%o4],%l0
1385         srl     %l0,29,%l0
1386         and     %l0,4,%l0
1387         add     %l0,2048,%l0
1388         ld      [G1_CONST_TBL+%l0],%f2
1389         fmuls   %f2,%f2,%f2
1390         st      %f2,[%i3]

1392 .spec4_exit:
1393         fmovs   %f10,%f16
1394         mov     %l5,%l0
1395         fmovs   %f12,%f2
1396         mov     %l6,%l1
1397         fmovs   %f14,%f4
1398         mov     %l7,%l2
1399         lda     [%i1]%asi,%l3
1400         lda     [%i1]%asi,%f6
1401         add     %i1,%i2,%o0
1402         lda     [%o0]%asi,%l4
1403         add     %o0,%i2,%o1
1404         lda     [%o1]%asi,%l5
1405         add     %o1,%i2,%o2
1406         lda     [%o2]%asi,%l6
1407         add     %o2,%i2,%o3
1408         lda     [%o3]%asi,%l7
1409         add     %o3,%i2,%i1
1410         and     %l3,G5_CONST,%l3
1411         and     %l4,G5_CONST,%l4
1412         and     %l5,G5_CONST,%l5
1413         and     %l6,G5_CONST,%l6
1414         and     %l7,G5_CONST,%l7

1416         subcc   %i0,5,%i0
1417         bpos,pt %icc,.main_loop
1418         add     %i3,%i4,%i3
1419         ba      .after_main_loop
1420         nop

1422         .align 16
1423 .spec5:
1424         sethi   %hi(0x7f800000),%o5
1425         cmp     %l5,%o5
1426         bge,pn  %icc,1f
1427         nop
1428         fcmpes  %fcc0,%f10,%f3
1429         fcmpes  %fcc1,%f10,THRESHOLDL
1430         fbl,a,pn        %fcc0,1f                ! if ( X < 0.0f )
1431         fstod   %f10,%f50                       ! (5) y = (double) X
1432         fbl,a,pt                %fcc1,.spec5_cont       ! if ( X < THRESHOLDL )
1433         fstod   %f10,%f50                       ! (5) y = (double) X
1434 1:
1435         fmuld   F62_K256ONLN2,%f44,%f44

1437         fmuld   F62_K256ONLN2,%f46,%f46

1439         fdtoi   %f40,%f16
1440         st      %f16,[%fp+tmp0]
1441         fmuld   F62_K256ONLN2,%f48,%f48

1443         fdtoi   %f42,%f2
1444         st      %f2,[%fp+tmp1]

1446         fdtoi   %f44,%f4
1447         st      %f4,[%fp+tmp2]
```

```
1449          fdtoi   %f46,%f6
1450          st      %f6,[%fp+tmp3]

1452          fdtoi   %f48,%f8
1453          st      %f8,[%fp+tmp4]

1455          fitod   %f16,%f34
1456          fpackfix        %f16,%f16

1458          fitod   %f2,%f18
1459          fpackfix        %f2,%f2

1461          fitod   %f4,%f20
1462          fpackfix        %f4,%f4

1464          fitod   %f6,%f22
1465          fpackfix        %f6,%f6

1467          fitod   %f8,%f24
1468          fpackfix        %f8,%f8

1470          ld      [%fp+tmp0],%o0
1471          fsubd   %f40,%f34,%f40

1473          ld      [%fp+tmp1],%o1
1474          fsubd   %f42,%f18,%f42

1476          ld      [%fp+tmp2],%o2
1477          and     %o0,255,%o0
1478          fsubd   %f44,%f20,%f44

1480          ld      [%fp+tmp3],%o3
1481          and     %o1,255,%o1
1482          fsubd   %f46,%f22,%f46

1484          sll     %o0,3,%o0
1485          sll     %o1,3,%o1
1486          fmuld   F60_KA2,%f40,%f34
1487          fsubd   %f48,%f24,%f48

1489          and     %o2,255,%o2
1490          fmuld   F60_KA2,%f42,%f18

1492          sll     %o2,3,%o2
1493          fmuld   F60_KA2,%f44,%f20

1495          ld      [%fp+tmp4],%o4
1496          and     %o3,255,%o3
1497          fmuld   F60_KA2,%f46,%f22

1499          sll     %o3,3,%o3
1500          fmuld   F60_KA2,%f48,%f24
1501          faddd   F58_KA1,%f34,%f34

1503          and     %o4,255,%o4
1504          faddd   F58_KA1,%f18,%f18

1506          faddd   F58_KA1,%f20,%f20

1508          faddd   F58_KA1,%f22,%f22

1510          fmuld   %f34,%f40,%f40
1511          ldd     [G1_CONST_TBL+%o0],%f34
1512          faddd   F58_KA1,%f24,%f24
```



```
1514          fmuld   %f18,%f42,%f42
1515          ldd     [G1_CONST_TBL+%o1],%f18

1517          fmuld   %f20,%f44,%f44
1518          ldd     [G1_CONST_TBL+%o2],%f20

1520          fmuld   %f22,%f46,%f46
1521          ldd     [G1_CONST_TBL+%o3],%f22
1522          sll     %o4,3,%o4

1524          fmuld   %f24,%f48,%f48
1525          ldd     [G1_CONST_TBL+%o4],%f24
1526          fpadd32 %f16,%f34,%f34

1528          fpadd32 %f2,%f18,%f18

1530          fpadd32 %f4,%f20,%f20

1532          fpadd32 %f6,%f22,%f22

1534          fpadd32 %f8,%f24,%f24
1535          fmuld   %f34,%f40,%f40

1537          fmuld   %f18,%f42,%f42

1539          fmuld   %f20,%f44,%f44

1541          fmuld   %f22,%f46,%f46

1543          fmuld   %f24,%f48,%f48
1544          faddd   %f34,%f40,%f40

1546          faddd   %f18,%f42,%f42

1548          faddd   %f20,%f44,%f44

1550          faddd   %f22,%f46,%f46

1552          faddd   %f24,%f48,%f48

1554          fdtos   %f40,%f26
1555          st      %f26,[%i3]
1556          add     %i3,%i4,%o4

1558          fdtos   %f42,%f18
1559          st      %f18,[%o4]
1560          add     %o4,%i4,%i3

1562          fdtos   %f44,%f20
1563          st      %f20,[%i3]
1564          add     %i3,%i4,%o4

1566          fdtos   %f46,%f22
1567          st      %f22,[%o4]
1568          add     %o4,%i4,%i3

1570          fdtos   %f48,%f24
1571          st      %f24,[%i3]
1572          add     %i3,%i4,%i3

1574          cmp     %l5,%o5
1575          bl,pt   %icc,.spec5_out_of_range
1576          sll     %i2,2,%o4

1578          ble,pn  %icc,.spec5_inf
1579          sub     %o4,%i2,%o4
```

```
! NaN -> NaN

        fmuls   %f10,%f10,%f10
        ba      .spec5_exit
        st      %f10,[%i3]

.spec5_inf:
        sub     %i1,%o4,%o4
        ld      [%o4],%l0
        srl     %l0,29,%l0
        andcc   %l0,4,%l0
        be,a,pn %icc,.spec5_exit
        st      %f10,[%i3]

        ba      .spec5_exit
        st      %f3,[%i3]

.spec5_out_of_range:
        sub     %o4,%i2,%o4
        sub     %i1,%o4,%o4
        ld      [%o4],%l0
        srl     %l0,29,%l0
        and     %l0,4,%l0
        add     %l0,2048,%l0
        ld      [G1_CONST_TBL+%l0],%f2
        fmuls   %f2,%f2,%f2
        st      %f2,[%i3]

.spec5_exit:
        fmovs   %f12,%f16
        mov     %l6,%l0
        fmovs   %f14,%f2
        mov     %l7,%l1
        lda     [%i1]%asi,%l2
        lda     [%i1]%asi,%f4
        add     %i1,%i2,%i1
        lda     [%i1]%asi,%l3
        lda     [%i1]%asi,%f6
        add     %i1,%i2,%o0
        lda     [%o0]%asi,%l4
        add     %o0,%i2,%o1
        lda     [%o1]%asi,%l5
        add     %o1,%i2,%o2
        lda     [%o2]%asi,%l6
        add     %o2,%i2,%o3
        lda     [%o3]%asi,%l7
        add     %o3,%i2,%i1
        and     %l2,G5_CONST,%l2
        and     %l3,G5_CONST,%l3
        and     %l4,G5_CONST,%l4
        and     %l5,G5_CONST,%l5
        and     %l6,G5_CONST,%l6
        and     %l7,G5_CONST,%l7

        subcc   %i0,6,%i0
        bpos,pt %icc,.main_loop
        add     %i3,%i4,%i3
        ba      .after_main_loop
        nop
.spec6:
        sethi   %hi(0x7f800000),%o5
        cmp     %l6,%o5
        bge,pn  %icc,1f
        nop
        fcmpes  %fcc0,%f12,%f3
```



```
        fcmpes  %fcc1,%f12,THRESHOLDL
        fbl,a,pn        %fcc0,1f                ! if ( X < 0.0f )
        fstod   %f12,%f52                       ! (6) y = (double) X
        fbl,a,pt        %fcc1,.spec6_cont       ! if ( X < THRESHOLDL )
        fstod   %f12,%f52                       ! (6) y = (double) X
1:
        fmuld   F62_K256ONLN2,%f46,%f46

        fdtoi   %f40,%f16
        st      %f16,[%fp+tmp0]
        fmuld   F62_K256ONLN2,%f48,%f48

        fdtoi   %f42,%f2
        st      %f2,[%fp+tmp1]
        fmuld   F62_K256ONLN2,%f50,%f50

        fdtoi   %f44,%f4
        st      %f4,[%fp+tmp2]

        fdtoi   %f46,%f6
        st      %f6,[%fp+tmp3]

        fdtoi   %f48,%f8
        st      %f8,[%fp+tmp4]

        fdtoi   %f50,%f10
        st      %f10,[%fp+tmp5]

        fitod   %f16,%f34
        fpackfix        %f16,%f16

        fitod   %f2,%f18
        fpackfix        %f2,%f2

        fitod   %f4,%f20
        fpackfix        %f4,%f4

        fitod   %f6,%f22
        fpackfix        %f6,%f6

        fitod   %f8,%f24
        fpackfix        %f8,%f8

        fitod   %f10,%f26
        fpackfix        %f10,%f10

        ld      [%fp+tmp0],%o0
        fsubd   %f40,%f34,%f40

        ld      [%fp+tmp1],%o1
        fsubd   %f42,%f18,%f42

        ld      [%fp+tmp2],%o2
        and     %o0,255,%o0
        fsubd   %f44,%f20,%f44

        ld      [%fp+tmp3],%o3
        and     %o1,255,%o1
        fsubd   %f46,%f22,%f46

        sll     %o0,3,%o0
        sll     %o1,3,%o1
        fmuld   F60_KA2,%f40,%f34
        fsubd   %f48,%f24,%f48

        and     %o2,255,%o2
```

```
1712          fmuld   F60_KA2,%f42,%f18
1713          fsubd   %f50,%f26,%f50

1715          sll     %o2,3,%o2
1716          fmuld   F60_KA2,%f44,%f20

1718          ld      [%fp+tmp4],%o4
1719          and     %o3,255,%o3
1720          fmuld   F60_KA2,%f46,%f22

1722          ld      [%fp+tmp5],%o5
1723          sll     %o3,3,%o3
1724          fmuld   F60_KA2,%f48,%f24
1725          faddd   F58_KA1,%f34,%f34

1727          and     %o4,255,%o4
1728          fmuld   F60_KA2,%f50,%f26
1729          faddd   F58_KA1,%f18,%f18

1731          and     %o5,255,%o5
1732          faddd   F58_KA1,%f20,%f20

1734          sll     %o5,3,%o5
1735          faddd   F58_KA1,%f22,%f22

1737          fmuld   %f34,%f40,%f40
1738          ldd     [G1_CONST_TBL+%o0],%f34
1739          faddd   F58_KA1,%f24,%f24

1741          fmuld   %f18,%f42,%f42
1742          ldd     [G1_CONST_TBL+%o1],%f18
1743          faddd   F58_KA1,%f26,%f26

1745          fmuld   %f20,%f44,%f44
1746          ldd     [G1_CONST_TBL+%o2],%f20

1748          fmuld   %f22,%f46,%f46
1749          ldd     [G1_CONST_TBL+%o3],%f22
1750          sll     %o4,3,%o4

1752          fmuld   %f24,%f48,%f48
1753          ldd     [G1_CONST_TBL+%o4],%f24
1754          fpadd32 %f16,%f34,%f34

1756          fmuld   %f26,%f50,%f50
1757          ldd     [G1_CONST_TBL+%o5],%f26
1758          fpadd32 %f2,%f18,%f18

1760          fpadd32 %f4,%f20,%f20

1762          fpadd32 %f6,%f22,%f22

1764          fpadd32 %f8,%f24,%f24
1765          fmuld   %f34,%f40,%f40

1767          fpadd32 %f10,%f26,%f26
1768          fmuld   %f18,%f42,%f42

1770          fmuld   %f20,%f44,%f44

1772          fmuld   %f22,%f46,%f46

1774          fmuld   %f24,%f48,%f48
1775          faddd   %f34,%f40,%f40

1777          fmuld   %f26,%f50,%f50
```



```
1778          faddd   %f18,%f42,%f42

1780          faddd   %f20,%f44,%f44

1782          faddd   %f22,%f46,%f46

1784          faddd   %f24,%f48,%f48

1786          faddd   %f26,%f50,%f50

1788          fdtos   %f40,%f26
1789          st      %f26,[%i3]
1790          add     %i3,%i4,%o4

1792          fdtos   %f42,%f18
1793          st      %f18,[%o4]
1794          add     %o4,%i4,%i3

1796          fdtos   %f44,%f20
1797          st      %f20,[%i3]
1798          add     %i3,%i4,%o4

1800          fdtos   %f46,%f22
1801          st      %f22,[%o4]
1802          add     %o4,%i4,%i3

1804          fdtos   %f48,%f24
1805          st      %f24,[%i3]
1806          add     %i3,%i4,%o4

1808          fdtos   %f50,%f26
1809          st      %f26,[%o4]
1810          add     %o4,%i4,%i3

1812          sethi   %hi(0x7f800000),%o5
1813          cmp     %l6,%o5
1814          bl,pt   %icc,.spec6_out_of_range
1815          sll     %i2,1,%o4

1817          ble,pn  %icc,.spec6_inf
1818          sub     %i1,%o4,%o4

1820  ! NaN -> NaN

1822          fmuls   %f12,%f12,%f12
1823          ba      .spec6_exit
1824          st      %f12,[%i3]

1826  .spec6_inf:
1827          ld      [%o4],%l0
1828          srl     %l0,29,%l0
1829          andcc   %l0,4,%l0
1830          be,a,pn %icc,.spec6_exit
1831          st      %f12,[%i3]

1833          ba      .spec6_exit
1834          st      %f3,[%i3]

1836  .spec6_out_of_range:
1837          sub     %i1,%o4,%o4
1838          ld      [%o4],%l0
1839          srl     %l0,29,%l0
1840          and     %l0,4,%l0
1841          add     %l0,2048,%l0
1842          ld      [G1_CONST_TBL+%l0],%f2
1843          fmuls   %f2,%f2,%f2
```

```
1844         st      %f2,[%i3]

1846 .spec6_exit:
1847         fmovs   %f14,%f16
1848         mov     %l7,%l0
1849         lda     [%i1]%asi,%l1
1850         lda     [%i1]%asi,%f2
1851         add     %i1,%i2,%i1
1852         lda     [%i1]%asi,%l2
1853         lda     [%i1]%asi,%f4
1854         add     %i1,%i2,%i1
1855         lda     [%i1]%asi,%l3
1856         lda     [%i1]%asi,%f6
1857         add     %i1,%i2,%o0
1858         lda     [%o0]%asi,%l4
1859         add     %o0,%i2,%o1
1860         lda     [%o1]%asi,%l5
1861         add     %o1,%i2,%o2
1862         lda     [%o2]%asi,%l6
1863         add     %o2,%i2,%o3
1864         lda     [%o3]%asi,%l7
1865         add     %o3,%i2,%i1
1866         and     %l1,G5_CONST,%l1
1867         and     %l2,G5_CONST,%l2
1868         and     %l3,G5_CONST,%l3
1869         and     %l4,G5_CONST,%l4
1870         and     %l5,G5_CONST,%l5
1871         and     %l6,G5_CONST,%l6
1872         and     %l7,G5_CONST,%l7

1874         subcc   %i0,7,%i0
1875         bpos,pt %icc,.main_loop
1876         add     %i3,%i4,%i3
1877         ba      .after_main_loop
1878         nop

1880         .align  16
1881 .spec7:
1882         sethi   %hi(0x7f800000),%o5
1883         cmp     %l7,%o5
1884         bge,pn  %icc,1f
1885         nop
1886         fcmpes  %fcc0,%f14,%f3
1887         fcmpes  %fcc1,%f14,THRESHOLDL
1888         fbl,a,pn        %fcc0,1f                ! if ( X < 0.0f )
1889         fstod   %f14,%f54                       ! (7) y = (double) X
1890         fbl,a,pt        %fcc1,.spec7_cont       ! if ( X < THRESHOLDL )
1891         fstod   %f14,%f54                       ! (7) y = (double) X
1892 1:
1893         fdtoi   %f40,%f16
1894         st      %f16,[%fp+tmp0]
1895         fmuld   F62_K256ONLN2,%f48,%f48

1897         fdtoi   %f42,%f2
1898         st      %f2,[%fp+tmp1]
1899         fmuld   F62_K256ONLN2,%f50,%f50

1901         fdtoi   %f44,%f4
1902         st      %f4,[%fp+tmp2]
1903         fmuld   F62_K256ONLN2,%f52,%f52

1905         fdtoi   %f46,%f6
1906         st      %f6,[%fp+tmp3]

1908         fdtoi   %f48,%f8
1909         st      %f8,[%fp+tmp4]
```



```
1911         fdtoi   %f50,%f10
1912         st      %f10,[%fp+tmp5]

1914         fdtoi   %f52,%f12
1915         st      %f12,[%fp+tmp6]

1917         fitod   %f16,%f34
1918         fpackfix        %f16,%f16

1920         fitod   %f2,%f18
1921         fpackfix        %f2,%f2

1923         fitod   %f4,%f20
1924         fpackfix        %f4,%f4

1926         fitod   %f6,%f22
1927         fpackfix        %f6,%f6

1929         fitod   %f8,%f24
1930         fpackfix        %f8,%f8

1932         fitod   %f10,%f26
1933         fpackfix        %f10,%f10

1935         fitod   %f12,%f28
1936         fpackfix        %f12,%f12

1938         ld      [%fp+tmp0],%o0
1939         fsubd   %f40,%f34,%f40

1941         ld      [%fp+tmp1],%o1
1942         fsubd   %f42,%f18,%f42

1944         ld      [%fp+tmp2],%o2
1945         and     %o0,255,%o0
1946         fsubd   %f44,%f20,%f44

1948         ld      [%fp+tmp3],%o3
1949         and     %o1,255,%o1
1950         fsubd   %f46,%f22,%f46

1952         sll     %o0,3,%o0
1953         sll     %o1,3,%o1
1954         fmuld   F60_KA2,%f40,%f34
1955         fsubd   %f48,%f24,%f48

1957         and     %o2,255,%o2
1958         fmuld   F60_KA2,%f42,%f18
1959         fsubd   %f50,%f26,%f50

1961         sll     %o2,3,%o2
1962         fmuld   F60_KA2,%f44,%f20
1963         fsubd   %f52,%f28,%f52

1965         ld      [%fp+tmp4],%o4
1966         and     %o3,255,%o3
1967         fmuld   F60_KA2,%f46,%f22

1969         ld      [%fp+tmp5],%o5
1970         sll     %o3,3,%o3
1971         fmuld   F60_KA2,%f48,%f24
1972         faddd   F58_KA1,%f34,%f34

1974         ld      [%fp+tmp6],%o7
1975         and     %o4,255,%o4
```

```
1976         fmuld   F60_KA2,%f50,%f26
1977         faddd   F58_KA1,%f18,%f18

1979         and     %o5,255,%o5
1980         fmuld   F60_KA2,%f52,%f28
1981         faddd   F58_KA1,%f20,%f20

1983         sll     %o5,3,%o5
1984         faddd   F58_KA1,%f22,%f22

1986         fmuld   %f34,%f40,%f40
1987         ldd     [G1_CONST_TBL+%o0],%f34
1988         faddd   F58_KA1,%f24,%f24

1990         fmuld   %f18,%f42,%f42
1991         ldd     [G1_CONST_TBL+%o1],%f18
1992         faddd   F58_KA1,%f26,%f26

1994         fmuld   %f20,%f44,%f44
1995         ldd     [G1_CONST_TBL+%o2],%f20
1996         faddd   F58_KA1,%f28,%f28

1998         fmuld   %f22,%f46,%f46
1999         ldd     [G1_CONST_TBL+%o3],%f22
2000         sll     %o4,3,%o4

2002         fmuld   %f24,%f48,%f48
2003         ldd     [G1_CONST_TBL+%o4],%f24
2004         and     %o7,255,%o7
2005         fpadd32 %f16,%f34,%f34

2007         fmuld   %f26,%f50,%f50
2008         ldd     [G1_CONST_TBL+%o5],%f26
2009         sll     %o7,3,%o7
2010         fpadd32 %f2,%f18,%f18

2012         fmuld   %f28,%f52,%f52
2013         ldd     [G1_CONST_TBL+%o7],%f28
2014         fpadd32 %f4,%f20,%f20

2016         fpadd32 %f6,%f22,%f22

2018         fpadd32 %f8,%f24,%f24
2019         fmuld   %f34,%f40,%f40

2021         fpadd32 %f10,%f26,%f26
2022         fmuld   %f18,%f42,%f42

2024         fpadd32 %f12,%f28,%f28
2025         fmuld   %f20,%f44,%f44

2027         fmuld   %f22,%f46,%f46

2029         fmuld   %f24,%f48,%f48
2030         faddd   %f34,%f40,%f40

2032         fmuld   %f26,%f50,%f50
2033         faddd   %f18,%f42,%f42

2035         fmuld   %f28,%f52,%f52
2036         faddd   %f20,%f44,%f44

2038         faddd   %f22,%f46,%f46

2040         faddd   %f24,%f48,%f48
```



```
2042         faddd   %f26,%f50,%f50

2044         faddd   %f28,%f52,%f52

2046         fdtos   %f40,%f26
2047         st      %f26,[%i3]
2048         add     %i3,%i4,%o4

2050         fdtos   %f42,%f18
2051         st      %f18,[%o4]
2052         add     %o4,%i4,%i3

2054         fdtos   %f44,%f20
2055         st      %f20,[%i3]
2056         add     %i3,%i4,%o4

2058         fdtos   %f46,%f22
2059         st      %f22,[%o4]
2060         add     %o4,%i4,%i3

2062         fdtos   %f48,%f24
2063         st      %f24,[%i3]
2064         add     %i3,%i4,%o4

2066         fdtos   %f50,%f26
2067         st      %f26,[%o4]
2068         add     %o4,%i4,%i3

2070         fdtos   %f52,%f28
2071         st      %f28,[%i3]
2072         add     %i3,%i4,%i3

2074         sethi   %hi(0x7f800000),%o5
2075         cmp     %l7,%o5
2076         bl,pt   %icc,.spec7_out_of_range
2077         sub     %i1,%i2,%o4

2079         ble,pn  %icc,.spec7_inf
2080         ld      [%o4],%l0

2082 ! NaN -> NaN

2084         fmuls   %f14,%f14,%f14
2085         ba      .spec7_exit
2086         st      %f14,[%i3]

2088 .spec7_inf:
2089         srl     %l0,29,%l0
2090         andcc   %l0,4,%l0
2091         be,a,pn %icc,.spec7_exit
2092         st      %f14,[%i3]

2094         ba      .spec7_exit
2095         st      %f3,[%i3]

2097 .spec7_out_of_range:
2098         ld      [%o4],%l0
2099         srl     %l0,29,%l0
2100         and     %l0,4,%l0
2101         add     %l0,2048,%l0
2102         ld      [G1_CONST_TBL+%l0],%f2
2103         fmuls   %f2,%f2,%f2
2104         st      %f2,[%i3]

2106 .spec7_exit:
2107         subcc   %i0,8,%i0
```

```
2108         bpos,pt %icc,.main_loop_preload
2109         add     %i3,%i4,%i3

2111         ba      .tail
2112         nop
2113         SET_SIZE(__vexpf)
```

```
**********************************************************
   30576 Sat May 10 12:09:58 2014
new/usr/src/lib/libmvec/common/vis/__vhypot.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */
/*
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 */

        .file   "__vhypot.S"

#include "libm.h"

        RO_DATA
        .align  64

.CONST_TBL:
        .word   0x7ff00000, 0   ! DC0
        .word   0x7fe00000, 0   ! DC1
        .word   0x00100000, 0   ! DC2
        .word   0x41b00000, 0   ! D2ON28 = 268435456.0
        .word   0x7fd00000, 0   ! DC3

#define counter         %i0
#define tmp_counter     %l3
#define tmp_px          %l5
#define tmp_py          %o7
#define stridex         %i2
#define stridey         %i4
#define stridez         %l0

#define DC0             %f8
#define DC0_HI          %f8
#define DC0_LO          %f9
#define DC1             %f46
#define DC2             %f48
#define DC3             %f0
#define D2ON28          %f62

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!      !!!!!   algorithm   !!!!!
!  ((float*)&x)[0] = ((float*)px)[0];
```



```
!  ((float*)&x)[1] = ((float*)px)[1];
!
!  ((float*)&y)[0] = ((float*)py)[0];
!  ((float*)&y)[1] = ((float*)py)[1];
!
!  x = fabs(x);
!  y = fabs(y);
!
!  c0 = vis_fcmple32(DC1,x);
!  c2 = vis_fcmple32(DC1,y);
!  c1 = vis_fcmpgt32(DC2,x);
!  c3 = vis_fcmpgt32(DC2,y);
!
!  c0 |= c2;
!  c1 &= c3;
!  if ( (c0 & 2) != 0 )
!  {
!    lx = ((int*)px)[1];
!    ly = ((int*)py)[1];
!    hx = *(int*)px;
!    hy = *(int*)py;
!
!    hx &= 0x7fffffff;
!    hy &= 0x7fffffff;
!
!    j0 = hx;
!    if ( j0 < hy ) j0 = hy;
!    j0 &= 0x7ff00000;
!    if ( j0 >= 0x7ff00000 )
!    {
!      if ( hx == 0x7ff00000 && lx == 0 ) res = x == y ? y : x;
!      else if ( hy == 0x7ff00000 && ly == 0 ) res = x == y ? x : y;
!      else res = x * y;
!
!      ((float*)pz)[0] = ((float*)&res)[0];
!      ((float*)pz)[1] = ((float*)&res)[1];
!    }
!    else
!    {
!      diff = hy - hx;
!      j0 = diff >> 31;
!      if ( ((diff ^ j0) - j0) < 0x03600000 )
!      {!
!        x *= D2ONM1022;
!        y *= D2ONM1022;
!
!        x_hi = ( x + two28 ) - two28;
!        x_lo = x - x_hi;
!        y_hi = ( y + two28 ) - two28;
!        y_lo = y - y_hi;
!        res = (x_hi * x_hi + y_hi * y_hi);
!        res += ((x + x_hi) * x_lo + (y + y_hi) * y_lo);
!
!        res = sqrt(res);
!
!        res = D2ONP1022 * res;
!        ((float*)pz)[0] = ((float*)&res)[0];
!        ((float*)pz)[1] = ((float*)&res)[1];
!      }
!      else
!      {
!        res = x + y;
!        ((float*)pz)[0] = ((float*)&res)[0];
!        ((float*)pz)[1] = ((float*)&res)[1];
!      }
!    }
```

```
!    px += stridex;
!    py += stridey;
!    pz += stridez;
!    continue;
!  }
!  if ( (c1 & 2) != 0 )
!  {
!    x *= D2ONP1022;
!    y *= D2ONP1022;
!
!    x_hi = ( x + two28 ) - two28;
!    x_lo = x - x_hi;
!    y_hi = ( y + two28 ) - two28;
!    y_lo = y - y_hi;
!    res = (x_hi * x_hi + y_hi * y_hi);
!    res += ((x + x_hi) * x_lo + (y + y_hi) * y_lo);
!
!    res = sqrt(res);
!
!    res = D2ONM1022 * res;
!    ((float*)pz)[0] = ((float*)&res)[0];
!    ((float*)pz)[1] = ((float*)&res)[1];
!    px += stridex;
!    py += stridey;
!    pz += stridez;
!    continue;
!  }
!
!  dmax = x;
!  if ( dmax < y ) dmax = y;
!
!  dmax = vis_fand(dmax,DC0);
!  dnorm = vis_fpsub32(DC1,dmax);
!
!  x *= dnorm;
!  y *= dnorm;
!
!  x_hi = x + D2ON28;
!  x_hi -= D2ON28;
!  x_lo = x - x_hi;
!
!  y_hi = y + D2ON28;
!  y_hi -= D2ON28;
!  y_lo = y - y_hi;
!
!  res = x_hi * x_hi;
!  dtmp1 = x + x_hi;
!  dtmp0 = y_hi * y_hi;
!  dtmp2 = y + y_hi;
!
!  res += dtmp0;
!  dtmp1 *= x_lo;
!  dtmp2 *= y_lo;
!  dtmp1 += dtmp2;
!  res += dtmp1;
!
!  res = sqrt(res);
!
!  res = dmax * res;
!  ((float*)pz)[0] = ((float*)&res)[0];
!  ((float*)pz)[1] = ((float*)&res)[1];
!
!  px += stridex;
!  py += stridey;
!  pz += stridez;
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```



```
        ENTRY(__vhypot)
        save    %sp,-SA(MINFRAME),%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,o3)
        wr      %g0,0x82,%asi

#ifdef __sparcv9
        ldx     [%fp+STACK_BIAS+176],%l0
#else
        ld      [%fp+STACK_BIAS+92],%l0
#endif
        ldd     [%o3],DC0
        sll     %i2,3,stridex
        mov     %i0,tmp_counter

        ldd     [%o3+8],DC1
        sll     %i4,3,stridey
        mov     %i1,tmp_px

        ldd     [%o3+16],DC2
        sll     %l0,3,stridez
        mov     %i3,tmp_py

        ldd     [%o3+24],D2ON28

        ldd     [%o3+32],DC3

.begin:
        mov     tmp_counter,counter
        mov     tmp_px,%i1
        mov     tmp_py,%i3
        clr     tmp_counter
.begin1:
        cmp     counter,0
        ble,pn  %icc,.exit
        nop

        lda     [%i1]%asi,%o0
        sethi   %hi(0x7ffffc00),%o5

        lda     [%i3]%asi,%o2
        add     %o5,1023,%o5

        lda     [%i1]%asi,%f26          ! (1_0) ((float*)&x)[0] = ((float*)px)[0

        lda     [%i1+4]%asi,%f27        ! (1_0) ((float*)&x)[1] = ((float*)px)[1
        add     %i1,stridex,%o1         ! px += stridex

        lda     [%i3]%asi,%f24          ! (1_0) ((float*)&y)[0] = ((float*)py)[0
        sethi   %hi(0x00100000),%l7
        and     %o0,%o5,%o0

        lda     [%i3+4]%asi,%f25        ! (1_0) ((float*)&y)[1] = ((float*)py)[1
        and     %o2,%o5,%o2
        sethi   %hi(0x7fe00000),%l6

        fabsd   %f26,%f36               ! (1_0) x = fabs(x);
        cmp     %o0,%o2
        mov     %o2,%l4

        fabsd   %f24,%f54               ! (1_0) y = fabs(y);
        add     %i3,stridey,%o5         ! py += stridey
        movg    %icc,%o0,%o2
        lda     [%o5]%asi,%f28          ! (2_0) ((float*)&y)[0] = ((float*)py)[0
```

```
260         cmp     %o2,%l6
261         sethi   %hi(0x7ff00000),%o4
262         bge,pn  %icc,.spec0
263         lda     [%o5+4]%asi,%f29        ! (2_0) ((float*)&y)[1] = ((float*)py)[1

265         cmp     %o2,%l7
266         bl,pn   %icc,.spec1
267         nop
268         lda     [%o1]%asi,%f26          ! (2_0) ((float*)&x)[0] = ((float*)px)[0

270         lda     [%o1+4]%asi,%f27        ! (2_0) ((float*)&x)[1] = ((float*)px)[1
271         add     %i3,stridey,%i3         ! py += stridey

273         fabsd   %f28,%f34               ! (2_0) y = fabs(y);

275         fabsd   %f26,%f50               ! (2_0) x = fabs(x);

277         fcmple32        DC1,%f50,%o3    ! (2_0) c0 = vis_fcmple32(DC1,x);

279         fcmple32        DC1,%f34,%o0    ! (2_0) c2 = vis_fcmple32(DC1,y);

281         fcmpgt32        DC2,%f50,%o4    ! (2_0) c1 = vis_fcmpgt32(DC2,x);

283         fcmpgt32        DC2,%f34,%o5    ! (2_0) c3 = vis_fcmpgt32(DC2,y);

285         or      %o3,%o0,%o3             ! (2_0) c0 |= c2;

287         andcc   %o3,2,%g0               ! (2_0) c0 & 2
288         bnz,pn  %icc,.update0           ! (2_0) if ( (c0 & 2) != 0 )
289         and     %o4,%o5,%o4             ! (2_0) c1 &= c3;
290 .cont0:
291         add     %i3,stridey,%l4         ! py += stridey
292         andcc   %o4,2,%g0               ! (2_0) c1 & 2
293         bnz,pn  %icc,.update1           ! (2_0) if ( (c1 & 2) != 0 )
294         fmovd   %f36,%f56               ! (1_0) dmax = x;
295 .cont1:
296         lda     [%l4]%asi,%f30          ! (3_0) ((float*)&y)[0] = ((float*)py)[0
297         add     %o1,stridex,%l2         ! px += stridex

299         lda     [%l4+4]%asi,%f31        ! (3_0) ((float*)&y)[1] = ((float*)py)[1

301         lda     [%l2]%asi,%f18          ! (3_1) ((float*)&x)[0] = ((float*)px)[0

303         lda     [%l2+4]%asi,%f19        ! (3_1) ((float*)&x)[1] = ((float*)px)[1

305         fabsd   %f30,%f30               ! (3_1) y = fabs(y);

307         fabsd   %f18,%f18               ! (3_1) x = fabs(x);

309         fcmped  %fcc2,%f54,%f56         ! (1_1) dmax ? y

311         fmovdg  %fcc2,%f54,%f56         ! (1_1) if ( dmax < y ) dmax = y;

313         fcmple32        DC1,%f18,%o3    ! (3_1) c0 = vis_fcmple32(DC1,x);

315         fcmple32        DC1,%f30,%o0    ! (3_1) c2 = vis_fcmple32(DC1,y);

317         fcmpgt32        DC2,%f18,%o4    ! (3_1) c1 = vis_fcmpgt32(DC2,x);

319         fcmpgt32        DC2,%f30,%o1    ! (3_1) c3 = vis_fcmpgt32(DC2,y);

321         fand    %f56,DC0,%f38           ! (1_1) dmax = vis_fand(dmax,DC0);

323         or      %o3,%o0,%o3             ! (3_1) c0 |= c2;

325         andcc   %o3,2,%g0               ! (3_1) c0 & 2
```



```
326         bnz,pn  %icc,.update2           ! (3_1) if ( (c0 & 2) != 0 )
327         and     %o4,%o1,%o4             ! (3_1) c1 &= c3;
328 .cont2:
329         add     %l4,stridey,%i3         ! py += stridey
330         andcc   %o4,2,%g0               ! (3_1) c1 & 2
331         bnz,pn  %icc,.update3           ! (3_1) if ( (c1 & 2) != 0 )
332         fmovd   %f50,%f32               ! (2_1) dmax = x;
333 .cont3:
334         fpsub32 DC1,%f38,%f10           ! (1_1) dnorm = vis_fpsub32(DC1,dmax);
335         lda     [%i3]%asi,%f20          ! (0_0) ((float*)&y)[0] = ((float*)py)[0

337         lda     [%i3+4]%asi,%f21        ! (0_0) ((float*)&y)[1] = ((float*)py)[1

339         add     %l2,stridex,%l1         ! px += stridex

341         fmuld   %f36,%f10,%f36          ! (1_1) x *= dnorm;
342         lda     [%l1]%asi,%f22          ! (0_0) ((float*)&x)[0] = ((float*)px)[0

344         lda     [%l1+4]%asi,%f23        ! (0_0) ((float*)&x)[1] = ((float*)px)[1

346         fmuld   %f54,%f10,%f56          ! (1_1) y *= dnorm;
347         fabsd   %f20,%f40               ! (0_0) y = fabs(y);

349         fabsd   %f22,%f20               ! (0_0) x = fabs(x);

351         fcmped  %fcc3,%f34,%f32         ! (2_1) dmax ? y


354         fmovdg  %fcc3,%f34,%f32         ! (2_1) if ( dmax < y ) dmax = y;

356         faddd   %f36,D2ON28,%f58        ! (1_1) x_hi = x + D2ON28;
357         fcmple32        DC1,%f20,%g5    ! (0_0) c0 = vis_fcmple32(DC1,x);

359         faddd   %f56,D2ON28,%f22        ! (1_1) y_hi = y + D2ON28;
360         fcmple32        DC1,%f40,%o2    ! (0_0) c2 = vis_fcmple32(DC1,y);

362         fcmpgt32        DC2,%f20,%g1    ! (0_0) c1 = vis_fcmpgt32(DC2,x);

364         fcmpgt32        DC2,%f40,%o4    ! (0_0) c3 = vis_fcmpgt32(DC2,y);

366         fand    %f32,DC0,%f52           ! (2_1) dmax = vis_fand(dmax,DC0);

368         or      %g5,%o2,%g5             ! (0_0) c0 |= c2;
369         fsubd   %f58,D2ON28,%f58        ! (1_1) x_hi -= D2ON28;

371         andcc   %g5,2,%g0               ! (0_0) c0 & 2
372         bnz,pn  %icc,.update4           ! (0_0) if ( (c0 & 2) != 0 )
373         fsubd   %f22,D2ON28,%f22        ! (1_1) y_hi -= D2ON28;
374 .cont4:
375         and     %g1,%o4,%g1             ! (0_0) c1 &= c3;

377         add     %i3,stridey,%l2         ! py += stridey
378         andcc   %g1,2,%g0               ! (0_0) c1 & 2
379         bnz,pn  %icc,.update5           ! (0_0) if ( (c1 & 2) != 0 )
380         fmovd   %f18,%f44               ! (3_1) dmax = x;
381 .cont5:
382         fpsub32 DC1,%f52,%f10           ! (2_1) dnorm = vis_fpsub32(DC1,dmax);
383         lda     [%l2]%asi,%f24          ! (1_0) ((float*)&y)[0] = ((float*)py)[0

385         fmuld   %f58,%f58,%f60          ! (1_1) res = x_hi * x_hi;
386         lda     [%l2+4]%asi,%f25        ! (1_0) ((float*)&y)[1] = ((float*)py)[1
387         add     %l1,stridex,%l7         ! px += stridex
388         faddd   %f56,%f22,%f28          ! (1_1) dtmp2 = y + y_hi;

390         faddd   %f36,%f58,%f6           ! (1_1) dtmp1 = x + x_hi;
391         lda     [%l7]%asi,%f26          ! (1_0) ((float*)&x)[0] = ((float*)px)[0
```

```
393         fmuld   %f50,%f10,%f50          ! (2_1) x *= dnorm;
394         fsubd   %f36,%f58,%f58          ! (1_1) x_lo = x - x_hi;
395         lda     [%l7+4]%asi,%f27        ! (1_0) ((float*)&x)[1] = ((float*)px)[1

397         fmuld   %f22,%f22,%f2           ! (1_1) dtmp0 = y_hi * y_hi;
398         fsubd   %f56,%f22,%f56          ! (1_1) y_lo = y - y_hi;

400         fmuld   %f34,%f10,%f34          ! (2_1) y *= dnorm;
401         fabsd   %f24,%f54               ! (1_0) y = fabs(y);

403         fabsd   %f26,%f36               ! (1_0) x = fabs(x);

405         fmuld   %f6,%f58,%f10           ! (1_1) dtmp1 *= x_lo;
406         fcmped  %fcc0,%f30,%f44         ! (3_1) dmax ? y

408         fmuld   %f28,%f56,%f26          ! (1_1) dtmp2 *= y_lo;

410         fmovdg  %fcc0,%f30,%f44         ! (3_1) if ( dmax < y ) dmax = y;

412         faddd   %f50,D2ON28,%f58        ! (2_1) x_hi = x + D2ON28;
413         fcmple32        DC1,%f36,%g1    ! (1_0) c0 = vis_fcmple32(DC1,x);

415         faddd   %f34,D2ON28,%f22        ! (2_1) y_hi = y + D2ON28;
416         fcmple32        DC1,%f54,%g5    ! (1_0) c2 = vis_fcmple32(DC1,y);

418         faddd   %f60,%f2,%f24           ! (1_1) res += dtmp0;
419         fcmpgt32        DC2,%f36,%o5    ! (1_0) c1 = vis_fcmpgt32(DC2,x);

421         faddd   %f10,%f26,%f28          ! (1_1) dtmp1 += dtmp2;
422         fcmpgt32        DC2,%f54,%o1    ! (1_0) c3 = vis_fcmpgt32(DC2,y);

424         fand    %f44,DC0,%f14           ! (3_1) dmax = vis_fand(dmax,DC0);

426         or      %g1,%g5,%g1             ! (1_0) c0 |= c2;
427         fsubd   %f58,D2ON28,%f44        ! (2_1) x_hi -= D2ON28;

429         andcc   %g1,2,%g0               ! (1_0) c0 & 2
430         bnz,pn  %icc,.update6           ! (1_0) if ( (c0 & 2) != 0 )
431         fsubd   %f22,D2ON28,%f58        ! (2_1) y_hi -= D2ON28;
432 .cont6:
433         and     %o5,%o1,%o5             ! (1_0) c1 &= c3;
434         faddd   %f24,%f28,%f26          ! (1_1) res += dtmp1;

436         add     %l2,stridey,%i3         ! py += stridey
437         andcc   %o5,2,%g0               ! (1_0) c1 & 2
438         bnz,pn  %icc,.update7           ! (1_0) if ( (c1 & 2) != 0 )
439         fmovd   %f20,%f4                ! (0_0) dmax = x;
440 .cont7:
441         fpsub32 DC1,%f14,%f10           ! (3_1) dnorm = vis_fpsub32(DC1,dmax);
442         lda     [%i3]%asi,%f28          ! (2_0) ((float*)&y)[0] = ((float*)py)[0

444         fmuld   %f44,%f44,%f2           ! (2_1) res = x_hi * x_hi;
445         lda     [%i3+4]%asi,%f29        ! (2_0) ((float*)&y)[1] = ((float*)py)[1
446         add     %l7,stridex,%o1         ! px += stridex
447         faddd   %f34,%f58,%f60          ! (2_1) dtmp2 = y + y_hi;

449         fsqrtd  %f26,%f24               ! (1_1) res = sqrt(res);
450         lda     [%o1]%asi,%f26          ! (2_0) ((float*)&x)[0] = ((float*)px)[0
451         faddd   %f50,%f44,%f56          ! (2_1) dtmp1 = x + x_hi;

453         fmuld   %f18,%f10,%f6           ! (3_1) x *= dnorm;
454         fsubd   %f50,%f44,%f18          ! (2_1) x_lo = x - x_hi;
455         lda     [%o1+4]%asi,%f27        ! (2_0) ((float*)&x)[1] = ((float*)px)[1

457         fmuld   %f58,%f58,%f44          ! (2_1) dtmp0 = y_hi * y_hi;
```



```
458         fsubd   %f34,%f58,%f22          ! (2_1) y_lo = y - y_hi;

460         fmuld   %f30,%f10,%f58          ! (3_1) y *= dnorm;
461         fabsd   %f28,%f34               ! (2_0) y = fabs(y);

463         fabsd   %f26,%f50               ! (2_0) x = fabs(x);

465         fmuld   %f56,%f18,%f10          ! (2_1) dtmp1 *= x_lo;
466         fcmped  %fcc1,%f40,%f4          ! (0_0) dmax ? y

468         fmuld   %f60,%f22,%f12          ! (2_1) dtmp2 *= y_lo;

470         fmovdg  %fcc1,%f40,%f4          ! (0_0) if ( dmax < y ) dmax = y;

472         faddd   %f6,D2ON28,%f56         ! (3_1) x_hi = x + D2ON28;
473         fcmple32        DC1,%f50,%o3    ! (2_0) c0 = vis_fcmple32(DC1,x);

475         faddd   %f58,D2ON28,%f28        ! (3_1) y_hi = y + D2ON28;
476         fcmple32        DC1,%f34,%o0    ! (2_0) c2 = vis_fcmple32(DC1,y);

478         faddd   %f2,%f44,%f30           ! (2_1) res += dtmp0;
479         fcmpgt32        DC2,%f50,%o4    ! (2_0) c1 = vis_fcmpgt32(DC2,x);

481         faddd   %f10,%f12,%f26          ! (2_1) dtmp1 += dtmp2;
482         fcmpgt32        DC2,%f34,%o5    ! (2_0) c3 = vis_fcmpgt32(DC2,y);

484         fand    %f4,DC0,%f16            ! (0_0) dmax = vis_fand(dmax,DC0);

486         or      %o3,%o0,%o3             ! (2_0) c0 |= c2;
487         fsubd   %f56,D2ON28,%f18        ! (3_1) x_hi -= D2ON28;

489         andcc   %o3,2,%g0               ! (2_0) c0 & 2
490         bnz,pn  %icc,.update8           ! (2_0) if ( (c0 & 2) != 0 )
491         fsubd   %f28,D2ON28,%f4         ! (3_1) y_hi -= D2ON28;
492 .cont8:
493         and     %o4,%o5,%o4             ! (2_0) c1 &= c3;
494         faddd   %f30,%f26,%f12          ! (2_1) res += dtmp1;

496         add     %i3,stridey,%l4         ! py += stridey
497         andcc   %o4,2,%g0               ! (2_0) c1 & 2
498         bnz,pn  %icc,.update9           ! (2_0) if ( (c1 & 2) != 0 )
499         fmovd   %f36,%f56               ! (1_0) dmax = x;
500 .cont9:
501         lda     [%l4]%asi,%f30          ! (3_0) ((float*)&y)[0] = ((float*)py)[0
502         add     %o1,stridex,%l2         ! px += stridex
503         fpsub32 DC1,%f16,%f44           ! (0_0) dnorm = vis_fpsub32(DC1,dmax);

505         fmuld   %f18,%f18,%f60          ! (3_1) res = x_hi * x_hi;
506         lda     [%l4+4]%asi,%f31        ! (3_0) ((float*)&y)[1] = ((float*)py)[1
507         faddd   %f58,%f4,%f32           ! (3_1) dtmp2 = y + y_hi;

509         fsqrtd  %f12,%f12               ! (2_1) res = sqrt(res);
510         faddd   %f6,%f18,%f28           ! (3_1) dtmp1 = x + x_hi;

512         cmp     counter,4
513         bl,pn   %icc,.tail
514         nop

516         ba      .main_loop
517         sub     counter,4,counter

519         .align  16
520 .main_loop:
521         fmuld   %f20,%f44,%f2           ! (0_1) x *= dnorm;
522         fsubd   %f6,%f18,%f20           ! (3_2) x_lo = x - x_hi;
523         lda     [%l2]%asi,%f18          ! (3_1) ((float*)&x)[0] = ((float*)px)[0
```

```
525         fmuld   %f4,%f4,%f22            ! (3_2) dtmp0 = y_hi * y_hi;
526         lda     [%l2+4]%asi,%f19        ! (3_1) ((float*)&x)[1] = ((float*)px)[1
527         fsubd   %f58,%f4,%f58           ! (3_2) y_lo = y - y_hi;

529         fmuld   %f40,%f44,%f44          ! (0_1) y *= dnorm;
530         fabsd   %f30,%f30               ! (3_1) y = fabs(y);

532         fmuld   %f38,%f24,%f10          ! (1_2) res = dmax * res;
533         fabsd   %f18,%f18               ! (3_1) x = fabs(x);
534         st      %f10,[%i5]              ! (1_2) ((float*)pz)[0] = ((float*)&res)

536         fmuld   %f28,%f20,%f28          ! (3_2) dtmp1 *= x_lo;
537         st      %f11,[%i5+4]            ! (1_2) ((float*)pz)[1] = ((float*)&res)
538         fcmped  %fcc2,%f54,%f56         ! (1_1) dmax ? y

540         fmuld   %f32,%f58,%f24          ! (3_2) dtmp2 *= y_lo;

542         fmovdg  %fcc2,%f54,%f56         ! (1_1) if ( dmax < y ) dmax = y;

544         faddd   %f2,D2ON28,%f10         ! (0_1) x_hi = x + D2ON28;
545         fcmple32        DC1,%f18,%o3    ! (3_1) c0 = vis_fcmple32(DC1,x);

547         faddd   %f44,D2ON28,%f20        ! (0_1) y_hi = y + D2ON28;
548         fcmple32        DC1,%f30,%o0    ! (3_1) c2 = vis_fcmple32(DC1,y);

550         faddd   %f60,%f22,%f22          ! (3_2) res += dtmp0;
551         fcmpgt32        DC2,%f18,%o4    ! (3_1) c1 = vis_fcmpgt32(DC2,x);

553         faddd   %f28,%f24,%f26          ! (3_2) dtmp1 += dtmp2;
554         fcmpgt32        DC2,%f30,%o1    ! (3_1) c3 = vis_fcmpgt32(DC2,y);

556         fand    %f56,DC0,%f38           ! (1_1) dmax = vis_fand(dmax,DC0);

558         or      %o3,%o0,%o3             ! (3_1) c0 |= c2;
559         fsubd   %f10,D2ON28,%f58        ! (0_1) x_hi -= D2ON28;

561         andcc   %o3,2,%g0               ! (3_1) c0 & 2
562         bnz,pn  %icc,.update10          ! (3_1) if ( (c0 & 2) != 0 )
563         fsubd   %f20,D2ON28,%f56        ! (0_1) y_hi -= D2ON28;
564 .cont10:
565         faddd   %f22,%f26,%f28          ! (3_2) res += dtmp1;
566         and     %o4,%o1,%o4             ! (3_1) c1 &= c3;

568         add     %l4,stridey,%i3         ! py += stridey
569         andcc   %o4,2,%g0               ! (3_1) c1 & 2
570         bnz,pn  %icc,.update11          ! (3_1) if ( (c1 & 2) != 0 )
571         fmovd   %f50,%f32               ! (2_1) dmax = x;
572 .cont11:
573         fpsub32 DC1,%f38,%f10           ! (1_1) dnorm = vis_fpsub32(DC1,dmax);
574         add     %l2,stridex,%l1         ! px += stridex
575         lda     [%i3]%asi,%f20          ! (0_0) ((float*)&y)[0] = ((float*)py)[0

577         fmuld   %f58,%f58,%f6           ! (0_1) res = x_hi * x_hi;
578         lda     [%i3+4]%asi,%f21        ! (0_0) ((float*)&y)[1] = ((float*)py)[1
579         add     %i5,stridez,%l6         ! pz += stridez
580         faddd   %f44,%f56,%f60          ! (0_1) dtmp2 = y + y_hi;

582         fsqrtd  %f28,%f4                ! (3_2) res = sqrt(res);
583         lda     [%l1]%asi,%f22          ! (0_0) ((float*)&x)[0] = ((float*)px)[0
584         faddd   %f2,%f58,%f24           ! (0_1) dtmp1 = x + x_hi;

586         fmuld   %f36,%f10,%f36          ! (1_1) x *= dnorm;
587         fsubd   %f2,%f58,%f26           ! (0_1) x_lo = x - x_hi;
588         lda     [%l1+4]%asi,%f23        ! (0_0) ((float*)&x)[1] = ((float*)px)[1
```



```
590         fmuld   %f56,%f56,%f28          ! (0_1) dtmp0 = y_hi * y_hi;
591         fsubd   %f44,%f56,%f44          ! (0_1) y_lo = y - y_hi;

593         fmuld   %f54,%f10,%f56          ! (1_1) y *= dnorm;
594         fabsd   %f20,%f40               ! (0_0) y = fabs(y);

596         fmuld   %f52,%f12,%f12          ! (2_2) res = dmax * res;
597         fabsd   %f22,%f20               ! (0_0) x = fabs(x);
598         st      %f12,[%l6]              ! (2_2) ((float*)pz)[0] = ((float*)&res)

600         fmuld   %f24,%f26,%f10          ! (0_1) dtmp1 *= x_lo;
601         st      %f13,[%l6+4]            ! (2_2) ((float*)pz)[1] = ((float*)&res)
602         fcmped  %fcc3,%f34,%f32         ! (2_1) dmax ? y

604         fmuld   %f60,%f44,%f12          ! (0_1) dtmp2 *= y_lo;

606         fmovdg  %fcc3,%f34,%f32         ! (2_1) if ( dmax < y ) dmax = y;

608         faddd   %f36,D2ON28,%f58        ! (1_1) x_hi = x + D2ON28;
609         fcmple32        DC1,%f20,%g5    ! (0_0) c0 = vis_fcmple32(DC1,x);

611         faddd   %f56,D2ON28,%f22        ! (1_1) y_hi = y + D2ON28;
612         fcmple32        DC1,%f40,%o2    ! (0_0) c2 = vis_fcmple32(DC1,y);

614         faddd   %f6,%f28,%f24           ! (0_1) res += dtmp0;
615         fcmpgt32        DC2,%f20,%g1    ! (0_0) c1 = vis_fcmpgt32(DC2,x);

617         faddd   %f10,%f12,%f26          ! (0_1) dtmp1 += dtmp2;
618         fcmpgt32        DC2,%f40,%o4    ! (0_0) c3 = vis_fcmpgt32(DC2,y);

620         fand    %f32,DC0,%f52           ! (2_1) dmax = vis_fand(dmax,DC0);

622         or      %g5,%o2,%g5             ! (0_0) c0 |= c2;
623         fsubd   %f58,D2ON28,%f58        ! (1_1) x_hi -= D2ON28;

625         andcc   %g5,2,%g0               ! (0_0) c0 & 2
626         bnz,pn  %icc,.update12          ! (0_0) if ( (c0 & 2) != 0 )
627         fsubd   %f22,D2ON28,%f22        ! (1_1) y_hi -= D2ON28;
628 .cont12:
629         and     %g1,%o4,%g1             ! (0_0) c1 &= c3;
630         faddd   %f24,%f26,%f12          ! (0_1) res += dtmp1;

632         add     %i3,stridey,%l2         ! py += stridey
633         andcc   %g1,2,%g0               ! (0_0) c1 & 2
634         bnz,pn  %icc,.update13          ! (0_0) if ( (c1 & 2) != 0 )
635         fmovd   %f18,%f44               ! (3_1) dmax = x;
636 .cont13:
637         fpsub32 DC1,%f52,%f10           ! (2_1) dnorm = vis_fpsub32(DC1,dmax);
638         add     %l1,stridex,%l7         ! px += stridex
639         lda     [%l2]%asi,%f24          ! (1_0) ((float*)&y)[0] = ((float*)py)[0

641         fmuld   %f58,%f58,%f60          ! (1_1) res = x_hi * x_hi;
642         add     %l6,stridez,%i5         ! pz += stridez
643         lda     [%l2+4]%asi,%f25        ! (1_0) ((float*)&y)[1] = ((float*)py)[1
644         faddd   %f56,%f22,%f28          ! (1_1) dtmp2 = y + y_hi;

646         fsqrtd  %f12,%f12               ! (0_1) res = sqrt(res);
647         lda     [%l7]%asi,%f26          ! (1_0) ((float*)&x)[0] = ((float*)px)[0
648         faddd   %f36,%f58,%f6           ! (1_1) dtmp1 = x + x_hi;

650         fmuld   %f50,%f10,%f50          ! (2_1) x *= dnorm;
651         fsubd   %f36,%f58,%f58          ! (1_1) x_lo = x - x_hi;
652         lda     [%l7+4]%asi,%f27        ! (1_0) ((float*)&x)[1] = ((float*)px)[1

654         fmuld   %f22,%f22,%f2           ! (1_1) dtmp0 = y_hi * y_hi;
655         fsubd   %f56,%f22,%f56          ! (1_1) y_lo = y - y_hi;
```

```
657         fmuld   %f34,%f10,%f34          ! (2_1) y *= dnorm;
658         fabsd   %f24,%f54               ! (1_0) y = fabs(y);

660         fmuld   %f14,%f4,%f14           ! (3_2) res = dmax * res;
661         fabsd   %f26,%f36               ! (1_0) x = fabs(x);
662         st      %f14,[%i5]              ! (3_2) ((float*)pz)[0] = ((float*)&res)

664         fmuld   %f6,%f58,%f10           ! (1_1) dtmp1 *= x_lo;
665         st      %f15,[%i5+4]            ! (3_2) ((float*)pz)[1] = ((float*)&res)
666         fcmped  %fcc0,%f30,%f44         ! (3_1) dmax ? y

668         fmuld   %f28,%f56,%f26          ! (1_1) dtmp2 *= y_lo;

670         fmovdg  %fcc0,%f30,%f44         ! (3_1) if ( dmax < y ) dmax = y;

672         faddd   %f50,D2ON28,%f58        ! (2_1) x_hi = x + D2ON28;
673         fcmple32        DC1,%f36,%g1    ! (1_0) c0 = vis_fcmple32(DC1,x);

675         faddd   %f34,D2ON28,%f22        ! (2_1) y_hi = y + D2ON28;
676         fcmple32        DC1,%f54,%g5    ! (1_0) c2 = vis_fcmple32(DC1,y);

678         faddd   %f60,%f2,%f24           ! (1_1) res += dtmp0;
679         fcmpgt32        DC2,%f36,%o5    ! (1_0) c1 = vis_fcmpgt32(DC2,x);

681         faddd   %f10,%f26,%f28          ! (1_1) dtmp1 += dtmp2;
682         fcmpgt32        DC2,%f54,%o1    ! (1_0) c3 = vis_fcmpgt32(DC2,y);

684         fand    %f44,DC0,%f14           ! (3_1) dmax = vis_fand(dmax,DC0);

686         or      %g1,%g5,%g1             ! (1_0) c0 |= c2;
687         fsubd   %f58,D2ON28,%f44        ! (2_1) x_hi -= D2ON28;

689         andcc   %g1,2,%g0               ! (1_0) c0 & 2
690         bnz,pn  %icc,.update14          ! (1_0) if ( (c0 & 2) != 0 )
691         fsubd   %f22,D2ON28,%f58        ! (2_1) y_hi -= D2ON28;
692 .cont14:
693         and     %o5,%o1,%o5             ! (1_0) c1 &= c3;
694         faddd   %f24,%f28,%f26          ! (1_1) res += dtmp1;

696         add     %l2,stridey,%i3         ! py += stridey
697         andcc   %o5,2,%g0               ! (1_0) c1 & 2
698         bnz,pn  %icc,.update15          ! (1_0) if ( (c1 & 2) != 0 )
699         fmovd   %f20,%f4                ! (0_0) dmax = x;
700 .cont15:
701         fpsub32 DC1,%f14,%f10           ! (3_1) dnorm = vis_fpsub32(DC1,dmax);
702         add     %l7,stridex,%o1         ! px += stridex
703         lda     [%i3]%asi,%f28          ! (2_0) ((float*)&y)[0] = ((float*)py)[0

705         fmuld   %f44,%f44,%f2           ! (2_1) res = x_hi * x_hi;
706         add     %i5,stridez,%g5         ! pz += stridez
707         lda     [%i3+4]%asi,%f29        ! (2_0) ((float*)&y)[1] = ((float*)py)[1
708         faddd   %f34,%f58,%f60          ! (2_1) dtmp2 = y + y_hi;

710         fsqrtd  %f26,%f24               ! (1_1) res = sqrt(res);
711         lda     [%o1]%asi,%f26          ! (2_0) ((float*)&x)[0] = ((float*)px)[0
712         faddd   %f50,%f44,%f56          ! (2_1) dtmp1 = x + x_hi;

714         fmuld   %f18,%f10,%f6           ! (3_1) x *= dnorm;
715         fsubd   %f50,%f44,%f18          ! (2_1) x_lo = x - x_hi;
716         lda     [%o1+4]%asi,%f27        ! (2_0) ((float*)&x)[1] = ((float*)px)[1

718         fmuld   %f58,%f58,%f44          ! (2_1) dtmp0 = y_hi * y_hi;
719         fsubd   %f34,%f58,%f22          ! (2_1) y_lo = y - y_hi;

721         fmuld   %f30,%f10,%f58          ! (3_1) y *= dnorm;
```



```
722         fabsd   %f28,%f34               ! (2_0) y = fabs(y);

724         fmuld   %f16,%f12,%f16          ! (0_1) res = dmax * res;
725         fabsd   %f26,%f50               ! (2_0) x = fabs(x);
726         st      %f16,[%g5]              ! (0_1) ((float*)pz)[0] = ((float*)&res)

728         fmuld   %f56,%f18,%f10          ! (2_1) dtmp1 *= x_lo;
729         st      %f17,[%g5+4]            ! (0_1) ((float*)pz)[1] = ((float*)&res)
730         fcmped  %fcc1,%f40,%f4          ! (0_0) dmax ? y

732         fmuld   %f60,%f22,%f12          ! (2_1) dtmp2 *= y_lo;

734         fmovdg  %fcc1,%f40,%f4          ! (0_0) if ( dmax < y ) dmax = y;

736         faddd   %f6,D2ON28,%f56         ! (3_1) x_hi = x + D2ON28;
737         fcmple32        DC1,%f50,%o3    ! (2_0) c0 = vis_fcmple32(DC1,x);

739         faddd   %f58,D2ON28,%f28        ! (3_1) y_hi = y + D2ON28;
740         fcmple32        DC1,%f34,%o0    ! (2_0) c2 = vis_fcmple32(DC1,y);

742         faddd   %f2,%f44,%f30           ! (2_1) res += dtmp0;
743         fcmpgt32        DC2,%f50,%o4    ! (2_0) c1 = vis_fcmpgt32(DC2,x);

745         faddd   %f10,%f12,%f26          ! (2_1) dtmp1 += dtmp2;
746         fcmpgt32        DC2,%f34,%o5    ! (2_0) c3 = vis_fcmpgt32(DC2,y);

748         fand    %f4,DC0,%f16            ! (0_0) dmax = vis_fand(dmax,DC0);

750         or      %o3,%o0,%o3             ! (2_0) c0 |= c2;
751         fsubd   %f56,D2ON28,%f18        ! (3_1) x_hi -= D2ON28;

753         andcc   %o3,2,%g0               ! (2_0) c0 & 2
754         bnz,pn  %icc,.update16          ! (2_0) if ( (c0 & 2) != 0 )
755         fsubd   %f28,D2ON28,%f4         ! (3_1) y_hi -= D2ON28;
756 .cont16:
757         and     %o4,%o5,%o4             ! (2_0) c1 &= c3;
758         faddd   %f30,%f26,%f12          ! (2_1) res += dtmp1;

760         add     %i3,stridey,%l4         ! py += stridey
761         andcc   %o4,2,%g0               ! (2_0) c1 & 2
762         bnz,pn  %icc,.update17          ! (2_0) if ( (c1 & 2) != 0 )
763         fmovd   %f36,%f56               ! (1_0) dmax = x;
764 .cont17:
765         lda     [%l4]%asi,%f30          ! (3_0) ((float*)&y)[0] = ((float*)py)[0
766         add     %o1,stridex,%l2         ! px += stridex
767         fpsub32 DC1,%f16,%f44           ! (0_0) dnorm = vis_fpsub32(DC1,dmax);

769         fmuld   %f18,%f18,%f60          ! (3_1) res = x_hi * x_hi;
770         add     %g5,stridez,%i5         ! pz += stridez
771         lda     [%l4+4]%asi,%f31        ! (3_0) ((float*)&y)[1] = ((float*)py)[1
772         faddd   %f58,%f4,%f32           ! (3_1) dtmp2 = y + y_hi;

774         fsqrtd  %f12,%f12               ! (2_1) res = sqrt(res);
775         subcc   counter,4,counter       ! counter -= 4;
776         bpos,pt %icc,.main_loop
777         faddd   %f6,%f18,%f28           ! (3_1) dtmp1 = x + x_hi;

779         add     counter,4,counter

781 .tail:
782         subcc   counter,1,counter
783         bneg,a  .begin
784         nop

786         fsubd   %f6,%f18,%f20           ! (3_2) x_lo = x - x_hi;
```

```
788         fmuld   %f4,%f4,%f22            ! (3_2) dtmp0 = y_hi * y_hi;
789         fsubd   %f58,%f4,%f58           ! (3_2) y_lo = y - y_hi;

791         fmuld   %f38,%f24,%f10          ! (1_2) res = dmax * res;
792         st      %f10,[%i5]              ! (1_2) ((float*)pz)[0] = ((float*)&res)

794         st      %f11,[%i5+4]            ! (1_2) ((float*)pz)[1] = ((float*)&res)

796         subcc   counter,1,counter
797         bneg,a  .begin
798         add     %i5,stridez,%i5

800         fmuld   %f28,%f20,%f28          ! (3_2) dtmp1 *= x_lo;

802         fmuld   %f32,%f58,%f24          ! (3_2) dtmp2 *= y_lo;

804         faddd   %f60,%f22,%f22          ! (3_2) res += dtmp0;

806         faddd   %f28,%f24,%f26          ! (3_2) dtmp1 += dtmp2;

808         faddd   %f22,%f26,%f28          ! (3_2) res += dtmp1;

810         add     %i5,stridez,%l6         ! pz += stridez

812         fsqrtd  %f28,%f4                ! (3_2) res = sqrt(res);
813         add     %l2,stridex,%l1         ! px += stridex

815         fmuld   %f52,%f12,%f12          ! (2_2) res = dmax * res;
816         st      %f12,[%l6]              ! (2_2) ((float*)pz)[0] = ((float*)&res)

818         st      %f13,[%l6+4]            ! (2_2) ((float*)pz)[1] = ((float*)&res)

820         subcc   counter,1,counter
821         bneg    .begin
822         add     %l6,stridez,%i5

824         fmuld   %f14,%f4,%f14           ! (3_2) res = dmax * res;
825         st      %f14,[%i5]              ! (3_2) ((float*)pz)[0] = ((float*)&res)

827         st      %f15,[%i5+4]            ! (3_2) ((float*)pz)[1] = ((float*)&res)

829         ba      .begin
830         add     %i5,stridez,%i5

832         .align  16
833 .spec0:
834         ld      [%i1+4],%l1             ! lx = ((int*)px)[1];
835         cmp     %o2,%o4                 ! j0 ? 0x7ff00000
836         bge,pn  %icc,1f                 ! if ( j0 >= 0x7ff00000 )
837         fabsd   %f26,%f26               ! x = fabs(x);

839         sub     %o0,%l4,%o0             ! diff = hy - hx;
840         fabsd   %f24,%f24               ! y = fabs(y);

842         sra     %o0,31,%l4              ! j0 = diff >> 31;

844         xor     %o0,%l4,%o0             ! diff ^ j0

846         sethi   %hi(0x03600000),%l1
847         sub     %o0,%l4,%o0             ! (diff ^ j0) - j0

849         cmp     %o0,%l1                 ! ((diff ^ j0) - j0) ? 0x03600000
850         bge,a,pn        %icc,2f         ! if ( ((diff ^ j0) - j0) >= 0x03600000
851         faddd   %f26,%f24,%f24          ! *pz = x + y

853         fmuld   %f26,DC2,%f36           ! (1_1) x *= dnorm;
```



```
855         fmuld   %f24,DC2,%f56           ! (1_1) y *= dnorm;

857         faddd   %f36,D2ON28,%f58        ! (1_1) x_hi = x + D2ON28;

859         faddd   %f56,D2ON28,%f22        ! (1_1) y_hi = y + D2ON28;

861         fsubd   %f58,D2ON28,%f58        ! (1_1) x_hi -= D2ON28;

863         fsubd   %f22,D2ON28,%f22        ! (1_1) y_hi -= D2ON28;

865         fmuld   %f58,%f58,%f60          ! (1_1) res = x_hi * x_hi;
866         faddd   %f56,%f22,%f28          ! (1_1) dtmp2 = y + y_hi;

868         faddd   %f36,%f58,%f6           ! (1_1) dtmp1 = x + x_hi;

870         fsubd   %f36,%f58,%f58          ! (1_1) x_lo = x - x_hi;

872         fmuld   %f22,%f22,%f2           ! (1_1) dtmp0 = y_hi * y_hi;
873         fsubd   %f56,%f22,%f56          ! (1_1) y_lo = y - y_hi;

875         fmuld   %f6,%f58,%f10           ! (1_1) dtmp1 *= x_lo;

877         fmuld   %f28,%f56,%f26          ! (1_1) dtmp2 *= y_lo;

879         faddd   %f60,%f2,%f24           ! (1_1) res += dtmp0;

881         faddd   %f10,%f26,%f28          ! (1_1) dtmp1 += dtmp2;

883         faddd   %f24,%f28,%f26          ! (1_1) res += dtmp1;

885         fsqrtd  %f26,%f24               ! (1_1) res = sqrt(res);

887         fmuld   DC3,%f24,%f24           ! (1_2) res = dmax * res;
888 2:
889         add     %i3,stridey,%i3
890         add     %i1,stridex,%i1
891         st      %f24,[%i5]              ! ((float*)pz)[0] = ((float*)&res)[0];
892         st      %f25,[%i5+4]            ! ((float*)pz)[1] = ((float*)&res)[1];

894         add     %i5,stridez,%i5
895         ba      .begin1
896         sub     counter,1,counter

898 1:
899         ld      [%i3+4],%l2             ! ly = ((int*)py)[1];
900         cmp     %o0,%o4                 ! hx ? 0x7ff00000
901         bne,pn  %icc,1f                 ! if ( hx != 0x7ff00000 )
902         fabsd   %f24,%f24               ! y = fabs(y);

904         cmp     %l1,0                   ! lx ? 0
905         be,pn   %icc,2f                 ! if ( lx == 0 )
906         nop
907 1:
908         cmp     %l4,%o4                 ! hy ? 0x7ff00000
909         bne,pn  %icc,1f                 ! if ( hy != 0x7ff00000 )
910         nop

912         cmp     %l2,0                   ! ly ? 0
913         be,pn   %icc,2f                 ! if ( ly == 0 )
914         nop
915 1:
916         add     %i3,stridey,%i3
917         add     %i1,stridex,%i1
918         fmuld   %f26,%f24,%f24          ! res = x * y;
919         st      %f24,[%i5]              ! ((float*)pz)[0] = ((float*)&res)[0];
```

```
921         st      %f25,[%i5+4]            ! ((float*)pz)[1] = ((float*)&res)[1];

923         add     %i5,stridez,%i5
924         ba      .begin1
925         sub     counter,1,counter

927 2:
928         add     %i1,stridex,%i1
929         add     %i3,stridey,%i3
930         st      DC0_HI,[%i5]            ! ((int*)pz)[0] = 0x7ff00000;
931         st      DC0_LO,[%i5+4]          ! ((int*)pz)[1] = 0;
932         fcmpd   %f26,%f24               ! x ? y

934         add     %i5,stridez,%i5
935         ba      .begin1
936         sub     counter,1,counter

938         .align  16
939 .spec1:
940         fmuld   %f26,DC3,%f36           ! (1_1) x *= dnorm;

942         fmuld   %f24,DC3,%f56           ! (1_1) y *= dnorm;

944         faddd   %f36,D2ON28,%f58        ! (1_1) x_hi = x + D2ON28;

946         faddd   %f56,D2ON28,%f22        ! (1_1) y_hi = y + D2ON28;

948         fsubd   %f58,D2ON28,%f58        ! (1_1) x_hi -= D2ON28;

950         fsubd   %f22,D2ON28,%f22        ! (1_1) y_hi -= D2ON28;

952         fmuld   %f58,%f58,%f60          ! (1_1) res = x_hi * x_hi;
953         faddd   %f56,%f22,%f28          ! (1_1) dtmp2 = y + y_hi;

955         faddd   %f36,%f58,%f6           ! (1_1) dtmp1 = x + x_hi;

957         fsubd   %f36,%f58,%f58          ! (1_1) x_lo = x - x_hi;

959         fmuld   %f22,%f22,%f2           ! (1_1) dtmp0 = y_hi * y_hi;
960         fsubd   %f56,%f22,%f56          ! (1_1) y_lo = y - y_hi;

962         fmuld   %f6,%f58,%f10           ! (1_1) dtmp1 *= x_lo;

964         fmuld   %f28,%f56,%f26          ! (1_1) dtmp2 *= y_lo;

966         faddd   %f60,%f2,%f24           ! (1_1) res += dtmp0;

968         faddd   %f10,%f26,%f28          ! (1_1) dtmp1 += dtmp2;

970         faddd   %f24,%f28,%f26          ! (1_1) res += dtmp1;

972         fsqrtd  %f26,%f24               ! (1_1) res = sqrt(res);

974         fmuld   DC2,%f24,%f24           ! (1_2) res = dmax * res;

976         add     %i3,stridey,%i3
977         add     %i1,stridex,%i1
978         st      %f24,[%i5]              ! ((float*)pz)[0] = ((float*)&res)[0];

980         st      %f25,[%i5+4]            ! ((float*)pz)[1] = ((float*)&res)[1];
981         add     %i5,stridez,%i5
982         ba      .begin1
983         sub     counter,1,counter

985         .align  16
```



```
986 .update0:
987         fzero   %f50
988         cmp     counter,1
989         ble     .cont0
990         fzero   %f34

992         mov     %o1,tmp_px
993         mov     %i3,tmp_py

995         sub     counter,1,tmp_counter
996         ba      .cont0
997         mov     1,counter

999         .align  16
1000 .update1:
1001        fzero   %f50
1002        cmp     counter,1
1003        ble     .cont1
1004        fzero   %f34

1006        mov     %o1,tmp_px
1007        mov     %i3,tmp_py

1009        sub     counter,1,tmp_counter
1010        ba      .cont1
1011        mov     1,counter

1013        .align  16
1014 .update2:
1015        fzero   %f18
1016        cmp     counter,2
1017        ble     .cont2
1018        fzero   %f30

1020        mov     %l2,tmp_px
1021        mov     %l4,tmp_py

1023        sub     counter,2,tmp_counter
1024        ba      .cont1
1025        mov     2,counter

1027        .align  16
1028 .update3:
1029        fzero   %f18
1030        cmp     counter,2
1031        ble     .cont3
1032        fzero   %f30

1034        mov     %l2,tmp_px
1035        mov     %l4,tmp_py

1037        sub     counter,2,tmp_counter
1038        ba      .cont3
1039        mov     2,counter

1041        .align  16
1042 .update4:
1043        fzero   %f20
1044        cmp     counter,3
1045        ble     .cont4
1046        fzero   %f40

1048        mov     %l1,tmp_px
1049        mov     %i3,tmp_py

1051        sub     counter,3,tmp_counter
```

```
1052         ba      .cont4
1053         mov     3,counter

1055         .align  16
1056 .update5:
1057         fzero   %f20
1058         cmp     counter,3
1059         ble     .cont5
1060         fzero   %f40

1062         mov     %l1,tmp_px
1063         mov     %i3,tmp_py

1065         sub     counter,3,tmp_counter
1066         ba      .cont5
1067         mov     3,counter

1069         .align  16
1070 .update6:
1071         fzero   %f36
1072         cmp     counter,4
1073         ble     .cont6
1074         fzero   %f54

1076         mov     %l7,tmp_px
1077         mov     %l2,tmp_py

1079         sub     counter,4,tmp_counter
1080         ba      .cont6
1081         mov     4,counter

1083         .align  16
1084 .update7:
1085         fzero   %f36
1086         cmp     counter,4
1087         ble     .cont7
1088         fzero   %f54

1090         mov     %l7,tmp_px
1091         mov     %l2,tmp_py

1093         sub     counter,4,tmp_counter
1094         ba      .cont7
1095         mov     4,counter

1097         .align  16
1098 .update8:
1099         fzero   %f50
1100         cmp     counter,5
1101         ble     .cont8
1102         fzero   %f34

1104         mov     %o1,tmp_px
1105         mov     %i3,tmp_py

1107         sub     counter,5,tmp_counter
1108         ba      .cont8
1109         mov     5,counter

1111         .align  16
1112 .update9:
1113         fzero   %f50
1114         cmp     counter,5
1115         ble     .cont9
1116         fzero   %f34
```



```
1118         mov     %o1,tmp_px
1119         mov     %i3,tmp_py

1121         sub     counter,5,tmp_counter
1122         ba      .cont9
1123         mov     5,counter


1126         .align  16
1127 .update10:
1128         fzero   %f18
1129         cmp     counter,2
1130         ble     .cont10
1131         fzero   %f30

1133         mov     %l2,tmp_px
1134         mov     %l4,tmp_py

1136         sub     counter,2,tmp_counter
1137         ba      .cont10
1138         mov     2,counter

1140         .align  16
1141 .update11:
1142         fzero   %f18
1143         cmp     counter,2
1144         ble     .cont11
1145         fzero   %f30

1147         mov     %l2,tmp_px
1148         mov     %l4,tmp_py

1150         sub     counter,2,tmp_counter
1151         ba      .cont11
1152         mov     2,counter

1154         .align  16
1155 .update12:
1156         fzero   %f20
1157         cmp     counter,3
1158         ble     .cont12
1159         fzero   %f40

1161         mov     %l1,tmp_px
1162         mov     %i3,tmp_py

1164         sub     counter,3,tmp_counter
1165         ba      .cont12
1166         mov     3,counter

1168         .align  16
1169 .update13:
1170         fzero   %f20
1171         cmp     counter,3
1172         ble     .cont13
1173         fzero   %f40

1175         mov     %l1,tmp_px
1176         mov     %i3,tmp_py

1178         sub     counter,3,tmp_counter
1179         ba      .cont13
1180         mov     3,counter

1182         .align  16
1183 .update14:
```

```
1184         fzero   %f54
1185         cmp     counter,4
1186         ble     .cont14
1187         fzero   %f36

1189         mov     %l7,tmp_px
1190         mov     %l2,tmp_py

1192         sub     counter,4,tmp_counter
1193         ba      .cont14
1194         mov     4,counter

1196         .align  16
1197 .update15:
1198         fzero   %f54
1199         cmp     counter,4
1200         ble     .cont15
1201         fzero   %f36

1203         mov     %l7,tmp_px
1204         mov     %l2,tmp_py

1206         sub     counter,4,tmp_counter
1207         ba      .cont15
1208         mov     4,counter

1210         .align  16
1211 .update16:
1212         fzero   %f50
1213         cmp     counter,5
1214         ble     .cont16
1215         fzero   %f34

1217         mov     %o1,tmp_px
1218         mov     %i3,tmp_py

1220         sub     counter,5,tmp_counter
1221         ba      .cont16
1222         mov     5,counter

1224         .align  16
1225 .update17:
1226         fzero   %f50
1227         cmp     counter,5
1228         ble     .cont17
1229         fzero   %f34

1231         mov     %o1,tmp_px
1232         mov     %i3,tmp_py

1234         sub     counter,5,tmp_counter
1235         ba      .cont17
1236         mov     5,counter

1238         .align  16
1239 .exit:
1240         ret
1241         restore
1242         SET_SIZE(__vhypot)
```

```
**********************************************************
   31358 Sat May 10 12:09:58 2014
new/usr/src/lib/libmvec/common/vis/__vhypotf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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        .file   "__vhypotf.S"

#include "libm.h"

        RO_DATA
        .align  64

.CONST_TBL:
        .word   0x3fe00001, 0x80007e00  ! K1  =  5.00000715259318464227e-01
        .word   0xbfc00003, 0xc0017a01  ! K2  = -1.25000447037521686593e-01
        .word   0x000fffff, 0xffffffff  ! DC0 = 0x000fffffffffffff
        .word   0x3ff00000, 0x00000000  ! DC1 = 0x3ff0000000000000
        .word   0x7ffff000, 0x00000000  ! DC2 = 0x7ffff00000000000
        .word   0x7fe00000, 0x00000000  ! DA0 = 0x7fe0000000000000
        .word   0x47efffff, 0xe0000000  ! DFMAX = 3.402823e+38
        .word   0x7f7fffff, 0x80808080  ! FMAX = 3.402823e+38 , SCALE = 0x808080
        .word   0x20000000, 0x00000000  ! DA1 = 0x2000000000000000

#define DC0             %f12
#define DC1             %f10
#define DC2             %f42
#define DA0             %f6
#define DA1             %f4
#define K2              %f26
#define K1              %f28
#define SCALE           %f3
#define FMAX            %f2
#define DFMAX           %f50

#define stridex         %l6
#define stridey         %i4
#define stridez         %l5
#define _0x7fffffff     %o1
```



```
#define _0x7f3504f3     %o2
#define _0x1ff0         %l2
#define TBL             %l1

#define counter         %l0

#define tmp_px          STACK_BIAS-0x30
#define tmp_py          STACK_BIAS-0x28
#define tmp_counter     STACK_BIAS-0x20
#define tmp0            STACK_BIAS-0x18
#define tmp1            STACK_BIAS-0x10
#define tmp2            STACK_BIAS-0x0c
#define tmp3            STACK_BIAS-0x08
#define tmp4            STACK_BIAS-0x04

! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x30

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!      !!!!!   algorithm   !!!!!
!  hx0 = *(int*)px;
!  x0 = *px;
!  px += stridex;
!
!  hy0 = *(int*)py;
!  y0 = *py;
!  py += stridey;
!
!  hx0 &= 0x7fffffff;
!  hy0 &= 0x7fffffff;
!
!  if ( hx >= 0x7f3504f3 || hy >= 0x7f3504f3 )
!  {
!    if ( hx >= 0x7f800000 || hy >= 0x7f800000 )
!    {
!      if ( hx == 0x7f800000 || hy == 0x7f800000 )
!        *(int*)pz = 0x7f800000;
!      else *pz = x * y;
!    }
!    else
!    {
!      hyp = sqrt(x * (double)x + y * (double)y);
!      if ( hyp <= DMAX ) ftmp0 = (float)hyp;
!      else ftmp0 = FMAX * FMAX;
!      *pz = ftmp0;
!    }
!    pz += stridez;
!    continue;
!  }
!  if ( (hx | hy) == 0 )
!  {
!    *pz = 0;
!    pz += stridez;
!    continue;
!  }
!  dx0 = x0 * (double)x0;
!  dy0 = y0 * (double)y0;
!  db0 = dx0 + dy0;
!
!  iexp0 = ((int*)&db0)[0];
!
!  h0 = vis_fand(db0,DC0);
!  h0 = vis_for(h0,DC1);
!  h_hi0 = vis_fand(h0,DC2);
!
!  db0 = vis_fand(db0,DA0);
```

```
!  db0 = vis_fmul8x16(SCALE, db0);
!  db0 = vis_fpadd32(db0,DA1);
!
!  iexp0 >>= 8;
!  di0 = iexp0 & 0x1ff0;
!  si0 = (char*)sqrt_arr + di0;
!
!  dtmp0 = ((double*)((char*)div_arr + di0))[0];
!  xx0 = h0 - h_hi0;
!  xx0 *= dmp0;
!
!  dtmp0 = ((double*)si0)[1];
!  res0 = K2 * xx0;
!  res0 += K1;
!  res0 *= xx0;
!  res0 += DC1;
!  res0 = dtmp0 * res0;
!  res0 *= db0;
!  ftmp0 = (float)res0;
!  *pz = ftmp0;
!  pz += stridez;
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

        ENTRY(__vhypotf)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,o3)
        PIC_SET(l7,__vlibm_TBL_sqrtf,l1)

#ifdef __sparcv9
        ldx     [%fp+STACK_BIAS+176],stridez
#else
        ld      [%fp+STACK_BIAS+92],stridez
#endif
        st      %i0,[%fp+tmp_counter]

        stx     %i1,[%fp+tmp_px]

        stx     %i3,[%fp+tmp_py]

        ldd     [%o3],K1
        sethi   %hi(0x7ffffc00),%o1

        ldd     [%o3+8],K2
        sethi   %hi(0x7f350400),%o2

        ldd     [%o3+16],DC0
        add     %o1,1023,_0x7fffffff
        add     %o2,0xf3,_0x7f3504f3

        ldd     [%o3+24],DC1
        sll     %i2,2,stridex

        ld      [%o3+56],FMAX

        ldd     [%o3+32],DC2
        sll     %i4,2,stridey

        ldd     [%o3+40],DA0
        sll     stridez,2,stridez

        ldd     [%o3+48],DFMAX

        ld      [%o3+60],SCALE
        or      %g0,0xff8,%l2
```



```
        ldd     [%o3+64],DA1
        sll     %l2,1,_0x1ff0
        or      %g0,%i5,%l7

.begin:
        ld      [%fp+tmp_counter],counter
        ldx     [%fp+tmp_px],%i1
        ldx     [%fp+tmp_py],%i2
        st      %g0,[%fp+tmp_counter]
.begin1:
        cmp     counter,0
        ble,pn  %icc,.exit
        lda     [%i1]0x82,%l3           ! (3_0) hx0 = *(int*)px;

        lda     [%i2]0x82,%l4           ! (3_0) hy0 = *(int*)py;

        lda     [%i1]0x82,%f17          ! (3_0) x0 = *px;
        and     %l3,_0x7fffffff,%l3     ! (3_0) hx0 &= 0x7fffffff;

        cmp     %l3,_0x7f3504f3         ! (3_0) hx ? 0x7f3504f3
        bge,pn  %icc,.spec              ! (3_0) if ( hx >= 0x7f3504f3 )
        and     %l4,_0x7fffffff,%l4     ! (3_0) hy0 &= 0x7fffffff;

        cmp     %l4,_0x7f3504f3         ! (3_0) hy ? 0x7f3504f3
        bge,pn  %icc,.spec              ! (3_0) if ( hy >= 0x7f3504f3 )
        or      %g0,%i2,%o7

        orcc    %l3,%l4,%g0
        bz,pn   %icc,.spec1

        add     %i1,stridex,%i1         ! px += stridex
        fsmuld  %f17,%f17,%f44          ! (3_0) dx0 = x0 * (double)x0;
        lda     [%i2]0x82,%f17          ! (3_0) y0 = *py;

        lda     [%i1]0x82,%l3           ! (4_0) hx0 = *(int*)px;

        lda     [stridey+%o7]0x82,%l4   ! (4_0) hy0 = *(int*)py;

        and     %l3,_0x7fffffff,%l3     ! (4_0) hx0 &= 0x7fffffff;

        fsmuld  %f17,%f17,%f24          ! (3_0) dy0 = y0 * (double)y0;
        cmp     %l3,_0x7f3504f3         ! (4_0) hx ? 0x7f3504f3
        bge,pn  %icc,.update0           ! (4_0) if ( hx >= 0x7f3504f3 )
        and     %l4,_0x7fffffff,%l4     ! (4_0) hy0 &= 0x7fffffff;

        orcc    %l3,%l4,%g0
        bz,pn   %icc,.update0
        lda     [%i1]0x82,%f17          ! (4_0) x0 = *px;
.cont0:
        faddd   %f44,%f24,%f24          ! (3_0) db0 = dx0 + dy0;

        fsmuld  %f17,%f17,%f40          ! (4_1) dy0 = x0 * (double)x0;
        cmp     %l4,_0x7f3504f3         ! (4_1) hy ? 0x7f3504f3
        lda     [stridey+%o7]0x82,%f17  ! (4_1) hy0 = *py;

        add     %o7,stridey,%i5         ! py += stridey
        lda     [%i1+stridex]0x82,%l3   ! (0_0) hx0 = *(int*)px;

        bge,pn  %icc,.update1           ! (4_1) if ( hy >= 0x7f3504f3 )
        st      %f24,[%fp+tmp0]         ! (3_1) iexp0 = ((int*)&db0)[0];
.cont1:
        and     %l3,_0x7fffffff,%l3     ! (0_0) hx0 &= 0x7fffffff;

        fsmuld  %f17,%f17,%f48          ! (4_1) dy0 = y0 * (double)y0;
        lda     [%i1+stridex]0x82,%f8   ! (0_0) x0 = *px;
```

```
260         add     %i1,stridex,%i1         ! px += stridex

262         lda     [%i5+stridey]0x82,%l4   ! (0_0) hy0 = *(int*)py;
263         cmp     %l3,_0x7f3504f3         ! (0_0) hx ? 0x7f3504f3
264         bge,pn  %icc,.update2           ! (0_0) if ( hx >= 0x7f3504f3 )
265         add     %i5,stridey,%o4         ! py += stridey
266 .cont2:
267         faddd   %f40,%f48,%f20          ! (4_1) db0 = dx0 + dy0;

269         fsmuld  %f8,%f8,%f40            ! (0_0) dx0 = x0 * (double)x0;
270         and     %l4,_0x7fffffff,%l4     ! (0_0) hy0 &= 0x7fffffff;
271         lda     [%i5+stridey]0x82,%f17  ! (0_0) hy0 = *py;

273         cmp     %l4,_0x7f3504f3         ! (0_0) hy ? 0x7f3504f3
274         bge,pn  %icc,.update3           ! (0_0) if ( hy >= 0x7f3504f3 )
275         st      %f20,[%fp+tmp1]         ! (4_1) iexp0 = ((int*)&db0)[0];

277         orcc    %l3,%l4,%g0
278         bz,pn   %icc,.update3
279 .cont3:
280         lda     [%i1+stridex]0x82,%l3   ! (1_0) hx0 = *(int*)px;

282         fand    %f24,DC0,%f60           ! (3_1) h0 = vis_fand(db0,DC0);

284         and     %l3,_0x7fffffff,%l3     ! (1_0) hx0 &= 0x7fffffff;

286         fsmuld  %f17,%f17,%f34          ! (0_0) dy0 = y0 * (double)y0;
287         cmp     %l3,_0x7f3504f3         ! (1_0) hx ? 0x7f3504f3
288         lda     [%o4+stridey]0x82,%l4   ! (1_0) hy0 = *(int*)py;

290         add     %i1,stridex,%i1         ! px += stridex

292         lda     [%i1]0x82,%f17          ! (1_0) x0 = *px;
293         bge,pn  %icc,.update4           ! (1_0) if ( hx >= 0x7f3504f3 )
294         add     %o4,stridey,%i5         ! py += stridey
295 .cont4:
296         and     %l4,_0x7fffffff,%l4     ! (1_0) hy0 &= 0x7fffffff;
297         for     %f60,DC1,%f46           ! (3_1) h0 = vis_for(h0,DC1);

299         cmp     %l4,_0x7f3504f3         ! (1_0) hy ? 0x7f3504f3
300         ld      [%fp+tmp0],%o0          ! (3_1) iexp0 = ((int*)&db0)[0];
301         faddd   %f40,%f34,%f0           ! (0_0) db0 = dx0 + dy0;

303         fsmuld  %f17,%f17,%f40          ! (1_0) dx0 = x0 * (double)x0;
304         add     %i1,stridex,%i1         ! px += stridex
305         lda     [%o4+stridey]0x82,%f17  ! (1_0) y0 = *py;

307         srax    %o0,8,%o0               ! (3_1) iexp0 >>= 8;
308         bge,pn  %icc,.update5           ! (1_0) if ( hy >= 0x7f3504f3 )
309         fand    %f46,DC2,%f38           ! (3_1) h_hi0 = vis_fand(h0,DC2);

311         orcc    %l3,%l4,%g0
312         bz,pn   %icc,.update5
313 .cont5:
314         lda     [%i1]0x82,%l3           ! (2_0) hx0 = *(int*)px;

316         and     %o0,_0x1ff0,%o0         ! (3_1) di0 = iexp0 & 0x1ff0;
317         st      %f0,[%fp+tmp2]          ! (0_0) iexp0 = ((int*)&db0)[0];
318         fand    %f20,DC0,%f60           ! (4_1) h0 = vis_fand(db0,DC0);

320         ldd     [TBL+%o0],%f22          ! (3_1) dtmp0 = ((double*)((char*)div_ar
321         fsubd   %f46,%f38,%f38          ! (3_1) xx0 = h0 - h_hi0;

323         fsmuld  %f17,%f17,%f32          ! (1_0) dy0 = y0 * (double)y0;
324         add     %i5,stridey,%i2         ! py += stridey
325         lda     [stridey+%i5]0x82,%l4   ! (2_0) hy0 = *(int*)py;
```



```
327         and     %l3,_0x7fffffff,%l3     ! (2_0) hx0 &= 0x7fffffff;

329         lda     [%i1]0x82,%f17          ! (2_0) x0 = *px;
330         cmp     %l3,_0x7f3504f3         ! (2_0) hx ? 0x7f3504f3

332         fmuld   %f38,%f22,%f38          ! (3_1) xx0 *= dmp0;
333         and     %l4,_0x7fffffff,%l4     ! (2_0) hy0 &= 0x7fffffff;
334         for     %f60,DC1,%f46           ! (4_1) h0 = vis_for(h0,DC1);

336         bge,pn  %icc,.update6           ! (2_0) if ( hx >= 0x7f3504f3 )
337         ld      [%fp+tmp1],%o3          ! (4_1) iexp0 = ((int*)&db0)[0];
338 .cont6:
339         faddd   %f40,%f32,%f18          ! (1_0) db0 = dx0 + dy0;

341         fsmuld  %f17,%f17,%f44          ! (2_0) dx0 = x0 * (double)x0;
342         cmp     %l4,_0x7f3504f3         ! (2_0) hy ? 0x7f3504f3
343         lda     [stridey+%i5]0x82,%f17  ! (2_0) y0 = *py;

345         add     %i1,stridex,%i1         ! px += stridex
346         bge,pn  %icc,.update7           ! (2_0) if ( hy >= 0x7f3504f3 )
347         fand    %f46,DC2,%f58           ! (4_1) h_hi0 = vis_fand(h0,DC2);

349         orcc    %l3,%l4,%g0
350         bz,pn   %icc,.update7
351         nop
352 .cont7:
353         fmuld   K2,%f38,%f56            ! (3_1) res0 = K2 * xx0;
354         srax    %o3,8,%o3               ! (4_1) iexp0 >>= 8;
355         lda     [%i1]0x82,%l3           ! (3_0) hx0 = *(int*)px;

357         and     %o3,_0x1ff0,%o3         ! (4_1) di0 = iexp0 & 0x1ff0;
358         st      %f18,[%fp+tmp3]         ! (1_0) iexp0 = ((int*)&db0)[0];
359         fand    %f0,DC0,%f60            ! (0_0) h0 = vis_fand(db0,DC0);

361         ldd     [TBL+%o3],%f22          ! (4_1) dtmp0 = ((double*)((char*)div_ar
362         add     %i2,stridey,%o7         ! py += stridey
363         fsubd   %f46,%f58,%f58          ! (4_1) xx0 = h0 - h_hi0;

365         fsmuld  %f17,%f17,%f30          ! (2_0) dy0 = y0 * (double)y0;
366         lda     [stridey+%i2]0x82,%l4   ! (3_0) hy0 = *(int*)py;
367         and     %l3,_0x7fffffff,%l3     ! (3_0) hx0 &= 0x7fffffff;

369         faddd   %f56,K1,%f54            ! (3_1) res0 += K1;
370         cmp     %l3,_0x7f3504f3         ! (3_0) hx ? 0x7f3504f3

372         lda     [%i1]0x82,%f17          ! (3_0) x0 = *px;
373         add     %i1,stridex,%i1         ! px += stridex
374         bge,pn  %icc,.update8           ! (3_0) if ( hx >= 0x7f3504f3 )

376         fmuld   %f58,%f22,%f58          ! (4_1) xx0 *= dmp0;
377 .cont8:
378         and     %l4,_0x7fffffff,%l4     ! (3_0) hy0 &= 0x7fffffff;
379         for     %f60,DC1,%f46           ! (0_0) h0 = vis_for(h0,DC1);

381         cmp     %l4,_0x7f3504f3         ! (3_0) hy ? 0x7f3504f3
382         ld      [%fp+tmp2],%g1          ! (0_0) iexp0 = ((int*)&db0)[0];
383         faddd   %f44,%f30,%f30          ! (2_0) db0 = dx0 + dy0;

385         fsmuld  %f17,%f17,%f44          ! (3_0) dx0 = x0 * (double)x0;
386         bge,pn  %icc,.update9           ! (3_0) if ( hy >= 0x7f3504f3 )
387         lda     [stridey+%i2]0x82,%f17  ! (3_0) y0 = *py;

389         orcc    %l3,%l4,%g0
390         bz,pn   %icc,.update9
391         nop
```

```
.cont9:
        fmuld   %f54,%f38,%f40          ! (3_1) res0 *= xx0;
        lda     [%i1]0x82,%l3           ! (4_0) hx0 = *(int*)px;
        fand    %f46,DC2,%f38           ! (0_0) h_hi0 = vis_fand(h0,DC2);

        fmuld   K2,%f58,%f54            ! (4_1) res0 = K2 * xx0;
        srax    %g1,8,%o5               ! (0_0) iexp0 >>= 8;
        lda     [stridey+%o7]0x82,%l4   ! (4_0) hy0 = *(int*)py;
        fand    %f24,DA0,%f56           ! (3_1) db0 = vis_fand(db0,DA0);

        and     %o5,_0x1ff0,%o5         ! (0_0) di0 = iexp0 & 0x1ff0;
        st      %f30,[%fp+tmp4]         ! (2_0) iexp0 = ((int*)&db0)[0];
        fand    %f18,DC0,%f60           ! (1_0) h0 = vis_fand(db0,DC0);

        ldd     [TBL+%o5],%f22          ! (0_0) dtmp0 = ((double*)((char*)div_ar
        add     %o0,TBL,%g1             ! (3_1) si0 = (char*)sqrt_arr + di0;
        and     %l3,_0x7fffffff,%l3     ! (4_0) hx0 &= 0x7fffffff;
        fsubd   %f46,%f38,%f38          ! (0_0) xx0 = h0 - h_hi0;

        fsmuld  %f17,%f17,%f24          ! (3_0) dy0 = y0 * (double)y0;
        cmp     %l3,_0x7f3504f3         ! (4_0) hx ? 0x7f3504f3
        bge,pn  %icc,.update10          ! (4_0) if ( hx >= 0x7f3504f3 )
        faddd   %f40,DC1,%f40           ! (3_1) res0 += DC1;

        fmul8x16        SCALE,%f56,%f36 ! (3_1) db0 = vis_fmul8x16(SCALE, db0);
        and     %l4,_0x7fffffff,%l4     ! (4_0) hy0 &= 0x7fffffff;
        ldd     [%g1+8],%f56            ! (3_1) dtmp0 = ((double*)si0)[1];
        faddd   %f54,K1,%f54            ! (4_1) res0 += K1;

        lda     [%i1]0x82,%f17          ! (4_0) x0 = *px;
.cont10:
        fmuld   %f38,%f22,%f38          ! (0_0) xx0 *= dmp0;
        cmp     counter,5
        for     %f60,DC1,%f46           ! (1_0) h0 = vis_for(h0,DC1);

        ld      [%fp+tmp3],%g1          ! (1_0) iexp0 = ((int*)&db0)[0];
        fmuld   %f56,%f40,%f62          ! (3_1) res0 = dtmp0 * res0;
        faddd   %f44,%f24,%f24          ! (3_0) db0 = dx0 + dy0;

        bl,pn   %icc,.tail
        nop

        ba      .main_loop
        sub     counter,5,counter

        .align  16
.main_loop:
        fsmuld  %f17,%f17,%f40          ! (4_1) dy0 = x0 * (double)x0;
        cmp     %l4,_0x7f3504f3         ! (4_1) hy ? 0x7f3504f3
        lda     [stridey+%o7]0x82,%f17  ! (4_1) hy0 = *py;
        fpadd32 %f36,DA1,%f36           ! (3_2) db0 = vis_fpadd32(db0,DA1);

        fmuld   %f54,%f58,%f58          ! (4_2) res0 *= xx0;
        add     %o7,stridey,%i5         ! py += stridey
        st      %f24,[%fp+tmp0]         ! (3_1) iexp0 = ((int*)&db0)[0];
        fand    %f46,DC2,%f44           ! (1_1) h_hi0 = vis_fand(h0,DC2);

        fmuld   K2,%f38,%f56            ! (0_1) res0 = K2 * xx0;
        srax    %g1,8,%g5               ! (1_1) iexp0 >>= 8;
        bge,pn  %icc,.update11          ! (4_1) if ( hy >= 0x7f3504f3 )
        fand    %f20,DA0,%f54           ! (4_2) db0 = vis_fand(db0,DA0);

        orcc    %l3,%l4,%g0
        nop
        bz,pn   %icc,.update11
        fzero   %f52
```



```
.cont11:
        fmuld   %f62,%f36,%f62          ! (3_2) res0 *= db0;
        and     %g5,_0x1ff0,%g5         ! (1_1) di0 = iexp0 & 0x1ff0;
        lda     [%i1+stridex]0x82,%l3   ! (0_0) hx0 = *(int*)px;
        fand    %f30,DC0,%f60           ! (2_1) h0 = vis_fand(db0,DC0);

        ldd     [%g5+TBL],%f22          ! (1_1) dtmp0 = ((double*)((char*)div_ar
        add     %o3,TBL,%g1             ! (4_2) si0 = (char*)sqrt_arr + di0;
        add     %i1,stridex,%i0         ! px += stridex
        fsubd   %f46,%f44,%f44          ! (1_1) xx0 = h0 - h_hi0;

        fsmuld  %f17,%f17,%f48          ! (4_1) dy0 = y0 * (double)y0;
        nop
        lda     [%i1+stridex]0x82,%f8   ! (0_0) x0 = *px;
        faddd   %f58,DC1,%f36           ! (4_2) res0 += DC1;

        faddd   %f56,K1,%f58            ! (0_1) res0 += K1;
        and     %l3,_0x7fffffff,%l3     ! (0_0) hx0 &= 0x7fffffff;
        ldd     [%g1+8],%f56            ! (4_2) dtmp0 = ((double*)si0)[1];
        fmul8x16        SCALE,%f54,%f54 ! (4_2) db0 = vis_fmul8x16(SCALE, db0);

        lda     [%i5+stridey]0x82,%l4   ! (0_0) hy0 = *(int*)py;
        cmp     %l3,_0x7f3504f3         ! (0_0) hx ? 0x7f3504f3
        bge,pn  %icc,.update12          ! (0_0) if ( hx >= 0x7f3504f3 )
        fdtos   %f62,%f14               ! (3_2) ftmp0 = (float)res0;
.cont12:
        fmuld   %f44,%f22,%f44          ! (1_1) xx0 *= dmp0;
        add     %l7,stridez,%o7         ! pz += stridez
        st      %f14,[%l7]              ! (3_2) *pz = ftmp0;
        for     %f60,DC1,%f46           ! (2_1) h0 = vis_for(h0,DC1);

        fmuld   %f56,%f36,%f36          ! (4_2) res0 = dtmp0 * res0;
        add     %i5,stridey,%o4         ! py += stridey
        ld      [%fp+tmp4],%g1          ! (2_1) iexp0 = ((int*)&db0)[0];
        faddd   %f40,%f48,%f20          ! (4_1) db0 = dx0 + dy0;

        fsmuld  %f8,%f8,%f40            ! (0_0) dx0 = x0 * (double)x0;
        and     %l4,_0x7fffffff,%l4     ! (0_0) hy0 &= 0x7fffffff;
        lda     [%i5+stridey]0x82,%f17  ! (0_0) hy0 = *py;
        fpadd32 %f54,DA1,%f62           ! (4_2) db0 = vis_fpadd32(db0,DA1);

        fmuld   %f58,%f38,%f38          ! (0_1) res0 *= xx0;
        cmp     %l4,_0x7f3504f3         ! (0_0) hy ? 0x7f3504f3
        st      %f20,[%fp+tmp1]         ! (4_1) iexp0 = ((int*)&db0)[0];
        fand    %f46,DC2,%f58           ! (2_1) h_hi0 = vis_fand(h0,DC2);

        fmuld   K2,%f44,%f56            ! (1_1) res0 = K2 * xx0;
        srax    %g1,8,%g1               ! (2_1) iexp0 >>= 8;
        bge,pn  %icc,.update13          ! (0_0) if ( hy >= 0x7f3504f3 )
        fand    %f0,DA0,%f54            ! (0_1) db0 = vis_fand(db0,DA0);

        orcc    %l3,%l4,%g0
        nop
        bz,pn   %icc,.update13
        fzero   %f52
.cont13:
        fmuld   %f36,%f62,%f62          ! (4_2) res0 *= db0;
        and     %g1,_0x1ff0,%g1         ! (2_1) di0 = iexp0 & 0x1ff0;
        lda     [%i0+stridex]0x82,%l3   ! (1_0) hx0 = *(int*)px;
        fand    %f24,DC0,%f60           ! (3_1) h0 = vis_fand(db0,DC0);

        ldd     [TBL+%g1],%f22          ! (2_1) dtmp0 = ((double*)((char*)div_ar
        add     %o5,TBL,%o0             ! (0_1) si0 = (char*)sqrt_arr + di0;
        add     %i0,stridex,%i1         ! px += stridex
        fsubd   %f46,%f58,%f58          ! (2_1) xx0 = h0 - h_hi0;
```

```
        fsmuld  %f17,%f17,%f34          ! (0_0) dy0 = y0 * (double)y0;
        add     %o7,stridez,%i0         ! pz += stridez
        lda     [%o4+stridey]0x82,%l4   ! (1_0) hy0 = *(int*)py;
        faddd   %f38,DC1,%f36           ! (0_1) res0 += DC1;

        faddd   %f56,K1,%f38            ! (1_1) res0 += K1;
        and     %l3,_0x7fffffff,%l3     ! (1_0) hx0 &= 0x7fffffff;
        ldd     [%o0+8],%f56            ! (0_1) dtmp0 = ((double*)si0)[1];
        fmul8x16        SCALE,%f54,%f54 ! (0_1) db0 = vis_fmul8x16(SCALE, db0);

        lda     [%i1]0x82,%f17          ! (1_0) x0 = *px;
        cmp     %l3,_0x7f3504f3         ! (1_0) hx ? 0x7f3504f3
        bge,pn  %icc,.update14          ! (1_0) if ( hx >= 0x7f3504f3 )
        fdtos   %f62,%f14               ! (4_2) ftmp0 = (float)res0;
.cont14:
        fmuld   %f58,%f22,%f58          ! (2_1) xx0 *= dmp0;
        and     %l4,_0x7fffffff,%l4     ! (1_0) hy0 &= 0x7fffffff;
        add     %o4,stridey,%i5         ! py += stridey
        for     %f60,DC1,%f46           ! (3_1) h0 = vis_for(h0,DC1);

        fmuld   %f56,%f36,%f36          ! (0_1) res0 = dtmp0 * res0;
        cmp     %l4,_0x7f3504f3         ! (1_0) hy ? 0x7f3504f3
        ld      [%fp+tmp0],%o0          ! (3_1) iexp0 = ((int*)&db0)[0];
        faddd   %f40,%f34,%f0           ! (0_0) db0 = dx0 + dy0;

        fsmuld  %f17,%f17,%f40          ! (1_0) dx0 = x0 * (double)x0;
        add     %i1,stridex,%i1         ! px += stridex
        lda     [%o4+stridey]0x82,%f17  ! (1_0) y0 = *py;
        fpadd32 %f54,DA1,%f62           ! (0_1) db0 = vis_fpadd32(db0,DA1);

        fmuld   %f38,%f44,%f44          ! (1_1) res0 *= xx0;
        st      %f14,[%o7]              ! (4_2) *pz = ftmp0;
        bge,pn  %icc,.update15          ! (1_0) if ( hy >= 0x7f3504f3 )
        fand    %f46,DC2,%f38           ! (3_1) h_hi0 = vis_fand(h0,DC2);

        orcc    %l3,%l4,%g0
        bz,pn   %icc,.update15
        nop
.cont15:
        fmuld   K2,%f58,%f54            ! (2_1) res0 = K2 * xx0;
        srax    %o0,8,%o0               ! (3_1) iexp0 >>= 8;
        st      %f0,[%fp+tmp2]          ! (0_0) iexp0 = ((int*)&db0)[0];
        fand    %f18,DA0,%f56           ! (1_1) db0 = vis_fand(db0,DA0);

        fmuld   %f36,%f62,%f62          ! (0_1) res0 *= db0;
        and     %o0,_0x1ff0,%o0         ! (3_1) di0 = iexp0 & 0x1ff0;
        lda     [%i1]0x82,%l3           ! (2_0) hx0 = *(int*)px;
        fand    %f20,DC0,%f60           ! (4_1) h0 = vis_fand(db0,DC0);

        ldd     [TBL+%o0],%f22          ! (3_1) dtmp0 = ((double*)((char*)div_ar
        add     %g5,TBL,%o3             ! (1_1) si0 = (char*)sqrt_arr + di0;
        add     %i0,stridez,%i3         ! pz += stridez
        fsubd   %f46,%f38,%f38          ! (3_1) xx0 = h0 - h_hi0;

        fsmuld  %f17,%f17,%f32          ! (1_0) dy0 = y0 * (double)y0;
        add     %i5,stridey,%i2         ! py += stridey
        lda     [stridey+%i5]0x82,%l4   ! (2_0) hy0 = *(int*)py;
        faddd   %f44,DC1,%f44           ! (1_1) res0 += DC1;

        fmul8x16        SCALE,%f56,%f36 ! (1_1) db0 = vis_fmul8x16(SCALE, db0);
        and     %l3,_0x7fffffff,%l3     ! (2_0) hx0 &= 0x7fffffff;
        ldd     [%o3+8],%f56            ! (1_1) dtmp0 = ((double*)si0)[1];
        faddd   %f54,K1,%f54            ! (2_1) res0 += K1;

        lda     [%i1]0x82,%f17          ! (2_0) x0 = *px;
        cmp     %l3,_0x7f3504f3         ! (2_0) hx ? 0x7f3504f3
```



```
        add     %i3,stridez,%o4         ! pz += stridez
        fdtos   %f62,%f14               ! (0_1) ftmp0 = (float)res0;

        fmuld   %f38,%f22,%f38          ! (3_1) xx0 *= dmp0;
        and     %l4,_0x7fffffff,%l4     ! (2_0) hy0 &= 0x7fffffff;
        st      %f14,[%i0]              ! (0_1) *pz = ftmp0;
        for     %f60,DC1,%f46           ! (4_1) h0 = vis_for(h0,DC1);

        fmuld   %f56,%f44,%f62          ! (1_1) res0 = dtmp0 * res0;
        bge,pn  %icc,.update16          ! (2_0) if ( hx >= 0x7f3504f3 )
        ld      [%fp+tmp1],%o3          ! (4_1) iexp0 = ((int*)&db0)[0];
        faddd   %f40,%f32,%f18          ! (1_0) db0 = dx0 + dy0;
.cont16:
        fsmuld  %f17,%f17,%f44          ! (2_0) dx0 = x0 * (double)x0;
        cmp     %l4,_0x7f3504f3         ! (2_0) hy ? 0x7f3504f3
        lda     [stridey+%i5]0x82,%f17  ! (2_0) y0 = *py;
        fpadd32 %f36,DA1,%f36           ! (1_1) db0 = vis_fpadd32(db0,DA1);

        fmuld   %f54,%f58,%f54          ! (2_1) res0 *= xx0;
        add     %i1,stridex,%l7         ! px += stridex
        bge,pn  %icc,.update17          ! (2_0) if ( hy >= 0x7f3504f3 )
        fand    %f46,DC2,%f58           ! (4_1) h_hi0 = vis_fand(h0,DC2);

        orcc    %l3,%l4,%g0
        nop
        bz,pn   %icc,.update17
        fzero   %f52
.cont17:
        fmuld   K2,%f38,%f56            ! (3_1) res0 = K2 * xx0;
        srax    %o3,8,%o3               ! (4_1) iexp0 >>= 8;
        st      %f18,[%fp+tmp3]         ! (1_0) iexp0 = ((int*)&db0)[0];
        fand    %f30,DA0,%f40           ! (2_1) db0 = vis_fand(db0,DA0);

        fmuld   %f62,%f36,%f62          ! (1_1) res0 *= db0;
        and     %o3,_0x1ff0,%o3         ! (4_1) di0 = iexp0 & 0x1ff0;
        lda     [%l7]0x82,%l3           ! (3_0) hx0 = *(int*)px;
        fand    %f0,DC0,%f60            ! (0_0) h0 = vis_fand(db0,DC0);

        ldd     [TBL+%o3],%f22          ! (4_1) dtmp0 = ((double*)((char*)div_ar
        add     %g1,TBL,%g1             ! (2_1) si0 = (char*)sqrt_arr + di0;
        add     %i2,stridey,%o7         ! py += stridey
        fsubd   %f46,%f58,%f58          ! (4_1) xx0 = h0 - h_hi0;

        fsmuld  %f17,%f17,%f30          ! (2_0) dy0 = y0 * (double)y0;
        lda     [stridey+%i2]0x82,%l4   ! (3_0) hy0 = *(int*)py;
        add     %l7,stridex,%i1         ! px += stridex
        faddd   %f54,DC1,%f36           ! (2_1) res0 += DC1;

        faddd   %f56,K1,%f54            ! (3_1) res0 += K1;
        and     %l3,_0x7fffffff,%l3     ! (3_0) hx0 &= 0x7fffffff;
        ldd     [%g1+8],%f56            ! (2_1) dtmp0 = ((double*)si0)[1];
        fmul8x16        SCALE,%f40,%f40 ! (2_1) db0 = vis_fmul8x16(SCALE, db0);

        lda     [%l7]0x82,%f17          ! (3_0) x0 = *px;
        cmp     %l3,_0x7f3504f3         ! (3_0) hx ? 0x7f3504f3
        bge,pn  %icc,.update18          ! (3_0) if ( hx >= 0x7f3504f3 )
        fdtos   %f62,%f14               ! (1_1) ftmp0 = (float)res0;
.cont18:
        fmuld   %f58,%f22,%f58          ! (4_1) xx0 *= dmp0;
        and     %l4,_0x7fffffff,%l4     ! (3_0) hy0 &= 0x7fffffff;
        st      %f14,[%i3]              ! (1_1) *pz = ftmp0;
        for     %f60,DC1,%f46           ! (0_0) h0 = vis_for(h0,DC1);

        fmuld   %f56,%f36,%f36          ! (2_1) res0 = dtmp0 * res0;
        cmp     %l4,_0x7f3504f3         ! (3_0) hy ? 0x7f3504f3
        ld      [%fp+tmp2],%g1          ! (0_0) iexp0 = ((int*)&db0)[0];
```

```
656         faddd   %f44,%f30,%f30          ! (2_0) db0 = dx0 + dy0;

658         fsmuld  %f17,%f17,%f44          ! (3_0) dx0 = x0 * (double)x0;
659         bge,pn  %icc,.update19          ! (3_0) if ( hy >= 0x7f3504f3 )
660         lda     [stridey+%i2]0x82,%f17  ! (3_0) y0 = *py;
661         fpadd32 %f40,DA1,%f62           ! (2_1) db0 = vis_fpadd32(db0,DA1);

663 .cont19:
664         fmuld   %f54,%f38,%f40          ! (3_1) res0 *= xx0;
665         orcc    %l3,%l4,%g0
666         st      %f30,[%fp+tmp4]         ! (2_0) iexp0 = ((int*)&db0)[0];
667         fand    %f46,DC2,%f38           ! (0_0) h_hi0 = vis_fand(h0,DC2);

669         fmuld   K2,%f58,%f54            ! (4_1) res0 = K2 * xx0;
670         srax    %g1,8,%o5               ! (0_0) iexp0 >>= 8;
671         lda     [%i1]0x82,%l3           ! (4_0) hx0 = *(int*)px;
672         fand    %f24,DA0,%f56           ! (3_1) db0 = vis_fand(db0,DA0);

674         fmuld   %f36,%f62,%f62          ! (2_1) res0 *= db0;
675         and     %o5,_0x1ff0,%o5         ! (0_0) di0 = iexp0 & 0x1ff0;
676         bz,pn   %icc,.update19a
677         fand    %f18,DC0,%f60           ! (1_0) h0 = vis_fand(db0,DC0);
678 .cont19a:
679         ldd     [TBL+%o5],%f22          ! (0_0) dtmp0 = ((double*)((char*)div_ar
680         add     %o0,TBL,%g1             ! (3_1) si0 = (char*)sqrt_arr + di0;
681         and     %l3,_0x7fffffff,%l3     ! (4_0) hx0 &= 0x7fffffff;
682         fsubd   %f46,%f38,%f38          ! (0_0) xx0 = h0 - h_hi0;

684         fsmuld  %f17,%f17,%f24          ! (3_0) dy0 = y0 * (double)y0;
685         cmp     %l3,_0x7f3504f3         ! (4_0) hx ? 0x7f3504f3
686         lda     [stridey+%o7]0x82,%l4   ! (4_0) hy0 = *(int*)py;
687         faddd   %f40,DC1,%f40           ! (3_1) res0 += DC1;

689         fmul8x16        SCALE,%f56,%f36 ! (3_1) db0 = vis_fmul8x16(SCALE, db0);
690         bge,pn  %icc,.update20          ! (4_0) if ( hx >= 0x7f3504f3 )
691         ldd     [%g1+8],%f56            ! (3_1) dtmp0 = ((double*)si0)[1];
692         faddd   %f54,K1,%f54            ! (4_1) res0 += K1;

694         lda     [%i1]0x82,%f17          ! (4_0) x0 = *px;
695 .cont20:
696         subcc   counter,5,counter       ! counter -= 5
697         add     %o4,stridez,%l7         ! pz += stridez
698         fdtos   %f62,%f14               ! (2_1) ftmp0 = (float)res0;

700         fmuld   %f38,%f22,%f38          ! (0_0) xx0 *= dmp0;
701         and     %l4,_0x7fffffff,%l4     ! (4_0) hy0 &= 0x7fffffff;
702         st      %f14,[%o4]              ! (2_1) *pz = ftmp0;
703         for     %f60,DC1,%f46           ! (1_0) h0 = vis_for(h0,DC1);

705         ld      [%fp+tmp3],%g1          ! (1_0) iexp0 = ((int*)&db0)[0];
706         fmuld   %f56,%f40,%f62          ! (3_1) res0 = dtmp0 * res0;
707         bpos,pt %icc,.main_loop
708         faddd   %f44,%f24,%f24          ! (3_0) db0 = dx0 + dy0;

710         add     counter,5,counter

712 .tail:
713         subcc   counter,1,counter
714         bneg    .begin
715         nop

717         fpadd32 %f36,DA1,%f36           ! (3_2) db0 = vis_fpadd32(db0,DA1);

719         fmuld   %f54,%f58,%f58          ! (4_2) res0 *= xx0;
720         fand    %f46,DC2,%f44           ! (1_1) h_hi0 = vis_fand(h0,DC2);
```



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722         fmuld   K2,%f38,%f56            ! (0_1) res0 = K2 * xx0;
723         srax    %g1,8,%g5               ! (1_1) iexp0 >>= 8;
724         fand    %f20,DA0,%f54           ! (4_2) db0 = vis_fand(db0,DA0);

726         fmuld   %f62,%f36,%f62          ! (3_2) res0 *= db0;
727         and     %g5,_0x1ff0,%g5         ! (1_1) di0 = iexp0 & 0x1ff0;

729         ldd     [%g5+TBL],%f22          ! (1_1) dtmp0 = ((double*)((char*)div_ar
730         add     %o3,TBL,%g1             ! (4_2) si0 = (char*)sqrt_arr + di0;
731         fsubd   %f46,%f44,%f44          ! (1_1) xx0 = h0 - h_hi0;

733         faddd   %f58,DC1,%f36           ! (4_2) res0 += DC1;

735         faddd   %f56,K1,%f58            ! (0_1) res0 += K1;
736         ldd     [%g1+8],%f56            ! (4_2) dtmp0 = ((double*)si0)[1];
737         fmul8x16        SCALE,%f54,%f54 ! (4_2) db0 = vis_fmul8x16(SCALE, db0);

739         fdtos   %f62,%f14               ! (3_2) ftmp0 = (float)res0;

741         fmuld   %f44,%f22,%f44          ! (1_1) xx0 *= dmp0;
742         add     %l7,stridez,%o7         ! pz += stridez
743         st      %f14,[%l7]              ! (3_2) *pz = ftmp0;

745         subcc   counter,1,counter
746         bneg    .begin
747         or      %g0,%o7,%l7

749         fmuld   %f56,%f36,%f36          ! (4_2) res0 = dtmp0 * res0;

751         fpadd32 %f54,DA1,%f62           ! (4_2) db0 = vis_fpadd32(db0,DA1);

753         fmuld   %f58,%f38,%f38          ! (0_1) res0 *= xx0;

755         fmuld   K2,%f44,%f56            ! (1_1) res0 = K2 * xx0;
756         fand    %f0,DA0,%f54            ! (0_1) db0 = vis_fand(db0,DA0);

758         fmuld   %f36,%f62,%f62          ! (4_2) res0 *= db0;

760         add     %o5,TBL,%o0             ! (0_1) si0 = (char*)sqrt_arr + di0;

762         faddd   %f38,DC1,%f36           ! (0_1) res0 += DC1;

764         faddd   %f56,K1,%f38            ! (1_1) res0 += K1;
765         ldd     [%o0+8],%f56            ! (0_1) dtmp0 = ((double*)si0)[1];
766         fmul8x16        SCALE,%f54,%f54 ! (0_1) db0 = vis_fmul8x16(SCALE, db0);

768         add     %o7,stridez,%i0         ! pz += stridez
769         fdtos   %f62,%f14               ! (4_2) ftmp0 = (float)res0;

771         fmuld   %f56,%f36,%f36          ! (0_1) res0 = dtmp0 * res0;

773         fpadd32 %f54,DA1,%f62           ! (0_1) db0 = vis_fpadd32(db0,DA1);

775         fmuld   %f38,%f44,%f44          ! (1_1) res0 *= xx0;
776         add     %i0,stridez,%i3         ! pz += stridez
777         st      %f14,[%o7]              ! (4_2) *pz = ftmp0;

779         subcc   counter,1,counter
780         bneg    .begin
781         or      %g0,%i0,%l7

783         fand    %f18,DA0,%f56           ! (1_1) db0 = vis_fand(db0,DA0);

785         fmuld   %f36,%f62,%f62          ! (0_1) res0 *= db0;

787         add     %g5,TBL,%o3             ! (1_1) si0 = (char*)sqrt_arr + di0;
```

```
789         faddd   %f44,DC1,%f44           ! (1_1) res0 += DC1;

791         fmul8x16        SCALE,%f56,%f36 ! (1_1) db0 = vis_fmul8x16(SCALE, db0);
792         ldd     [%o3+8],%f56            ! (1_1) dtmp0 = ((double*)si0)[1];

794         add     %i3,stridez,%o4         ! pz += stridez
795         fdtos   %f62,%f14               ! (0_1) ftmp0 = (float)res0;

797         st      %f14,[%i0]              ! (0_1) *pz = ftmp0;

799         subcc   counter,1,counter
800         bneg    .begin
801         or      %g0,%i3,%l7

803         fmuld   %f56,%f44,%f62          ! (1_1) res0 = dtmp0 * res0;

805         fpadd32 %f36,DA1,%f36           ! (1_1) db0 = vis_fpadd32(db0,DA1);

807         fmuld   %f62,%f36,%f62          ! (1_1) res0 *= db0;

809         fdtos   %f62,%f14               ! (1_1) ftmp0 = (float)res0;

811         st      %f14,[%i3]              ! (1_1) *pz = ftmp0;

813         ba      .begin
814         or      %g0,%o4,%l7

816         .align  16
817 .spec1:
818         st      %g0,[%l7]               ! *pz = 0;
819         add     %l7,stridez,%l7         ! pz += stridez

821         add     %i2,stridey,%i2         ! py += stridey
822         ba      .begin1
823         sub     counter,1,counter       ! counter--

825         .align  16
826 .spec:
827         sethi   %hi(0x7f800000),%i0
828         cmp     %l3,%i0                 ! hx ? 0x7f800000
829         bge,pt  %icc,2f                 ! if ( hx >= 0x7f800000 )
830         ld      [%i2],%f8

832         cmp     %l4,%i0                 ! hy ? 0x7f800000
833         bge,pt  %icc,2f                 ! if ( hy >= 0x7f800000 )
834         nop

836         fsmuld  %f17,%f17,%f44          ! x * (double)x
837         fsmuld  %f8,%f8,%f24            ! y * (double)y
838         faddd   %f44,%f24,%f24          ! x * (double)x + y * (double)y
839         fsqrtd  %f24,%f24               ! hyp = sqrt(x * (double)x + y * (double
840         fcmped  %f24,DFMAX              ! hyp ? DMAX
841         fbug,a  1f                      ! if ( hyp > DMAX )
842         fmuls   FMAX,FMAX,%f20          ! ftmp0 = FMAX * FMAX;

844         fdtos   %f24,%f20               ! ftmp0 = (float)hyp;
845 1:
846         st      %f20,[%l7]              ! *pz = ftmp0;
847         add     %l7,stridez,%l7         ! pz += stridez
848         add     %i1,stridex,%i1         ! px += stridex

850         add     %i2,stridey,%i2         ! py += stridey
851         ba      .begin1
852         sub     counter,1,counter       ! counter--
853 2:
```



```
854         fcmps   %f17,%f8                ! exceptions
855         cmp     %l3,%i0                 ! hx ? 0x7f800000
856         be,a    %icc,1f                 ! if ( hx == 0x7f800000 )
857         st      %i0,[%l7]               ! *(int*)pz = 0x7f800000;

859         cmp     %l4,%i0                 ! hy ? 0x7f800000
860         be,a    %icc,1f                 ! if ( hy == 0x7f800000
861         st      %i0,[%l7]               ! *(int*)pz = 0x7f800000;

863         fmuls   %f17,%f8,%f8            ! x * y
864         st      %f8,[%l7]               ! *pz = x * y;

866 1:
867         add     %l7,stridez,%l7         ! pz += stridez
868         add     %i1,stridex,%i1         ! px += stridex

870         add     %i2,stridey,%i2         ! py += stridey
871         ba      .begin1
872         sub     counter,1,counter       ! counter--

874         .align  16
875 .update0:
876         cmp     counter,1
877         ble     .cont0
878         fzeros  %f17

880         stx     %i1,[%fp+tmp_px]

882         add     %o7,stridey,%i5
883         stx     %i5,[%fp+tmp_py]

885         sub     counter,1,counter
886         st      counter,[%fp+tmp_counter]

888         ba      .cont0
889         or      %g0,1,counter

891         .align  16
892 .update1:
893         cmp     counter,1
894         ble     .cont1
895         fzeros  %f17

897         stx     %i1,[%fp+tmp_px]
898         stx     %i5,[%fp+tmp_py]

900         sub     counter,1,counter
901         st      counter,[%fp+tmp_counter]

903         ba      .cont1
904         or      %g0,1,counter

906         .align  16
907 .update2:
908         cmp     counter,2
909         ble     .cont2
910         fzeros  %f8

912         stx     %i1,[%fp+tmp_px]
913         stx     %o4,[%fp+tmp_py]

915         sub     counter,2,counter
916         st      counter,[%fp+tmp_counter]

918         ba      .cont2
919         or      %g0,2,counter
```

```
921         .align  16
922 .update3:
923         cmp     counter,2
924         ble     .cont3
925         fzeros  %f17

927         stx     %i1,[%fp+tmp_px]
928         stx     %o4,[%fp+tmp_py]

930         sub     counter,2,counter
931         st      counter,[%fp+tmp_counter]

933         ba      .cont3
934         or      %g0,2,counter

936         .align  16
937 .update4:
938         cmp     counter,3
939         ble     .cont4
940         fzeros  %f17

942         stx     %i1,[%fp+tmp_px]
943         stx     %i5,[%fp+tmp_py]

945         sub     counter,3,counter
946         st      counter,[%fp+tmp_counter]

948         ba      .cont4
949         or      %g0,3,counter

951         .align  16
952 .update5:
953         cmp     counter,3
954         ble     .cont5
955         fzeros  %f17

957         sub     %i1,stridex,%i2
958         stx     %i2,[%fp+tmp_px]
959         stx     %i5,[%fp+tmp_py]

961         sub     counter,3,counter
962         st      counter,[%fp+tmp_counter]

964         ba      .cont5
965         or      %g0,3,counter

967         .align  16
968 .update6:
969         cmp     counter,4
970         ble     .cont6
971         fzeros  %f17

973         stx     %i1,[%fp+tmp_px]
974         stx     %i2,[%fp+tmp_py]

976         sub     counter,4,counter
977         st      counter,[%fp+tmp_counter]

979         ba      .cont6
980         or      %g0,4,counter

982         .align  16
983 .update7:
984         cmp     counter,4
985         ble     .cont7
```



```
986         fzeros  %f17

988         sub     %i1,stridex,%o7
989         stx     %o7,[%fp+tmp_px]
990         stx     %i2,[%fp+tmp_py]

992         sub     counter,4,counter
993         st      counter,[%fp+tmp_counter]

995         ba      .cont7
996         or      %g0,4,counter

998         .align  16
999 .update8:
1000        cmp     counter,5
1001        ble     .cont8
1002        fzeros  %f17

1004        sub     %i1,stridex,%o5
1005        stx     %o5,[%fp+tmp_px]
1006        stx     %o7,[%fp+tmp_py]

1008        sub     counter,5,counter
1009        st      counter,[%fp+tmp_counter]

1011        ba      .cont8
1012        or      %g0,5,counter

1014        .align  16
1015 .update9:
1016        cmp     counter,5
1017        ble     .cont9
1018        fzeros  %f17

1020        sub     %i1,stridex,%o5
1021        stx     %o5,[%fp+tmp_px]
1022        stx     %o7,[%fp+tmp_py]

1024        sub     counter,5,counter
1025        st      counter,[%fp+tmp_counter]

1027        ba      .cont9
1028        or      %g0,5,counter

1030        .align  16
1031 .update10:
1032        fmul8x16        SCALE,%f56,%f36 ! (3_1) db0 = vis_fmul8x16(SCALE, db0);
1033        and     %l4,_0x7fffffff,%l4     ! (4_0) hy0 &= 0x7fffffff;
1034        ldd     [%g1+8],%f56            ! (3_1) dtmp0 = ((double*)si0)[1];
1035        faddd   %f54,K1,%f54            ! (4_1) res0 += K1;

1037        cmp     counter,6
1038        ble     .cont10
1039        fzeros  %f17

1041        stx     %i1,[%fp+tmp_px]
1042        add     %o7,stridey,%i5
1043        stx     %i5,[%fp+tmp_py]

1045        sub     counter,6,counter
1046        st      counter,[%fp+tmp_counter]

1048        ba      .cont10
1049        or      %g0,6,counter

1051        .align  16
```

```
.update11:
        cmp     counter,1
        ble     .cont11
        fzeros  %f17

        stx     %i1,[%fp+tmp_px]
        stx     %i5,[%fp+tmp_py]

        sub     counter,1,counter
        st      counter,[%fp+tmp_counter]

        ba      .cont11
        or      %g0,1,counter

        .align  16
.update12:
        cmp     counter,2
        ble     .cont12
        fzeros  %f8

        stx     %i0,[%fp+tmp_px]
        add     %i5,stridey,%o4
        stx     %o4,[%fp+tmp_py]

        sub     counter,2,counter
        st      counter,[%fp+tmp_counter]

        ba      .cont12
        or      %g0,2,counter

        .align  16
.update13:
        cmp     counter,2
        ble     .cont13
        fzeros  %f17

        stx     %i0,[%fp+tmp_px]
        stx     %o4,[%fp+tmp_py]

        sub     counter,2,counter
        st      counter,[%fp+tmp_counter]

        ba      .cont13
        or      %g0,2,counter

        .align  16
.update14:
        cmp     counter,3
        ble     .cont14
        fzeros  %f17

        stx     %i1,[%fp+tmp_px]
        add     %o4,stridey,%i5
        stx     %i5,[%fp+tmp_py]

        sub     counter,3,counter
        st      counter,[%fp+tmp_counter]

        ba      .cont14
        or      %g0,3,counter

        .align  16
.update15:
        cmp     counter,3
        ble     .cont15
        fzeros  %f17
```



```
        sub     %i1,stridex,%i2
        stx     %i2,[%fp+tmp_px]
        stx     %i5,[%fp+tmp_py]

        sub     counter,3,counter
        st      counter,[%fp+tmp_counter]

        ba      .cont15
        or      %g0,3,counter

        .align  16
.update16:
        faddd   %f40,%f32,%f18          ! (1_0) db0 = dx0 + dy0;
        cmp     counter,4
        ble     .cont16
        fzeros  %f17

        stx     %i1,[%fp+tmp_px]
        stx     %i2,[%fp+tmp_py]

        sub     counter,4,counter
        st      counter,[%fp+tmp_counter]

        ba      .cont16
        or      %g0,4,counter

        .align  16
.update17:
        cmp     counter,4
        ble     .cont17
        fzeros  %f17

        stx     %i1,[%fp+tmp_px]
        stx     %i2,[%fp+tmp_py]

        sub     counter,4,counter
        st      counter,[%fp+tmp_counter]

        ba      .cont17
        or      %g0,4,counter

        .align  16
.update18:
        cmp     counter,5
        ble     .cont18
        fzeros  %f17

        stx     %l7,[%fp+tmp_px]
        stx     %o7,[%fp+tmp_py]

        sub     counter,5,counter
        st      counter,[%fp+tmp_counter]

        ba      .cont18
        or      %g0,5,counter

        .align  16
.update19:
        fpadd32 %f40,DA1,%f62           ! (2_1) db0 = vis_fpadd32(db0,DA1);
        cmp     counter,5
        ble     .cont19
        fzeros  %f17

        stx     %l7,[%fp+tmp_px]
        stx     %o7,[%fp+tmp_py]
```

```
1185         sub     counter,5,counter
1186         st      counter,[%fp+tmp_counter]

1188         ba      .cont19
1189         or      %g0,5,counter

1191         .align  16
1192 .update19a:
1193         cmp     counter,5
1194         ble     .cont19a
1195         fzeros  %f17

1197         stx     %l7,[%fp+tmp_px]
1198         stx     %o7,[%fp+tmp_py]

1200         sub     counter,5,counter
1201         st      counter,[%fp+tmp_counter]

1203         ba      .cont19a
1204         or      %g0,5,counter

1206         .align  16
1207 .update20:
1208         faddd   %f54,K1,%f54            ! (4_1) res0 += K1;
1209         cmp     counter,6
1210         ble     .cont20
1211         fzeros  %f17

1213         stx     %i1,[%fp+tmp_px]
1214         add     %o7,stridey,%g1
1215         stx     %g1,[%fp+tmp_py]

1217         sub     counter,6,counter
1218         st      counter,[%fp+tmp_counter]

1220         ba      .cont20
1221         or      %g0,6,counter

1223 .exit:
1224         ret
1225         restore
1226         SET_SIZE(__vhypotf)
```

```
**********************************************************
   14411 Sat May 10 12:09:59 2014
new/usr/src/lib/libmvec/common/vis/__vlog.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vlog.S"

#include "libm.h"

        RO_DATA
        .align  32
TBL:
        .word   0xbfd522ae, 0x0738a000
        .word   0xbd2ebe70, 0x8164c759
        .word   0xbfd3c252, 0x77333000
        .word   0xbd183b54, 0xb606bd5c
        .word   0xbfd26962, 0x1134e000
        .word   0x3d31b61f, 0x10522625
        .word   0xbfd1178e, 0x8227e000
        .word   0xbd31ef78, 0xce2d07f2
        .word   0xbfcf991c, 0x6cb3c000
        .word   0x3d390d04, 0xcd7cc834
        .word   0xbfcd1037, 0xf2656000
        .word   0x3d084a7e, 0x75b6f6e4
        .word   0xbfca93ed, 0x3c8ae000
        .word   0x3d287243, 0x50562169
        .word   0xbfc823c1, 0x6551a000
        .word   0xbd1e0ddb, 0x9a631e83
        .word   0xbfc5bf40, 0x6b544000
        .word   0x3d127023, 0xeb68981c
        .word   0xbfc365fc, 0xb015a000
        .word   0x3d3fd3a0, 0xafb9691b
        .word   0xbfc1178e, 0x8227e000
        .word   0xbd21ef78, 0xce2d07f2
        .word   0xbfbda727, 0x63844000
        .word   0xbd1a8940, 0x1fa71733
        .word   0xbfb9335e, 0x5d594000
        .word   0xbd23115c, 0x3abd47da
```



```
        .word   0xbfb4d311, 0x5d208000
        .word   0x3cf53a25, 0x82f4e1ef
        .word   0xbfb08598, 0xb59e4000
        .word   0x3d17e5dd, 0x7009902c
        .word   0xbfa894aa, 0x149f8000
        .word   0xbd39a19a, 0x8be97661
        .word   0xbfa0415d, 0x89e78000
        .word   0x3d3dddc7, 0xf461c516
        .word   0xbf902056, 0x58930000
        .word   0xbd3611d2, 0x7c8e8417
        .word   0x00000000, 0x00000000
        .word   0x00000000, 0x00000000
        .word   0x3f9f829b, 0x0e780000
        .word   0x3d298026, 0x7c7e09e4
        .word   0x3faf0a30, 0xc0110000
        .word   0x3d48a998, 0x5f325c5c
        .word   0x3fb6f0d2, 0x8ae58000
        .word   0xbd34b464, 0x1b664613
        .word   0x3fbe2707, 0x6e2b0000
        .word   0xbd2a342c, 0x2af0003c
        .word   0x3fc29552, 0xf8200000
        .word   0xbd35b967, 0xf4471dfc
        .word   0x3fc5ff30, 0x70a78000
        .word   0x3d43d3c8, 0x73e20a07
        .word   0x3fc9525a, 0x9cf44000
        .word   0x3d46b476, 0x41307539
        .word   0x3fcc8ff7, 0xc79a8000
        .word   0x3d4a21ac, 0x25d81ef3
        .word   0x3fcfb918, 0x6d5e4000
        .word   0xbd0d572a, 0xab993c87
        .word   0x3fd1675c, 0xababa000
        .word   0x3d38380e, 0x731f55c4
        .word   0x3fd2e8e2, 0xbae12000
        .word   0xbd267b1e, 0x99b72bd8
        .word   0x3fd4618b, 0xc21c6000
        .word   0xbd13d82f, 0x484c84cc
        .word   0x3fd5d1bd, 0xbf580000
        .word   0x3d4394a1, 0x1b1c1ee4
! constants:
        .word   0x40000000,0x00000000
        .word   0x3fe55555,0x555571da
        .word   0x3fd99999,0x8702be3a
        .word   0x3fd24af7,0x3f4569b1
        .word   0x3ea62e42,0xfee00000   ! scaled by 2**-20
        .word   0x3caa39ef,0x35793c76   ! scaled by 2**-20
        .word   0xffff8000,0x00000000
        .word   0x43200000
        .word   0xfff00000
        .word   0xc0194000
        .word   0x4000

#define two             0x200
#define A1              0x208
#define A2              0x210
#define A3              0x218
#define ln2hi           0x220
#define ln2lo           0x228
#define mask            0x230
#define ox43200000      0x238
#define oxfff00000      0x23c
#define oxc0194000      0x240
#define ox4000          0x244

! local storage indices

#define jnk             STACK_BIAS-0x8
```

```
128 #define tmp2            STACK_BIAS-0x10
129 #define tmp1            STACK_BIAS-0x18
130 #define tmp0            STACK_BIAS-0x20
131 ! sizeof temp storage - must be a multiple of 16 for V9
132 #define tmps            0x20

134 ! register use

136 ! i0  n
137 ! i1  x
138 ! i2  stridex
139 ! i3  y
140 ! i4  stridey
141 ! i5

143 ! g1  TBL

145 ! l0  j0
146 ! l1  j1
147 ! l2  j2
148 ! l3
149 ! l4  0x94000
150 ! l5
151 ! l6  0x000fffff
152 ! l7  0x7ff00000

154 ! o0  py0
155 ! o1  py1
156 ! o2  py2
157 ! o3
158 ! o4
159 ! o5
160 ! o7

162 ! f0  u0,q0
163 ! f2  v0,(two-v0)-u0,z0
164 ! f4  n0,f0,q0
165 ! f6  s0
166 ! f8  q
167 ! f10 u1,q1
168 ! f12 v1,(two-v1)-u1,z1
169 ! f14 n1,f1,q1
170 ! f16 s1
171 ! f18 t
172 ! f20 u2,q2
173 ! f22 v2,(two-v2)-u2,q2
174 ! f24 n2,f2,q2
175 ! f26 s2
176 ! f28 0xfff00000
177 ! f29 0x43200000
178 ! f30 0x4000
179 ! f31 0xc0194000
180 ! f32 t0
181 ! f34 h0,f0-(c0-h0)
182 ! f36 c0
183 ! f38 A1
184 ! f40 two
185 ! f42 t1
186 ! f44 h1,f1-(c1-h1)
187 ! f46 c1
188 ! f48 A2
189 ! f50 0xffff8000...
190 ! f52 t2
191 ! f54 h2,f2-(c2-h2)
192 ! f56 c2
193 ! f58 A3
```



```
194 ! f60 ln2hi
195 ! f62 ln2lo

197         ENTRY(__vlog)
198         save    %sp,-SA(MINFRAME)-tmps,%sp
199         PIC_SETUP(l7)
200         PIC_SET(l7,TBL,o0)
201         mov     %o0,%g1
202         wr      %g0,0x82,%asi           ! set %asi for non-faulting loads
203         sethi   %hi(0x94000),%l4
204         sethi   %hi(0x000fffff),%l6
205         or      %l6,%lo(0x000fffff),%l6
206         sethi   %hi(0x7ff00000),%l7
207         ldd     [%g1+two],%f40
208         ldd     [%g1+A1],%f38
209         ldd     [%g1+A2],%f48
210         ldd     [%g1+A3],%f58
211         ldd     [%g1+ln2hi],%f60
212         ldd     [%g1+ln2lo],%f62
213         ldd     [%g1+mask],%f50
214         ld      [%g1+ox43200000],%f29
215         ld      [%g1+oxfff00000],%f28
216         ld      [%g1+oxc0194000],%f31
217         ld      [%g1+ox4000],%f30
218         sll     %i2,3,%i2               ! scale strides
219         sll     %i4,3,%i4
220         add     %fp,jnk,%o0             ! precondition loop
221         add     %fp,jnk,%o1
222         add     %fp,jnk,%o2
223         fzero   %f2
224         fzero   %f6
225         fzero   %f18
226         fzero   %f36
227         fzero   %f12
228         fzero   %f14
229         fzero   %f16
230         fzero   %f42
231         fzero   %f44
232         fzero   %f46
233         std     %f46,[%fp+tmp1]
234         fzero   %f24
235         fzero   %f26
236         fzero   %f52
237         fzero   %f54
238         std     %f54,[%fp+tmp2]
239         sub     %i3,%i4,%i3
240         ld      [%i1],%l0               ! ix
241         ld      [%i1],%f0               ! u.l[0] = *x
242         ba      .loop0
243         ld      [%i1+4],%f1             ! u.l[1] = *(1+x)

245         .align  16
246 ! -- 16 byte aligned
247 .loop0:
248         sub     %l0,%l7,%o3
249         sub     %l6,%l0,%o4
250         fpadd32s %f0,%f31,%f4           ! n = (ix + 0xc0194000) & 0xfff00000
251         fmuld   %f6,%f2,%f8             ! (previous iteration)

253         andcc   %o3,%o4,%o4
254         bge,pn  %icc,.range0            ! ix <= 0x000fffff or >= 0x7ff00000
255 ! delay slot
256         fands   %f4,%f28,%f4

258         add     %i1,%i2,%i1             ! x += stridex
259         add     %i3,%i4,%i3             ! y += stridey
```

```
260         fpsub32s %f0,%f4,%f0            ! u.l[0] -= n

262 .cont0:
263         lda     [%i1]%asi,%l1           ! preload next argument
264         add     %l0,%l4,%l0             ! j = ix + 0x94000
265         fpadd32s %f0,%f30,%f2           ! v.l[0] = u.l[0] + 0x4000

267         lda     [%i1]%asi,%f10
268         srl     %l0,11,%l0              ! j = (j >> 11) & 0x1f0
269         fand    %f2,%f50,%f2            ! v.l &= 0xffff8000...

271         lda     [%i1+4]%asi,%f11
272         and     %l0,0x1f0,%l0
273         fitod   %f4,%f32                ! (double) n

275         add     %l0,8,%l3
276         fsubd   %f0,%f2,%f4             ! f = u.d - v.d

278         faddd   %f0,%f2,%f6             ! s = f / (u.d + v.d)

280         fsubd   %f40,%f2,%f2            ! two - v.d
281         fmuld   %f32,%f60,%f34          ! h = n * ln2hi + TBL[j]

283         faddd   %f8,%f18,%f8            ! y = c + (t + q)
284         fmuld   %f32,%f62,%f32          ! t = n * ln2lo + TBL[j+1]

286         fdivd   %f4,%f6,%f6

288         faddd   %f54,%f24,%f56          ! c = h + f
289         fmuld   %f26,%f26,%f22          ! z = s * s

291         faddd   %f8,%f36,%f8
292         st      %f8,[%o0]

294         st      %f9,[%o0+4]
295         mov     %i3,%o0
296         faddd   %f14,%f38,%f14

298         fsubd   %f56,%f54,%f54          ! t += f - (c - h)
299         fmuld   %f22,%f58,%f20          ! q = ...

301         fsubd   %f2,%f0,%f2             ! (two - v.d) - u.d
302         ldd     [%g1+%l0],%f36

304         faddd   %f42,%f44,%f18
305         fmuld   %f12,%f14,%f14
306         ldd     [%fp+tmp1],%f12

308         faddd   %f20,%f48,%f20
309         nop

311         faddd   %f34,%f36,%f34
312         ldd     [%g1+%l3],%f0

314         faddd   %f14,%f12,%f12

316         fsubd   %f24,%f54,%f54
317         fmuld   %f22,%f20,%f24

319         std     %f2,[%fp+tmp0]
320         addcc   %i0,-1,%i0
321         ble,pn  %icc,.endloop0
322 ! delay slot
323         faddd   %f32,%f0,%f32

325 ! -- 16 byte aligned
```



```
326 .loop1:
327         sub     %l1,%l7,%o3
328         sub     %l6,%l1,%o4
329         fpadd32s %f10,%f31,%f14         ! n = (ix + 0xc0194000) & 0xfff00000
330         fmuld   %f16,%f12,%f8           ! (previous iteration)

332         andcc   %o3,%o4,%o4
333         bge,pn  %icc,.range1            ! ix <= 0x000fffff or >= 0x7ff00000
334 ! delay slot
335         fands   %f14,%f28,%f14

337         add     %i1,%i2,%i1             ! x += stridex
338         add     %i3,%i4,%i3             ! y += stridey
339         fpsub32s %f10,%f14,%f10         ! u.l[0] -= n

341 .cont1:
342         lda     [%i1]%asi,%l2           ! preload next argument
343         add     %l1,%l4,%l1             ! j = ix + 0x94000
344         fpadd32s %f10,%f30,%f12         ! v.l[0] = u.l[0] + 0x4000

346         lda     [%i1]%asi,%f20
347         srl     %l1,11,%l1              ! j = (j >> 11) & 0x1f0
348         fand    %f12,%f50,%f12          ! v.l &= 0xffff8000...

350         lda     [%i1+4]%asi,%f21
351         and     %l1,0x1f0,%l1
352         fitod   %f14,%f42               ! (double) n

354         add     %l1,8,%l3
355         fsubd   %f10,%f12,%f14          ! f = u.d - v.d

357         faddd   %f10,%f12,%f16          ! s = f / (u.d + v.d)

359         fsubd   %f40,%f12,%f12          ! two - v.d
360         fmuld   %f42,%f60,%f44          ! h = n * ln2hi + TBL[j]

362         faddd   %f8,%f18,%f8            ! y = c + (t + q)
363         fmuld   %f42,%f62,%f42          ! t = n * ln2lo + TBL[j+1]

365         fdivd   %f14,%f16,%f16

367         faddd   %f34,%f4,%f36           ! c = h + f
368         fmuld   %f6,%f6,%f2             ! z = s * s

370         faddd   %f8,%f46,%f8
371         st      %f8,[%o1]

373         st      %f9,[%o1+4]
374         mov     %i3,%o1
375         faddd   %f24,%f38,%f24

377         fsubd   %f36,%f34,%f34          ! t += f - (c - h)
378         fmuld   %f2,%f58,%f0            ! q = ...

380         fsubd   %f12,%f10,%f12          ! (two - v.d) - u.d
381         ldd     [%g1+%l1],%f46

383         faddd   %f52,%f54,%f18
384         fmuld   %f22,%f24,%f24
385         ldd     [%fp+tmp2],%f22

387         faddd   %f0,%f48,%f0
388         nop

390         faddd   %f44,%f46,%f44
391         ldd     [%g1+%l3],%f10
```

```
393         faddd   %f24,%f22,%f22

395         fsubd   %f4,%f34,%f34
396         fmuld   %f2,%f0,%f4

398         std     %f12,[%fp+tmp1]
399         addcc   %i0,-1,%i0
400         ble,pn  %icc,.endloop1
401 ! delay slot
402         faddd   %f42,%f10,%f42

404 ! -- 16 byte aligned
405 .loop2:
406         sub     %l2,%l7,%o3
407         sub     %l6,%l2,%o4
408         fpadd32s %f20,%f31,%f24         ! n = (ix + 0xc0194000) & 0xfff00000
409         fmuld   %f26,%f22,%f8           ! (previous iteration)

411         andcc   %o3,%o4,%o4
412         bge,pn  %icc,.range2            ! ix <= 0x000fffff or >= 0x7ff00000
413 ! delay slot
414         fands   %f24,%f28,%f24

416         add     %i1,%i2,%i1             ! x += stridex
417         add     %i3,%i4,%i3             ! y += stridey
418         fpsub32s %f20,%f24,%f20         ! u.l[0] -= n

420 .cont2:
421         lda     [%i1]%asi,%l0           ! preload next argument
422         add     %l2,%l4,%l2             ! j = ix + 0x94000
423         fpadd32s %f20,%f30,%f22         ! v.l[0] = u.l[0] + 0x4000

425         lda     [%i1]%asi,%f0
426         srl     %l2,11,%l2              ! j = (j >> 11) & 0x1f0
427         fand    %f22,%f50,%f22          ! v.l &= 0xffff8000...

429         lda     [%i1+4]%asi,%f1
430         and     %l2,0x1f0,%l2
431         fitod   %f24,%f52               ! (double) n

433         add     %l2,8,%l3
434         fsubd   %f20,%f22,%f24          ! f = u.d - v.d

436         faddd   %f20,%f22,%f26          ! s = f / (u.d + v.d)

438         fsubd   %f40,%f22,%f22          ! two - v.d
439         fmuld   %f52,%f60,%f54          ! h = n * ln2hi + TBL[j]

441         faddd   %f8,%f18,%f8            ! y = c + (t + q)
442         fmuld   %f52,%f62,%f52          ! t = n * ln2lo + TBL[j+1]

444         fdivd   %f24,%f26,%f26

446         faddd   %f44,%f14,%f46          ! c = h + f
447         fmuld   %f16,%f16,%f12          ! z = s * s

449         faddd   %f8,%f56,%f8
450         st      %f8,[%o2]

452         st      %f9,[%o2+4]
453         mov     %i3,%o2
454         faddd   %f4,%f38,%f4

456         fsubd   %f46,%f44,%f44          ! t += f - (c - h)
457         fmuld   %f12,%f58,%f10          ! q = ...
```



```
459         fsubd   %f22,%f20,%f22          ! (two - v.d) - u.d
460         ldd     [%g1+%l2],%f56

462         faddd   %f32,%f34,%f18
463         fmuld   %f2,%f4,%f4
464         ldd     [%fp+tmp0],%f2

466         faddd   %f10,%f48,%f10
467         nop

469         faddd   %f54,%f56,%f54
470         ldd     [%g1+%l3],%f20

472         faddd   %f4,%f2,%f2

474         fsubd   %f14,%f44,%f44
475         fmuld   %f12,%f10,%f14

477         std     %f22,[%fp+tmp2]
478         addcc   %i0,-1,%i0
479         bg,pt   %icc,.loop0
480 ! delay slot
481         faddd   %f52,%f20,%f52


484 ! Once we get to the last element, we loop three more times to finish
485 ! the computations in progress.  This means we will load past the end
486 ! of the argument vector, but since we use non-faulting loads and never
487 ! use the data, the only potential problem is cache miss.  (Note that
488 ! when the argument is 2, the only exception that occurs in the compu-
489 ! tation is an inexact result in the final addition, and we break out
490 ! of the "extra" iterations before then.)
491 .endloop2:
492         sethi   %hi(0x40000000),%l0     ! "next argument" = two
493         cmp     %i0,-3
494         bg,a,pt %icc,.loop0
495 ! delay slot
496         fmovd   %f40,%f0
497         ret
498         restore

500         .align  16
501 .endloop0:
502         sethi   %hi(0x40000000),%l1     ! "next argument" = two
503         cmp     %i0,-3
504         bg,a,pt %icc,.loop1
505 ! delay slot
506         fmovd   %f40,%f10
507         ret
508         restore

510         .align  16
511 .endloop1:
512         sethi   %hi(0x40000000),%l2     ! "next argument" = two
513         cmp     %i0,-3
514         bg,a,pt %icc,.loop2
515 ! delay slot
516         fmovd   %f40,%f20
517         ret
518         restore


521         .align  16
522 .range0:
523         cmp     %l0,%l7
```

```
524         bgeu,pn %icc,2f                 ! if (unsigned) ix >= 0x7ff00000
525 ! delay slot
526         ld      [%i1+4],%o5
527         fxtod   %f0,%f0                 ! scale by 2**1074 w/o trapping
528         st      %f0,[%fp+tmp0]
529         add     %i1,%i2,%i1             ! x += stridex
530         orcc    %l0,%o5,%g0
531         be,pn   %icc,1f                 ! if x == 0
532 ! delay slot
533         add     %i3,%i4,%i3             ! y += stridey
534         fpadd32s %f0,%f31,%f4           ! n = (ix + 0xc0194000) & 0xfff00000
535         fands   %f4,%f28,%f4
536         fpsub32s %f0,%f4,%f0            ! u.l[0] -= n
537         ld      [%fp+tmp0],%l0
538         ba,pt   %icc,.cont0
539 ! delay slot
540         fpsub32s %f4,%f29,%f4           ! n -= 0x43200000
541 1:
542         fdivs   %f29,%f1,%f4            ! raise div-by-zero
543         ba,pt   %icc,3f
544 ! delay slot
545         st      %f28,[%i3]              ! store -inf
546 2:
547         sll     %l0,1,%l0               ! lop off sign bit
548         add     %i1,%i2,%i1             ! x += stridex
549         orcc    %l0,%o5,%g0
550         be,pn   %icc,1b                 ! if x == -0
551 ! delay slot
552         add     %i3,%i4,%i3             ! y += stridey
553         fabsd   %f0,%f4                 ! *y = (x + |x|) * inf
554         faddd   %f0,%f4,%f0
555         fand    %f28,%f50,%f4
556         fnegd   %f4,%f4
557         fmuld   %f0,%f4,%f0
558         st      %f0,[%i3]
559 3:
560         addcc   %i0,-1,%i0
561         ble,pn  %icc,.endloop2
562 ! delay slot
563         st      %f1,[%i3+4]
564         ld      [%i1],%l0               ! get next argument
565         ld      [%i1],%f0
566         ba,pt   %icc,.loop0
567 ! delay slot
568         ld      [%i1+4],%f1


571         .align  16
572 .range1:
573         cmp     %l1,%l7
574         bgeu,pn %icc,2f                 ! if (unsigned) ix >= 0x7ff00000
575 ! delay slot
576         ld      [%i1+4],%o5
577         fxtod   %f10,%f10               ! scale by 2**1074 w/o trapping
578         st      %f10,[%fp+tmp1]
579         add     %i1,%i2,%i1             ! x += stridex
580         orcc    %l1,%o5,%g0
581         be,pn   %icc,1f                 ! if x == 0
582 ! delay slot
583         add     %i3,%i4,%i3             ! y += stridey
584         fpadd32s %f10,%f31,%f14         ! n = (ix + 0xc0194000) & 0xfff00000
585         fands   %f14,%f28,%f14
586         fpsub32s %f10,%f14,%f10         ! u.l[0] -= n
587         ld      [%fp+tmp1],%l1
588         ba,pt   %icc,.cont1
589 ! delay slot
```



```
590         fpsub32s %f14,%f29,%f14         ! n -= 0x43200000
591 1:
592         fdivs   %f29,%f11,%f14          ! raise div-by-zero
593         ba,pt   %icc,3f
594 ! delay slot
595         st      %f28,[%i3]              ! store -inf
596 2:
597         sll     %l1,1,%l1               ! lop off sign bit
598         add     %i1,%i2,%i1             ! x += stridex
599         orcc    %l1,%o5,%g0
600         be,pn   %icc,1b                 ! if x == -0
601 ! delay slot
602         add     %i3,%i4,%i3             ! y += stridey
603         fabsd   %f10,%f14               ! *y = (x + |x|) * inf
604         faddd   %f10,%f14,%f10
605         fand    %f28,%f50,%f14
606         fnegd   %f14,%f14
607         fmuld   %f10,%f14,%f10
608         st      %f10,[%i3]
609 3:
610         addcc   %i0,-1,%i0
611         ble,pn  %icc,.endloop0
612 ! delay slot
613         st      %f11,[%i3+4]
614         ld      [%i1],%l1               ! get next argument
615         ld      [%i1],%f10
616         ba,pt   %icc,.loop1
617 ! delay slot
618         ld      [%i1+4],%f11


621         .align  16
622 .range2:
623         cmp     %l2,%l7
624         bgeu,pn %icc,2f                 ! if (unsigned) ix >= 0x7ff00000
625 ! delay slot
626         ld      [%i1+4],%o5
627         fxtod   %f20,%f20               ! scale by 2**1074 w/o trapping
628         st      %f20,[%fp+tmp2]
629         add     %i1,%i2,%i1             ! x += stridex
630         orcc    %l2,%o5,%g0
631         be,pn   %icc,1f                 ! if x == 0
632 ! delay slot
633         add     %i3,%i4,%i3             ! y += stridey
634         fpadd32s %f20,%f31,%f24         ! n = (ix + 0xc0194000) & 0xfff00000
635         fands   %f24,%f28,%f24
636         fpsub32s %f20,%f24,%f20         ! u.l[0] -= n
637         ld      [%fp+tmp2],%l2
638         ba,pt   %icc,.cont2
639 ! delay slot
640         fpsub32s %f24,%f29,%f24         ! n -= 0x43200000
641 1:
642         fdivs   %f29,%f21,%f24          ! raise div-by-zero
643         ba,pt   %icc,3f
644 ! delay slot
645         st      %f28,[%i3]              ! store -inf
646 2:
647         sll     %l2,1,%l2               ! lop off sign bit
648         add     %i1,%i2,%i1             ! x += stridex
649         orcc    %l2,%o5,%g0
650         be,pn   %icc,1b                 ! if x == -0
651 ! delay slot
652         add     %i3,%i4,%i3             ! y += stridey
653         fabsd   %f20,%f24               ! *y = (x + |x|) * inf
654         faddd   %f20,%f24,%f20
655         fand    %f28,%f50,%f24
```

```
656         fnegd   %f24,%f24
657         fmuld   %f20,%f24,%f20
658         st      %f20,[%i3]
659 3:
660         addcc   %i0,-1,%i0
661         ble,pn  %icc,.endloop1
662 ! delay slot
663         st      %f21,[%i3+4]
664         ld      [%i1],%l2               ! get next argument
665         ld      [%i1],%f20
666         ba,pt   %icc,.loop2
667 ! delay slot
668         ld      [%i1+4],%f21
669
670         SET_SIZE(__vlog)
```

```
**********************************************************
   84386 Sat May 10 12:09:59 2014
new/usr/src/lib/libmvec/common/vis/__vlog_ultra3.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vlog_ultra3.S"

#include "libm.h"
#if defined(LIBMVEC_SO_BUILD)
        .weak   __vlog
        .type   __vlog,#function
        __vlog = __vlog_ultra3
#endif

/*
 * ELEVENBIT table and order 5 POLYNOMIAL no explicit correction t
 */

        RO_DATA
        .align  64
!! this is a new 11 bit table.
TBL:
        .word   0xbfd522ae,     0x0738a000
        .word   0xbd2ebe70,     0x8164c759
        .word   0xbfd5178d,     0x9ab55000
        .word   0xbd35c153,     0x0fe963b3
        .word   0xbfd50c6f,     0x1d11b000
        .word   0xbd42f8ca,     0x40bec1ea
        .word   0xbfd50152,     0x8da1f000
        .word   0xbd42cfac,     0x6d29f4d7
        .word   0xbfd4f637,     0xebba9000
        .word   0xbd401f53,     0x9a676da3
        .word   0xbfd4eb1f,     0x36b07000
        .word   0xbd184047,     0x46e5797b
        .word   0xbfd4e008,     0x6dd8b000
        .word   0xbd4594b6,     0xaf0ddc3c
        .word   0xbfd4d4f3,     0x90890000
        .word   0xbd19fd79,     0x3a9f1441
```



```
        .word   0xbfd4c9e0,     0x9e172000
        .word   0xbd4877dd,     0xb93d49d7
        .word   0xbfd4becf,     0x95d97000
        .word   0xbd422662,     0x6ffee2c8
        .word   0xbfd4b3c0,     0x77267000
        .word   0xbd4d3497,     0x2fdf5a8c
        .word   0xbfd4a8b3,     0x41552000
        .word   0xbd46127e,     0x3d0dc8d1
        .word   0xbfd49da7,     0xf3bcc000
        .word   0xbd307b33,     0x4daf4b9a
        .word   0xbfd4929e,     0x8db4e000
        .word   0xbd3b9056,     0x556c70de
        .word   0xbfd48797,     0x0e958000
        .word   0xbd3dc1b8,     0x465cf25f
        .word   0xbfd47c91,     0x75b6f000
        .word   0xbd05acd1,     0x7009e35b
        .word   0xbfd4718d,     0xc271c000
        .word   0xbd306c18,     0xfb4c14c5
        .word   0xbfd4668b,     0xf41ef000
        .word   0xbd432874,     0x4e9d2b85
        .word   0xbfd45b8c,     0x0a17d000
        .word   0xbd4e26ed,     0xf182f57b
        .word   0xbfd4508e,     0x03b61000
        .word   0xbd40ef1c,     0x2579199c
        .word   0xbfd44591,     0xe0539000
        .word   0xbd4e916a,     0x76d6dc28
        .word   0xbfd43a97,     0x9f4ac000
        .word   0xbd23ee07,     0x6a81f88e
        .word   0xbfd42f9f,     0x3ff62000
        .word   0xbd390644,     0x0f7d3354
        .word   0xbfd424a8,     0xc1b0c000
        .word   0xbd2dc57c,     0x99ae2a25
        .word   0xbfd419b4,     0x23d5e000
        .word   0xbd418e43,     0x6ec90e0a
        .word   0xbfd40ec1,     0x65c13000
        .word   0xbd3f59a8,     0xa01757f6
        .word   0xbfd403d0,     0x86cea000
        .word   0xbd3e6ef5,     0x74487308
        .word   0xbfd3f8e1,     0x865a8000
        .word   0xbd26f338,     0x912773e3
        .word   0xbfd3edf4,     0x63c16000
        .word   0xbd407cc1,     0xeb4069e1
        .word   0xbfd3e309,     0x1e604000
        .word   0xbd43f634,     0xa2afb68d
        .word   0xbfd3d81f,     0xb5946000
        .word   0xbd4b74e0,     0xf558b217
        .word   0xbfd3cd38,     0x28bb6000
        .word   0xbd489faf,     0xb06c8342
        .word   0xbfd3c252,     0x77333000
        .word   0xbd183b54,     0xb606bd5c
        .word   0xbfd3b76e,     0xa059f000
        .word   0xbd47b5cf,     0x9912c7cb
        .word   0xbfd3ac8c,     0xa38e5000
        .word   0xbd48bd04,     0x10ff506d
        .word   0xbfd3a1ac,     0x802f3000
        .word   0xbd398ecf,     0x399abd8d
        .word   0xbfd396ce,     0x359bb000
        .word   0xbd4ea7c6,     0x3a99c99c
        .word   0xbfd38bf1,     0xc3337000
        .word   0xbd4ce9e9,     0x41e9516d
        .word   0xbfd38117,     0x28564000
        .word   0xbd496386,     0xdb17e3f5
        .word   0xbfd3763e,     0x64645000
        .word   0xbd318b1f,     0x291dcb56
        .word   0xbfd36b67,     0x76be1000
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1925        .word   0x3d116978,     0x5a9c223f
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1927        .word   0x3d40b5e4,     0xa9d627ef
1928        .word   0x3fd382f3,     0x216c4000
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2039         .word   0x3d2e9e43,     0x9f105039
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2041         .word   0x3d36e9b9,     0xc879af55
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```
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2045         .word   0x3d463e81,     0xdaacbccc
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2073         .word   0x3d48f8fc,     0x947d5965
2074         .word   0x3fd6ca28,     0xd2e34000
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2077         .word   0x3d39b9c8,     0xae9a6ee2
2078         .word   0x3fd6e08e,     0xaa2ba000
2079         .word   0x3d1e38c1,     0x39318d71
2080         .word   0x3fd6ebbe,     0xa600e000
2081         .word   0x3d4cce14,     0xc7dd17dd
2082         .word   0x3fd6f6ec,     0xad8b2000
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2084         .word   0x3fd70218,     0xc178e000
2085         .word   0x3d42a947,     0x0e225428
2086         .word   0x3fd70d42,     0xe2789000
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2088         .word   0x3fd7186b,     0x11381000
2089         .word   0x3d1934e2,     0x677d272b
2090         .word   0x3fd72391,     0x4e650000
2091         .word   0x3d0c1d52,     0xbdc87d8a
2092         .word   0x3fd72eb5,     0x9aac9000
2093         .word   0x3d4dd010,     0xd08a7a15
2094 !! TBL - end

2096 ! constants:
2097         .align 64
2098 CONSTANTS:
2099         .word   0x40000000,0x00000000
2100         .word   0x3fe55555,0x555571da
2101         .word   0x3fd99999,0x8702be3a
2102         .word   0x3fd24af7,0x3f4569b1
2103         .word   0x3ea62e42,0xfee00000   ! scaled by 2**-20
2104         .word   0x3caa39ef,0x35793c76   ! scaled by 2**-20
2105         .word   0xfffffc00,0x00000000   ! ELEVENBIT
2106         .word   0x43200000
2107         .word   0xfff00000
```

```
2108         .word   0xc0190200              ! ELEVENBIT
2109         .word   0x0200                  ! ELEVENBIT

2111 #define two             0x00
2112 #define A1              0x08
2113 #define A2              0x10
2114 #define A3              0x18
2115 #define ln2hi           0x20
2116 #define ln2lo           0x28
2117 #define mask            0x30
2118 #define ox43200000      0x38
2119 #define oxfff00000      0x3c
2120 #define oxc0194000      0x40
2121 #define ox4000          0x44


2124 ! local storage indices

2126 #define jnk             STACK_BIAS-0x8
2127 #define tmp2            STACK_BIAS-0x10
2128 #define tmp1            STACK_BIAS-0x18
2129 #define tmp0            STACK_BIAS-0x20
2130 #define tmp3            STACK_BIAS-0x28
2131 #define tmp4            STACK_BIAS-0x30
2132 #define tmp5            STACK_BIAS-0x38
2133 #define tmp6            STACK_BIAS-0x40
2134 ! sizeof temp storage - must be a multiple of 16 for V9
2135 #define tmps            0x40

2137 ! register use

2139 ! i0  n
2140 ! i1  x
2141 ! i2  stridex
2142 ! i3  y
2143 ! i4  stridey
2144 ! i5

2146 ! g1  TBL

2148 ! l0  j0
2149 ! l1  j1
2150 ! l2  j2
2151 ! l3
2152 ! l4  0x94000
2153 ! l5  CONSTANTS
2154 ! l6  0x000fffff
2155 ! l7  0x7ff00000

2157 ! o0  py0
2158 ! o1  py1
2159 ! o2  py2
2160 ! o3            used in primary range bounds check
2161 ! o4            used in primary range bounds check
2162 ! o5            used in .rangeI check section as temporary
2163 ! o7            NOT USED

2165 ! f0  u0,q0
2166 ! f2  v0,(two-v0)-u0,z0
2167 ! f4  n0,f0,q0
2168 ! f6  s0
2169 ! f8  q
2170 ! f10 u1,q1
2171 ! f12 v1,(two-v1)-u1,z1
2172 ! f14 n1,f1,q1
2173 ! f16 s1
```



```
2174 ! f18 t ! now tmp0 storage
2175 ! f20 u2,q2
2176 ! f22 v2,(two-v2)-u2,q2
2177 ! f24 n2,f2,q2
2178 ! f26 s2
2179 ! f28 0xfff00000
2180 ! f29 0x43200000
2181 ! f30 0x4000
2182 ! f31 0xc0194000
2183 ! f32 t0
2184 ! f34 h0,f0-(c0-h0)
2185 ! f36 c0
2186 ! f38 A1
2187 ! f40 two
2188 ! f42 t1
2189 ! f44 h1,f1-(c1-h1)
2190 ! f46 c1
2191 ! f48 A2
2192 ! f50 0xffff8000... or 0xfffffc00 for 6 or 11 bit tbl resp
2193 ! f52 t2
2194 ! f54 h2,f2-(c2-h2)
2195 ! f56 c2
2196 ! f58 A3        now tmp1 storage
2197 ! f60 ln2hi
2198 ! f62 ln2lo
2199 !--------------------------------------------------------------------
2200 !--------------------------------------------------------------------
2201 ! PREFETCH info
2202 #define PREFETCH_MULT_READS 0
2203 !--------------------------------------------------------------------
2204 !--------------------------------------------------------------------
2205 ! define pipes for easier reading

2207 #define ICNT            %i0

2209 #define XPTR            %i1
2210 #define XSTR            %i2
2211 #define YPTR            %i3
2212 #define YSTR            %i4

2214 #define RANGE_LO        %l6
2215 #define RANGE_HI        %l7

2217 #define P0_X1           %f0
2218 #define P0_f1           %f1
2219 #define P0_f2           %f2
2220 #define P0_f3           %f3
2221 #define P0_f4           %f4
2222 #define P0_f5           %f5
2223 #define P0_f6           %f6
2224 #define P0_f7           %f7
2225 !#define P0_f8          %f8
2226 #define T0_f8           %f8
2227 #define P0_f9           %f9

2229 #define P1_X2           %f10
2230 #define P1_f11          %f11
2231 #define P1_f12          %f12
2232 #define P1_f13          %f13
2233 #define P1_f14          %f14
2234 #define P1_f15          %f15
2235 #define P1_f16          %f16
2236 #define P1_f17          %f17

2238 !#define P1_f18         %f18
2239 #define T1_f18          %f18
```

```
2241 #define P1_f19          %f19

2243 #define P2_X3           %f20
2244 #define P2_f21          %f21
2245 #define P2_f22          %f22
2246 #define P2_f23          %f23
2247 #define P2_f24          %f24
2248 #define P2_f25          %f25
2249 #define P2_f26          %f26
2250 #define P2_f27          %f27
2251 #define INF_f28         %f28
2252 #define CONSTE432_f29   %f29

2254 #define CONST_f30       %f30

2256 #define TTOPMSK         %f31

2258 #define P0_f32          %f32
2259 #define P0_f34          %f34
2260 #define P0_f36          %f36

2262 #define P1_f42          %f42
2263 #define P1_f44          %f44
2264 #define P1_f46          %f46

2266 #define P2_f52          %f52
2267 #define P2_f54          %f54
2268 #define P2_f56          %f56

2270 #define G1_TBL          %g1
2271 #define L5_CONSTANTS    %l5
2272 #define FP40_TWO        %f40
2273 #define FP38_A1         %f38
2274 #define FP48_A2         %f48
2275 #define FP50_MASK       %f50
2276 !!!#define FP58_A3              %f58
2277 #define T2_f58          %f58
2278 #define FP60_LN2HI      %f60
2279 #define FP62_LN2LO      %f62


2282 !--------------------------------------------------------------------

2284         ENTRY(__vlog_ultra3)
2285         save    %sp,-SA(MINFRAME)-tmps,%sp
2286         PIC_SETUP(l7)
2287         PIC_SET(l7,CONSTANTS,l5)
2288         PIC_SET(l7,TBL,o0)
2289         mov     %o0,%g1
2290         wr      %g0,0x82,%asi           ! set %asi for non-faulting loads

2292         ld      [XPTR],%l0              ! quickly                       !X1

2294         sethi   %hi(0x90200),%l4                ! ELEVENBIT
2295         or      %l4,%lo(0x90200),%l4            ! ELEVENBIT
2296         ldd     [XPTR],P0_X1            ! u.l[0] = *x                   !X1
2297         sethi   %hi(0x000fffff),RANGE_LO
2298         or      RANGE_LO,%lo(0x000fffff),RANGE_LO
2299         sethi   %hi(0x7ff00000),RANGE_HI
2300         ldd     [L5_CONSTANTS+two],FP40_TWO
2301         fzero   P1_X2
2302         fzero   P2_X3
2303         ldd     [L5_CONSTANTS+A1],FP38_A1
2304         ldd     [L5_CONSTANTS+A2],FP48_A2
2305         ldd     [L5_CONSTANTS+ln2hi],FP60_LN2HI
```



```
2306         ldd     [L5_CONSTANTS+ln2lo],FP62_LN2LO
2307         ldd     [L5_CONSTANTS+mask],FP50_MASK
2308         ld      [L5_CONSTANTS+ox43200000],CONSTE432_f29
2309         ld      [L5_CONSTANTS+oxfff00000],INF_f28
2310         ld      [L5_CONSTANTS+oxc0194000],TTOPMSK
2311         fpadd32s P0_X1,TTOPMSK,P0_f2    ! X+TTOP !X1 START
2312         ld      [L5_CONSTANTS+ox4000],CONST_f30
2313         sll     XSTR,3,XSTR             ! scale strides
2314         sll     YSTR,3,YSTR
2315         add     %fp,jnk,%o0             ! precondition loop
2316         fands   P0_f2,INF_f28,P0_f2     ! (X+TTOP)&INF->n               X1
2317 !       st      P0_X1,[%fp+tmp0]        !BYPASS in
2318         fzero   P0_f4
2319         fzero   P0_f6
2320 !       ld      [%fp+tmp0],%l0          !BYPASS out ix                  X1
2321         add     %fp,jnk,%o1
2322         add     %fp,jnk,%o2
2323         fzero   P0_f32
2324         fzero   P0_f34
2325         fzero   P0_f36
2326         fzero   P1_f12
2327         sub     %l0,RANGE_HI,%o3                ! bounds for X1
2328         sub     RANGE_LO,%l0,%o4                ! bounds for X1
2329         fzero   P1_f14
2330         fzero   P1_f16
2331         sub     YPTR,YSTR,YPTR
2332         fzero   P1_f42
2333         mov     %g0,%l1                         ! zero out for first pass
2334         mov     %g0,%l2                         ! zero out for first pass
2335         fzero   P1_f44
2336         fzero   P1_f46
2337         fzero   T0_f8
2338         fzero   T1_f18
2339         fzero   T2_f58
2340         fzero   P2_f24
2341         fzero   P2_f26
2342         fzero   P2_f52
2343         fzero   P2_f54
2344         fzero   P2_f56
2345         ba      .loop0
2346         std     P2_f26,[%fp+tmp2]

2348         .align  16
2349 ! -- 16 byte aligned
2350 .loop0:
2351 !############################## AREA 1 (0-19) ###################################
2352 !>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> 1.1 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2353 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 0

2355         fmuld   P1_f44,FP48_A2,P1_f46                   ! s^2,A2        !
2356         andcc   %o3,%o4,%o4                                     !       X1
2357         bge,pn  %icc,.range0    ! ix<=0x000fffff or >=0x7ff00000 !      X1
2358 ! delay slot
2359         nop
2360         ! x , n , reduction

2362 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 1
2363         fpsub32s P0_X1,P0_f2,P0_X1              ! X - n -> x    !       X1
2364         add     XPTR,XSTR,XPTR          ! x += stridex
2365         add     YPTR,YSTR,YPTR          ! y += stridey  !

2367 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 2
2368 .cont0:
2369         ! n*l2lo , lylo
2370         faddd   P0_f4,P0_f34,P0_f34     !n*l2lo,lylo            !       X1-2
2371         ! TBL calc
```

```
2372         add     %l0,%l4,%l0             ! j = ix + 0x94000              X1
2373 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 3
2374         fsubd   FP40_TWO,P2_f24,P2_f24  ! two - xT              !       X3-2


2377 !>>>>>>>>>>>>>>>>>>>>>>>>>>>> 1.2 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2378 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 4
2379         ! round up redunction
2380         fpadd32s P0_X1,CONST_f30,P0_f4  ! x round up                    X1
2381 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 5
2382         ! s ( poly + ( 2-xT-x)), n*l2lo+lylo
2383         faddd   P0_f36,P0_f34,P0_f36    ! + n*l2lo+lylo                 X1-2
2384         ! n*l2hi
2385         fmuld   T0_f8,FP60_LN2HI,T0_f8 ! n*l2hi                 !       X1-2

2387 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 6
2388         fmuld   T1_f18,FP62_LN2LO,P1_f12 ! n*l2lo                       !
2389         faddd   P1_f46,FP38_A1,P1_f46   ! (s^2*A2), A1
2390         ! TBL calc
2391         srl     %l0,10,%l0              ! j=(j>>11)&0x1f0 !ELEVENBIT !  X1

2393 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 7
2394         fsubd   P2_f24,P2_X3,P2_f24     ! (two - xT) - x        !       !X3-2

2396 !>>>>>>>>>>>>>>>>>>>>>>>>>>>> 1.3 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2397 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 8
2398         ldda    [XPTR]%asi,P1_X2                !       X2-nextX
2399         ! x-roundedup & 0xffff8000  -> xT  i.e 11bit value of x
2400         fand    P0_f4,FP50_MASK,P0_f4   ! xT                    !       X1

2402


2404 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 9
2405         faddd   P0_f36,P0_f32,P0_f36    ! + (x-xT)                      X1-2
2406         and     %l0,0x3ff,%l0           ! ELEVENBIT             !       X1
2407         st      P1_X2,[%fp+tmp0]        !BYPASS in              !       X2

2409 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 10
2410         fmuld   P1_f46,P1_f44,P1_f46       ! s^2*A2+A1 , s^2
2411         ldd     [G1_TBL+%l1],P1_f44             !lylo           !       X2-2
2412         sub     %l1,8,%l1                       ! get back ptr to lyhi  X2-2
2413         faddd   P1_f12,P1_f44,P1_f44    !n*l2lo,lylo            !       X2-2

2415 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 11

2417 !>>>>>>>>>>>>>>>>>>>>>>>>>>>> 1.4 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2418 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 12
2419         faddd   P0_f36,P0_f6,P0_f36             ! + lyhi                X1-2

2421 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 13
2422         ! x+xT
2423         faddd   P0_X1,P0_f4,P0_f6        ! x + xT               !       X1
2424         ! TBL calc
2425         sll     %l0,4,%l0               ! ELEVENBIT             !       X1


2428 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 14
2429         faddd   P1_f46,P1_f14,P1_f46    ! (s^2*A2+A1)s^2 + (2-xT-x)


2432 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 15
2433         fpadd32s P1_X2,TTOPMSK,P1_f12 ! X + TTOP                         !
2434         ld      [%fp+tmp0],%l3                  !BYPASS out     !       X2

2436 !>>>>>>>>>>>>>>>>>>>>>>>>>>>> 1.5 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2437 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 16
```



```
2438         ! x-xT
2439         fsubd   P0_X1,P0_f4,P0_f32              ! x-xT          !       X1

2441 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 17
2442         faddd   P0_f36,T0_f8,P0_f36     ! + n*l2hi                      X1-2
2443         ! TBL+1
2444         add     %l0,8,%l0                                       !       X1


2447 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 18
2448         fmuld   P1_f16,P1_f46,P1_f46            ! s*(POLY)      !       X2-2

2450 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 19
2451         fands   P1_f12,INF_f28,P1_f12                           !       X2
2452         fmuld   P2_f26,P2_f26,P2_f54            ! z = s * s     !       !X3-2

2454 !############################ AREA 2 (20#39) ################################
2455 !>>>>>>>>>>>>>>>>>>>>>>>>>>>> 2.1 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2456 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 20
2457         ! (x-xT) / (x+xT) => s
2458         fdivd   P0_f32,P0_f6,P0_f6      ! -> s                  !       X1
2459         faddd   P1_f46,P1_f44,P1_f46    ! + n*l2lo+lylo                 X2-2
2460         ldd     [G1_TBL+%l1],P1_f44     ! ld lyhi               !       X2-2
2461         mov     %l3,%l1                 ! BYPASS temp           !       X2
2462         ! wrap !!! done for X0
2463         std     P0_f36,[%o0]                                    !       X1-2 FIN
2464         mov     YPTR,%o0                                        !       X1-2 INC

2466         addcc   ICNT,-1,ICNT            !
2467         ble,pn  %icc,.endloop0          !
2468 ! delay slot
2469         nop

2471 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 21
2472 ! -- 16 byte aligned
2473 .loop1:
2474         sub     %l1,RANGE_HI,%o3                ! bounds for            X2
2475         sub     RANGE_LO,%l1,%o4                ! bounds for            X2
2476         andcc   %o3,%o4,%o4                                     !       X2
2477         bge,pn  %icc,.range1    ! ix<=0x000fffff or >=0x7ff00000 !      X2
2478 ! delay slot
2479         nop

2481 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 22
2482         fpsub32s P1_X2,P1_f12,P1_X2             ! X - n -> x    !       X2
2483         add     XPTR,XSTR,XPTR          ! x += stridex
2484         add     YPTR,YSTR,YPTR          ! y += stridey  !
2485 .cont1:

2487 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 23
2488         fmuld   P2_f54,FP48_A2,P2_f56                   ! s^2,A2!       X3-2

2490 !>>>>>>>>>>>>>>>>>>>>>>>>>>>> 2.2 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2491 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 24
2492         ! n to double
2493         fitod   P0_f2,T0_f8             ! (double) n            !       X1

2495 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 25

2497 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 26
2498         faddd   P1_f46,P1_f42,P1_f46    ! + (x-xT)                      X2-2

2500 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 27
2501         fpadd32s P1_X2,CONST_f30,P1_f14 ! x round up                    X2
2502         faddd   P2_f56,FP38_A1,P2_f56   ! (s^2*A2), A1                  X3-2
```

```
!>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> 2.3 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 28
        ! 2 , xT
        fsubd   FP40_TWO,P0_f4,P0_f4    ! two - xT              !       X1
        fmuld   T1_f18,FP60_LN2HI,T1_f18 ! n*l2hi                       !
        ldda    [XPTR]%asi,P2_X3                                !       X3-nextX

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 29

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 30
        faddd   P1_f46,P1_f44,P1_f46            ! + lyhi                X2-2
        st      P2_X3,[%fp+tmp0]        !BYPASS in              !       X3


!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 31
        fand    P1_f14,FP50_MASK,P1_f14 ! xT                    !       X2
        fmuld   P2_f56,P2_f54,P2_f56       ! s^2*A2+A1 , s^2            X3-2
        ldd     [G1_TBL+%l2],P2_f54             !lylo           !       X3
        sub     %l2,8,%l2               ! back to TBL hi        !       X3
        add     %l1,%l4,%l1             ! j = ix + 0x94000              X2

!>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> 2.4 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 32
        ! 2-xT , x
        fsubd   P0_f4,P0_X1,P0_f4       ! (two - xT) - x        !       !X1

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 33
        fpadd32s P2_X3,TTOPMSK,P2_f22 ! X + TTOP                 !      X3


!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 34
        faddd   P1_f46,T1_f18,P1_f46    ! + n*l2hi                      X2-2

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 35
        faddd   P1_X2,P1_f14,P1_f16      ! x + xT               !       X2
        srl     %l1,10,%l1              ! j=(j>>11)&0x1f0 !ELEVENBIT !  X2
        faddd   P2_f56,P2_f24,P2_f56    ! + 2-xT-x                      X3-2


!>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> 2.5 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 36
        fitod   P1_f12,T1_f18           ! (double) n            !       X2
        fmuld   T2_f58,FP62_LN2LO,P2_f24 ! n*l2lo               !       X3-2


!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 37
        fands   P2_f22,INF_f28,P2_f22                           !       X3
        ld      [%fp+tmp0],%l3                  !BYPASS out     !       X3

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 38
        std     P1_f46,[%o1]                                    !       X2-2 FIN
        mov     YPTR,%o1                                        !       X2-2 INC

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 39
        fsubd   P1_X2,P1_f14,P1_f42             ! x-xT          !       X2
        fmuld   P2_f26,P2_f56,P2_f56            ! s*(POLY)      !       X3-2
        ldd     [G1_TBL+%l2],P2_f26     ! ld lyhi               !       X3
        mov     %l3,%l2                 ! BYPASS for X3         !       X3
        and     %l1,0x3ff,%l1           ! ELEVENBIT             !       X2

!############################# AREA 3 (40#59) ####################################
!>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> 3.1 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 40
        faddd   P2_f24,P2_f54,P2_f54    !n*l2lo,lylo            !       X3-2
        ! s , s
        fmuld   P0_f6,P0_f6,P0_f34              ! z = s * s     !       !X1
```



```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 41
        fdivd   P1_f42,P1_f16,P1_f16    ! -> s                  !       X2
! -- 16 byte aligned
        addcc   ICNT,-1,ICNT            !
        ble,pn  %icc,.endloop1          !
        nop
.loop2:

        sub     %l2,RANGE_HI,%o3                ! bounds for            X3
        sub     RANGE_LO,%l2,%o4                ! bounds for            X3
        andcc   %o3,%o4,%o4                                     !       X3
        bge,pn  %icc,.range2    ! ix<=0x000fffff or >=0x7ff00000 !      X3
!       delay slot
        nop
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 42
        fpsub32s P2_X3,P2_f22,P2_X3             ! X - n -> x    !       X3
        add     XPTR,XSTR,XPTR          ! x += stridex
        add     YPTR,YSTR,YPTR          ! y += stridey  !
.cont2:

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 43
        sll     %l1,4,%l1               ! ELEVENBIT             !       X2
        fmuld   T2_f58,FP60_LN2HI,T2_f58 ! n*l2hi               !       X3-2
        faddd   P2_f56,P2_f54,P2_f56    ! + n*l2lo+lylo                 X3-2


!>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> 3.2 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 44
        ! s^ , A2
        fmuld   P0_f34,FP48_A2,P0_f36                   ! s^2,A2        !
        fsubd   FP40_TWO,P1_f14,P1_f14  ! two - xT              !       X2
        add     %l2,%l4,%l2             ! j = ix + 0x94000              X3
        srl     %l2,10,%l2              ! j=(j>>11)&0x1f0 !ELEVENBIT !  X3
        ldda    [XPTR]%asi,P0_X1                                !       X1-nextX

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 45
        st      P0_X1,[%fp+tmp0]        !BYPASS in              !       X1-nextX

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 46
        fpadd32s P2_X3,CONST_f30,P2_f24 ! x round up                    X3

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 47
        add     %l1,8,%l1                                       !       X2
        faddd   P2_f56,P2_f52,P2_f56    ! + (x-xT)                      X3-2

!>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> 3.3 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 48
        ! s^2*A2 , A1
        faddd   P0_f36,FP38_A1,P0_f36   ! (s^2*A2), A1

        and     %l2,0x3ff,%l2           ! ELEVENBIT             !       X3


!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 49
        fsubd   P1_f14,P1_X2,P1_f14     ! (two - xT) - x        !       !X2


!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 50
        fand    P2_f24,FP50_MASK,P2_f24 ! xT                    !       X3

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 51
        faddd   P2_f56,P2_f26,P2_f56            ! + lyhi                X3-2

!>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> 3.4 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 52
```

```
2636         ! s^2*A2+A1 , s^2
2637         fmuld   P0_f36,P0_f34,P0_f36       ! s^2*A2+A1 , s^2
2638         fpadd32s P0_X1,TTOPMSK,P0_f2 ! X + TTOP                !       X1-nextX
2639         sll     %l2,4,%l2               ! ELEVENBIT            !       X3


2642 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 53
2643         ! lylo
2644         ldd     [G1_TBL+%l0],P0_f34             !lylo          !       X1
2645         add     %l0,-8,%l0                      !lyhi pointer  !       X1

2647 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 54
2648         faddd   P2_X3,P2_f24,P2_f26      ! x + xT              !       X3

2650 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 55
2651         faddd   P2_f56,T2_f58,P2_f56    ! + n*l2hi                     X3-2

2653 !>>>>>>>>>>>>>>>>>>>>>>>>>>>> 3.5 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2654 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 56
2655         ! s^2(s^2*A1+A1) + (2-xT-x)
2656         faddd   P0_f36,P0_f4,P0_f36     !
2657         add     %l2,8,%l2               ! TBL+8 is TBL lo      !       X3

2659 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 57
2660         ! X+TTOP & INF -> n
2661         fands   P0_f2,INF_f28,P0_f2                            !       X1-nextX
2662         ! n * l2lo
2663         fmuld   T0_f8,FP62_LN2LO,P0_f4 ! n*l2lo                !       X1

2665 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 58
2666         fsubd   P2_X3,P2_f24,P2_f52             ! x-xT         !       X3
2667 !BEST   ld      [%fp+tmp0],%l3          !BYPASS out            !       X1-nextX
2668         ld      [%fp+tmp0],%l3          !BYPASS out            !       X1-nextX


2671 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 59
2672         fitod   P2_f22,T2_f58           ! (double) n           !       X3
2673         std     P2_f56,[%o2]                                   !       X3 FINI
2674         mov     YPTR,%o2                                       !       X3 INC

2676 !############################# AREA 4 (OVERFLOW) ################################
2677 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 60
2678         ! s * (s^2(s^2*A1+A1) + (2-xT-x))
2679         fmuld   P0_f6,P0_f36,P0_f36             ! s*(POLY)     !       X1

2681 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 61
2682         fmuld   P1_f16,P1_f16,P1_f44            ! z = s * s    !       !X2
2683         ! lyhi
2684         ldd     [G1_TBL+%l0],P0_f6      ! ld lyhi              !       X1
2685         mov     %l3,%l0                 ! BYPASS tmp for X1    !       X1
2686         sub     %l0,RANGE_HI,%o3                ! bounds for           X1
2687         sub     RANGE_LO,%l0,%o4                ! bounds for           X1

2689 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 62
2690         addcc   ICNT,-1,ICNT            !
2691 ! FALL THROUGH if running out of X array here
2692         bg,pt   %icc,.loop0             !62
2693 ! delay slot
2694         fdivd   P2_f52,P2_f26,P2_f26    ! -> s                 !       X3

2696 !!!!!!!!!!!!!!!!!!!!!!!!!!!!CYCLE 63
2697 !LOSTC
```



```
2703         ! Once we get to the last element, we loop three more times to finish
2704         ! the computations in progress.  This means we will load past the end
2705         ! of the argument vector, but since we use non-faulting loads and never
2706         ! use the data, the only potential problem is cache miss.  (Strictly
2707         ! speaking, since we pad the argument vector with twos, we incorrectly
2708         ! raise inexact if the actual argument vector is all ones.)
2709         .endloop2:
2710                 sethi   %hi(0x40000000),%l0     ! "next argument" = two
2711                 sub     %l0,RANGE_HI,%o3                ! bnds chk x1
2712                 sub     RANGE_LO,%l0,%o4                ! bounds chk x1
2713                 fmovd   FP40_TWO,P0_X1
2714                 cmp     ICNT,-3
2715                 bg,a,pt %icc,.loop0
2716         ! delay slot
2717                 fpadd32s P0_X1,TTOPMSK,P0_f2    ! n=(ix+0xc0194000)&0xfff00000
2718                 ret
2719                 restore

2721                 .align  16
2722         .endloop0:
2723                 sethi   %hi(0x40000000),%l1     ! "next argument" = two
2724                 fmovd   FP40_TWO,P1_X2
2725                 cmp     ICNT,-3
2726                 bg,a,pt %icc,.loop1
2727         ! delay slot
2728                 fpadd32s P1_X2,TTOPMSK,P1_f12   ! n=(ix+0xc0194000)&0xfff00000
2729                 ret
2730                 restore

2732                 .align  16
2733         .endloop1:
2734                 sethi   %hi(0x40000000),%l2     ! "next argument" = two
2735                 fmovd   FP40_TWO,P2_X3
2736                 cmp     ICNT,-3
2737                 bg,a,pt %icc,.loop2
2738         ! delay slot
2739                 fpadd32s P2_X3,TTOPMSK,P2_f22   ! n=(ix+0xc0194000)&0xfff00000
2740                 ret
2741                 restore


2744                 .align  16
2745         .range0:
2746                 cmp     %l0,RANGE_HI
2747                 bgeu,pn %icc,2f                 ! if (unsigned) ix >= 0x7ff00000
2748         ! delay slot
2749                 ld      [XPTR+4],%o5
2750                 !THERE
2751                 fxtod   P0_X1,P0_X1             ! scale by 2**1074 w/o trapping
2752                 st      P0_X1,[%fp+tmp0]        !BYPASS in
2753                 add     XPTR,XSTR,XPTR          ! x += stridex
2754                 orcc    %l0,%o5,%g0
2755                 be,pn   %icc,1f                 ! if x == 0
2756         ! delay slot
2757                 add     YPTR,YSTR,YPTR          ! y += stridey
2758                 ! HERE
2759                 fpadd32s P0_X1,TTOPMSK,P0_f2            ! n = (ix + 0xc0194000)
2760                 fands   P0_f2,INF_f28,P0_f2
2761                 fpsub32s P0_X1,P0_f2,P0_X1              ! u.l[0] -= n
2762                 ld      [%fp+tmp0],%l0          !BYPASS out
2763                 ba,pt   %icc,.cont0
2764         ! delay slot
2765                 fpsub32s P0_f2,CONSTE432_f29,P0_f2              ! n -= 0x4320000
2766         1:
2767                 fdivs   CONSTE432_f29,P0_f1,P0_f2               ! raise div-by-z
```

```
2768                ba,pt   %icc,3f
2769        ! delay slot
2770                st      INF_f28,[YPTR]          ! store -inf
2771        2:
2772                sll     %l0,1,%l0               ! lop off sign bit
2773                add     XPTR,XSTR,XPTR          ! x += stridex
2774                orcc    %l0,%o5,%g0
2775                be,pn   %icc,1b                 ! if x == -0
2776        ! delay slot
2777                add     YPTR,YSTR,YPTR          ! y += stridey
2778                fzero   P0_f2                   ! *y = (x < 0.0? 0.0 : x) * inf
2779                fcmpd   %fcc0,P0_X1,P0_f2
2780                fmovdl  %fcc0,P0_f2,P0_X1
2781                fand    INF_f28,FP50_MASK,P0_f2
2782                fnegd   P0_f2,P0_f2
2783                fmuld   P0_X1,P0_f2,P0_X1
2784                st      P0_X1,[YPTR]
2785        3:
2786                addcc   ICNT,-1,ICNT
2787                ble,pn  %icc,.endloop2
2788        ! delay slot
2789                st      P0_f1,[YPTR+4]
2790                ld      [XPTR],%l0              ! get next argument
2791                sub     %l0,RANGE_HI,%o3                ! bnds chk x1
2792                sub     RANGE_LO,%l0,%o4                ! bounds chk x1
2793                ldd     [XPTR],P0_X1
2794                fpadd32s P0_X1,TTOPMSK,P0_f2    ! n=(ix+0xc0194000)&0xfff00000
2795                ba,pt   %icc,.loop0
2796        ! delay slot
2797                fands   P0_f2,INF_f28,P0_f2                             !58


2800                .align  16
2801        .range1:
2802                cmp     %l1,RANGE_HI
2803                bgeu,pn %icc,2f                 ! if (unsigned) ix >= 0x7ff00000
2804        ! delay slot
2805                ld      [XPTR+4],%o5
2806                fxtod   P1_X2,P1_X2             ! scale by 2**1074 w/o trapping
2807                st      P1_X2,[%fp+tmp1]
2808                add     XPTR,XSTR,XPTR          ! x += stridex
2809                orcc    %l1,%o5,%g0
2810                be,pn   %icc,1f                 ! if x == 0
2811        ! delay slot
2812                add     YPTR,YSTR,YPTR          ! y += stridey
2813                fpadd32s P1_X2,TTOPMSK,P1_f12           ! n = (ix + 0xc0194000)
2814                fands   P1_f12,INF_f28,P1_f12
2815                fpsub32s P1_X2,P1_f12,P1_X2             ! u.l[0] -= n
2816                ld      [%fp+tmp1],%l1
2817                ba,pt   %icc,.cont1
2818        ! delay slot
2819                fpsub32s P1_f12,CONSTE432_f29,P1_f12            ! n -= 0x4320000
2820        1:
2821                fdivs   CONSTE432_f29,P1_f11,P1_f12             ! raise div-by-z
2822                ba,pt   %icc,3f
2823        ! delay slot
2824                st      INF_f28,[YPTR]          ! store -inf
2825        2:
2826                sll     %l1,1,%l1               ! lop off sign bit
2827                add     XPTR,XSTR,XPTR          ! x += stridex
2828                orcc    %l1,%o5,%g0
2829                be,pn   %icc,1b                 ! if x == -0
2830        ! delay slot
2831                add     YPTR,YSTR,YPTR          ! y += stridey
2832                fzero   P1_f12                  ! *y = (x < 0.0? 0.0 : x) * inf
2833                fcmpd   %fcc0,P1_X2,P1_f12
```



```
2834                fmovdl  %fcc0,P1_f12,P1_X2
2835                fand    INF_f28,FP50_MASK,P1_f12
2836                fnegd   P1_f12,P1_f12
2837                fmuld   P1_X2,P1_f12,P1_X2
2838                st      P1_X2,[YPTR]
2839        3:
2840                addcc   ICNT,-1,ICNT
2841                ble,pn  %icc,.endloop0
2842        ! delay slot
2843                st      P1_f11,[YPTR+4]
2844                ld      [XPTR],%l1              ! get next argument
2845                ldd     [XPTR],P1_X2
2846                fpadd32s P1_X2,TTOPMSK,P1_f12           ! X + TTOP
2847                ba,pt   %icc,.loop1
2848        ! delay slot
2849                fands   P1_f12,INF_f28,P1_f12           ! & INF


2852                .align  16
2853        .range2:
2854                cmp     %l2,RANGE_HI
2855                bgeu,pn %icc,2f                 ! if (unsigned) ix >= 0x7ff00000
2856        ! delay slot
2857                ld      [XPTR+4],%o5
2858                fxtod   P2_X3,P2_X3             ! scale by 2**1074 w/o trapping
2859                st      P2_X3,[%fp+tmp2]
2860                add     XPTR,XSTR,XPTR          ! x += stridex
2861                orcc    %l2,%o5,%g0
2862                be,pn   %icc,1f                 ! if x == 0
2863        ! delay slot
2864                add     YPTR,YSTR,YPTR          ! y += stridey
2865                fpadd32s P2_X3,TTOPMSK,P2_f22           ! n = (ix + 0xc0194000) & 0xfff0
2866                fands   P2_f22,INF_f28,P2_f22
2867                fpsub32s P2_X3,P2_f22,P2_X3             ! u.l[0] -= n
2868                ld      [%fp+tmp2],%l2
2869                ba,pt   %icc,.cont2
2870        ! delay slot
2871                fpsub32s P2_f22,CONSTE432_f29,P2_f22            ! n -= 0x43200000
2872        1:
2873                fdivs   CONSTE432_f29,P2_f21,P2_f22             ! raise div-by-zero
2874                ba,pt   %icc,3f
2875        ! delay slot
2876                st      INF_f28,[YPTR]          ! store -inf
2877        2:
2878                sll     %l2,1,%l2               ! lop off sign bit
2879                add     XPTR,XSTR,XPTR          ! x += stridex
2880                orcc    %l2,%o5,%g0
2881                be,pn   %icc,1b                 ! if x == -0
2882        ! delay slot
2883                add     YPTR,YSTR,YPTR          ! y += stridey
2884                fzero   P2_f22                  ! *y = (x < 0.0? 0.0 : x) * inf
2885                fcmpd   %fcc0,P2_X3,P2_f22
2886                fmovdl  %fcc0,P2_f22,P2_X3
2887                fand    INF_f28,FP50_MASK,P2_f22
2888                fnegd   P2_f22,P2_f22
2889                fmuld   P2_X3,P2_f22,P2_X3
2890                st      P2_X3,[YPTR]
2891        3:
2892                addcc   ICNT,-1,ICNT
2893                ble,pn  %icc,.endloop1
2894        ! delay slot
2895                st      P2_f21,[YPTR+4]
2896                ld      [XPTR],%l2              ! get next argument
2897                ldd     [XPTR],P2_X3
2898                fpadd32s P2_X3,TTOPMSK,P2_f22 ! X + TTOP
2899                ba,pt   %icc,.loop2
```

```
2900 ! delay slot
2901         fands   P2_f22,INF_f28,P2_f22                          !       X3
2902         nop !ld [XPTR+4],P2_f21

2904         SET_SIZE(__vlog_ultra3)
```

```
**********************************************************
   36221 Sat May 10 12:09:59 2014
new/usr/src/lib/libmvec/common/vis/__vlogf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vlogf.S"

#include "libm.h"

        RO_DATA
        .align  64
!! CONST_TBL[2*i]   = 127*log(2) - log(1+i/32), i = [0, 32]
!! CONST_TBL[2*i+1] = 2**(-23)/(1+i/32),        i = [0, 32]

.CONST_TBL:
        .word   0x405601e6,     0x78fc457b,     0x3e800000,     0x00000000,
        .word   0x4055ffee,     0x4f4b5df8,     0x3e7f07c1,     0xf07c1f08,
        .word   0x4055fe05,     0x32e4434f,     0x3e7e1e1e,     0x1e1e1e1e,
        .word   0x4055fc2a,     0x44598c21,     0x3e7d41d4,     0x1d41d41d,
        .word   0x4055fa5c,     0xb720babf,     0x3e7c71c7,     0x1c71c71c,
        .word   0x4055f89b,     0xcf803581,     0x3e7bacf9,     0x14c1bad0,
        .word   0x4055f6e6,     0xe0c3f1b1,     0x3e7af286,     0xbca1af28,
        .word   0x4055f53d,     0x4badcb50,     0x3e7a41a4,     0x1a41a41a,
        .word   0x4055f39e,     0x7d18782e,     0x3e799999,     0x9999999a,
        .word   0x4055f209,     0xecc5965c,     0x3e78f9c1,     0x8f9c18fa,
        .word   0x4055f07f,     0x1c5099d5,     0x3e786186,     0x18618618,
        .word   0x4055eefd,     0x9641645e,     0x3e77d05f,     0x417d05f4,
        .word   0x4055ed84,     0xed3a291d,     0x3e7745d1,     0x745d1746,
        .word   0x4055ec14,     0xbb3ced72,     0x3e76c16c,     0x16c16c17,
        .word   0x4055eaac,     0xa10589ab,     0x3e7642c8,     0x590b2164,
        .word   0x4055e94c,     0x45758439,     0x3e75c988,     0x2b931057,
        .word   0x4055e7f3,     0x550f85e3,     0x3e755555,     0x55555555,
        .word   0x4055e6a1,     0x818078ec,     0x3e74e5e0,     0xa72f0539,
        .word   0x4055e556,     0x8134aae1,     0x3e747ae1,     0x47ae147b,
        .word   0x4055e412,     0x0ef783b7,     0x3e741414,     0x14141414,
        .word   0x4055e2d3,     0xe99c9674,     0x3e73b13b,     0x13b13b14,
        .word   0x4055e19b,     0xd3b0f9d9,     0x3e73521c,     0xfb2b78c1,
        .word   0x4055e069,     0x9333fb26,     0x3e72f684,     0xbda12f68,
```



```
        .word   0x4055df3c,     0xf1565bd0,     0x3e729e41,     0x29e4129e,
        .word   0x4055de15,     0xba3f64fa,     0x3e724924,     0x92492492,
        .word   0x4055dcf3,     0xbcd73219,     0x3e71f704,     0x7dc11f70,
        .word   0x4055dbd6,     0xca95a75a,     0x3e71a7b9,     0x611a7b96,
        .word   0x4055dabe,     0xb7559927,     0x3e715b1e,     0x5f75270d,
        .word   0x4055d9ab,     0x592bb896,     0x3e711111,     0x11111111,
        .word   0x4055d89c,     0x8840e4fe,     0x3e70c971,     0x4fbcda3b,
        .word   0x4055d792,     0x1eaf8df0,     0x3e708421,     0x08421084,
        .word   0x4055d68b,     0xf863da3d,     0x3e704104,     0x10410410,
        .word   0x4055d589,     0xf2fe5107,     0x3e700000,     0x00000000,
        .word   0xbfcffb16,     0xbfa3db6e,     ! K3 = -2.49850123953105416108e-
        .word   0x3fd5561b,     0xa4b3110b,     ! K2 =  3.33380614127478394992e-
        .word   0xbfe00000,     0x0b666d0b,     ! K1 = -5.00000021234343492201e-
        .word   0x3fefffff,     0xff3fd118,     ! K0 =  9.99999998601683029714e-
        .word   0x3fe62e42,     0xfefa39ef,     ! LN2 = 6.93147180559452862e-01
        .word   0xbf800000,     0x7f800000,     ! MONE = -1.0f ;    INF

! local storage indices
#define tmp0            STACK_BIAS-0x8
#define tmp1            STACK_BIAS-0x10
#define tmp2            STACK_BIAS-0x18
#define tmp3            STACK_BIAS-0x20
#define tmp4            STACK_BIAS-0x28
#define tmp5            STACK_BIAS-0x30
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x30

#define ZERO            %f28
#define K3              %f30
#define K2              %f32
#define K1              %f34
#define K0              %f36
#define LN2             %f38

#define stridex         %o0
#define stridex2        %o1
#define stridey         %o2
#define x0              %o3
#define x1              %o4
#define y               %o5

#define ind0            %i0
#define ind1            %i1
#define ind2            %i2
#define ind3            %i3
#define MASK_0x007fffff %i4
#define MASK_0xfffc0000 %i5
#define CONST_0x20000   %o7
#define MASK_0x7f800000 %l3

#define ival0           %l0
#define iy0             %l1
#define ival1           %l2
#define iy1             %l1
#define ival2           %l4
#define iy2             %l5
#define ival3           %l6
#define iy3             %l2
#define counter         %l7

#define LOGFTBL         %g5
#define LOGFTBL_P8      %g1

! register use

! i0  ind0
```

```
! i1  ind1
! i2  ind2
! i3  ind3
! i4  0x007fffff
! i5  0xfffc0000

! l0  ival0
! l1  iy0, iy1
! l2  ival1, iy3
! l3  0x7f800000
! l4  ival2
! l5  iy2
! l6  ival3
! l7  cycle counter

! o0  stridex
! o1  stridex * 2
! o2  stridey
! o3  x
! o4  x
! o5  y
! o7  0x20000

! g1  CONST_TBL
! g5  CONST_TBL + 8

! f2
! f4
! f6
! f8
! f9
! f10
! f12
! f14
! f16
! f18
! f19
! f20
! f22
! f24
! f26
! f28 ZERO = 0
! f30 K3 = -2.49850123953105416108e-01
! f32 K2 =  3.33380614127478394992e-01
! f34 K1 = -5.00000021234343492201e-01
! f36 K0 =  9.99999986601683029714e-01
! f38 LN2 = 6.93147180559452862e-01
! f40
! f42
! f44
! f46
! f48
! f50
! f52
! f54
! f56
! f58
! f60
! f62


!  !!!!!  Algorithm   !!!!!
!
!  double exp, ty, yy, ldtmp0, ldtmp1;
!  double dtmp0, dtmp1, dtmp2, dtmp3, dtmp4, dtmp5;
!  float  value;
```



```
!  int    ival, iy, i, ind, iexp;
!  double K3   = -2.49850123953105416108e-01;
!  double K2   =  3.33380614127478394992e-01;
!  double K1   = -5.00000021234343492201e-01;
!  double K0   =  9.99999986601683029714e-01;
!  double LN2  =  6.93147180559452862e-01;
!  double ZERO =  0;
!  float  INF;
!
!  ival = *(int*)(x);
!  if (ival >= 0x7f800000) goto spec;
!  if (ival <= 0x7fffff) goto spec;
!  *(float*)&*(float*)&exp = *(float*)(x);
!  exp = vis_fpack32(ZERO, exp);
!  iy = ival & 0x007fffff;
!  ival = iy + 0x20000;
!  ival = ival & 0xfffc0000;
!  i  = ival >> 14;
!  ind  = i & (-8);
!  iy = iy - ival;
!  ty = LN2 * (double)(*(int*)&exp);
!  ldtmp0 = *(double*)((char*)CONST_TBL+ind);
!  ldtmp1 = *(double*)((char*)CONST_TBL+ind+8);
!  ty = ty - ldtmp0;
!  yy = (double) iy;
!  yy = yy * ldtmp1;
!  dtmp0 = K3 * yy;
!  dtmp1 = dtmp0 + K2;
!  dtmp2 = dtmp1 * yy;
!  dtmp3 = dtmp2 + K1;
!  dtmp4 = dtmp3 * yy;
!  dtmp5 = dtmp4 + K0;
!  yy    = dtmp5 * yy;
!  yy    = yy + ty;
!  y[0] = (float)(yy);
!  return;
!
!spec:
!  if ((ival & 0x7fffffff) >= 0x7f800000) { /* X = NaN or Inf */
!    value = *(float*) &ival;
!    y[0] = (value < 0.0f? 0.0f : value) * value;
!    return;
!  } else if (ival <= 0) {
!    y[0] = ((ival & 0x7fffffff) == 0) ?
!      -1.0f / 0f. : 0f. /0f.;      /* X = +-0 : X < 0 */
!    return;
!  } else { /* Denom. number */
!    value = (float) ival;
!    ival = *(int*) &value;
!    iexp = (ival >> 23) - 149;
!    iy = ival & 0x007fffff;
!    ival = iy + 0x20000;
!    ival = ival & 0xfffc0000;
!    i  = ival >> 14;
!    ind  = i & (-8);
!    iy = iy - ival;
!    ty = LN2 * (double)iexp;
!    ldtmp0 = *(double*)((char*)CONST_TBL+ind);
!    ldtmp1 = *(double*)((char*)CONST_TBL+ind+8);
!    ty = ty - ldtmp0;
!    yy = (double) iy;
!    yy = yy * ldtmp1;
!    dtmp0 = K3 * yy;
!    dtmp1 = dtmp0 + K2;
!    dtmp2 = dtmp1 * yy;
!    dtmp3 = dtmp2 + K1;
```

```
!    dtmp4 = dtmp3 * yy;
!    dtmp5 = dtmp4 + K0;
!    yy    = dtmp5 * yy;
!    yy    = yy + ty;
!    y[0] = (float)(yy);
!    return;
!  }
!--------------------------------------------------------------------

        ENTRY(__vlogf)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,g5)
        wr      %g0,0,%gsr

        st      %i0,[%fp+tmp0]
        stx     %i1,[%fp+tmp5]

        sra     %i2,0,%l4
        ldd     [LOGFTBL+528],K3
        add     %i3,0,y
        sllx    %l4,2,stridex
        sllx    %l4,3,stridex2
        ldd     [LOGFTBL+536],K2
        sra     %i4,0,%l3
        ldd     [LOGFTBL+544],K1
        sllx    %l3,2,stridey
        sethi   %hi(0x7ffc00),MASK_0x007fffff
        add     MASK_0x007fffff,1023,MASK_0x007fffff
        ldd     [LOGFTBL+552],K0
        sethi   %hi(0xfffc0000),MASK_0xfffc0000
        ldd     [LOGFTBL+560],LN2
        sethi   %hi(0x20000),CONST_0x20000
        fzero   ZERO
        sethi   %hi(0x7f800000),MASK_0x7f800000
        sub     y,stridey,y

.begin:
        ld      [%fp+tmp0],counter
        ldx     [%fp+tmp5],x0
        st      %g0,[%fp+tmp0]
.begin1:
        add     x0,stridex2,x1! x += 2*stridex
        subcc   counter,1,counter
        bneg,pn %icc,.end
        lda     [x0]0x82,ival0                  ! (Y0_0) ival = *(int*)(x)

        add     LOGFTBL,8,LOGFTBL_P8
        lda     [stridex+x0]0x82,ival1          ! (Y1_0) ival = *(int*)(x)

        cmp     ival0,MASK_0x7f800000           ! (Y0_0) if (ival >= 0x7f800000)
        lda     [x1]0x82,ival2                  ! (Y2_0) ival = *(int*)(x);

        bge,pn  %icc,.spec                      ! (Y0_0) if (ival >= 0x7f800000)
        nop

        cmp     ival0,MASK_0x007fffff           ! (Y0_0) if (ival <= 0x7fffff)
        ble,pn  %icc,.spec                      ! (Y0_0) if (ival <= 0x7fffff)
        nop

        cmp     ival1,MASK_0x7f800000           ! (Y1_0) if (ival >= 0x7f800000)
        and     ival0,MASK_0x007fffff,iy0       ! (Y0_0) iy = ival & 0x007fffff


        add     iy0,CONST_0x20000,ival0         ! (Y0_0) ival = iy + 0x20000
```



```
        and     ival0,MASK_0xfffc0000,ival0     ! (Y0_0) ival = ival & 0xfffc000
        bge,pn  %icc,.update2                   ! (Y1_0) if (ival >= 0x7f800000)
        nop
.cont2:
        sub     iy0,ival0,iy0                   ! (Y0_0) iy = iy - ival
        cmp     ival1,MASK_0x007fffff           ! (Y1_0) if (ival <= 0x7fffff)
        lda     [stridex+x1]0x82,ival3          ! (Y3_0) ival = *(int*)(x)

        st      iy0,[%fp+tmp1]                  ! (Y0_0) (double) iy
        ble,pn  %icc,.update3                   ! (Y1_0) if (ival <= 0x7fffff)
        nop
.cont3:
        cmp     ival2,MASK_0x7f800000           ! (Y2_0) if (ival >= 0x7f800000)
        and     ival1,MASK_0x007fffff,iy1       ! (Y1_0) iy = ival & 0x007fffff
        bge,pn  %icc,.update4                   ! (Y2_0) if (ival >= 0x7f800000)
        nop
.cont4:
        cmp     ival2,MASK_0x007fffff           ! (Y2_0) if (ival <= 0x7fffff)
        ble,pn  %icc,.update5                   ! (Y2_0) if (ival <= 0x7fffff)
        nop
.cont5:
        add     iy1,CONST_0x20000,ival1         ! (Y1_0) ival = iy + 0x20000
        and     ival2,MASK_0x007fffff,iy2       ! (Y2_0) iy = ival & 0x007fffff

        and     ival1,MASK_0xfffc0000,ival1     ! (Y1_0) ival = ival & 0xfffc000
        add     iy2,CONST_0x20000,ival2         ! (Y2_0) ival = iy + 0x20000

        sub     iy1,ival1,iy1                   ! (Y1_0) iy = iy - ival
        and     ival2,MASK_0xfffc0000,ival2     ! (Y2_0) ival = ival & 0xfffc000

        cmp     ival3,MASK_0x7f800000           ! (Y3_0) (ival >= 0x7f800000)
        sub     iy2,ival2,iy2                   ! (Y2_0) iy = iy - ival
        st      iy1,[%fp+tmp3]                  ! (Y1_0) (double) iy

        st      iy2,[%fp+tmp2]                  ! (Y2_0) (double) iy
        bge,pn  %icc,.update6                   ! (Y3_0) (ival >= 0x7f800000)
        nop
.cont6:
        cmp     ival3,MASK_0x007fffff           ! (Y3_0) if (ival <= 0x7fffff)
        ld      [%fp+tmp1],%f2                  ! (Y0_0) (double) iy
        ble,pn  %icc,.update7                   ! (Y3_0) if (ival <= 0x7fffff)
        sra     ival0,14,ival0                  ! (Y0_0) i  = ival >> 14;
.cont7:
        sra     ival1,14,ind1                   ! (Y1_0) i  = ival >> 14;
        ld      [%fp+tmp3],%f4                  ! (Y1_0) (double) iy

        sra     ival2,14,ival2                  ! (Y2_0) i  = ival >> 14;
        and     ival0,-8,ind0                   ! (Y0_0) ind  = i & (-8)
        lda     [x0]0x82,%f6                    ! (Y0_0) *(float*)&exp = *(float

        and     ind1,-8,ind1                    ! (Y1_0) ind  = i & (-8)
        ldd     [LOGFTBL_P8+ind0],%f14          ! (Y0_0) ldtmp1 = *(double*)((ch
        fitod   %f2,%f48                        ! (Y0_0) yy = (double) iy

        and     ival3,MASK_0x007fffff,iy3       ! (Y3_0) iy = ival & 0x007fffff
        lda     [stridex+x0]0x82,%f8            ! (Y1_0) *(float*)&exp = *(float

        add     iy3,CONST_0x20000,ival3         ! (Y3_0) iy + 0x20000
        ldd     [LOGFTBL_P8+ind1],%f16          ! (Y1_0) ldtmp1 = *(double*)((ch
        fitod   %f4,%f26                        ! (Y1_0) yy = (double) iy

        sub     y,stridey,y                     ! y += stridey
        and     ival3,MASK_0xfffc0000,ival3     ! (Y3_0) ival = ival & 0xfffc000
        lda     [x1]0x82,%f10                   ! (Y2_0) *(float*)&exp = *(float

        add     x1,stridex2,x0                  ! x += 2*stridex
```

```
392         sub     iy3,ival3,iy3                   ! (Y3_0) iy = iy - ival
393         ld      [%fp+tmp2],%f2                  ! (Y2_0) (double) iy
394         fmuld   %f48,%f14,%f46                  ! (Y0_0) yy = yy * ldtmp1

396         lda     [stridex+x1]0x82,%f12           ! (Y3_0) *(float*)&exp = *(float
397         fmuld   %f26,%f16,%f62                  ! (Y1_0) yy = yy * ldtmp1

399         sra     ival3,14,ival3                  ! (Y3_0) i  = ival >> 14;
400         lda     [x0]0x82,ival0                  ! (Y0_1) ival = *(int*)(x)

402         add     x0,stridex2,x1                  ! x += 2*stridex
403         st      iy3,[%fp+tmp3]                  ! (Y3_0) (double) iy
404         fmuld   K3,%f46,%f22                    ! (Y0_0) dtmp0 = K3 * yy

406         and     ival2,-8,ind2                   ! (Y2_0) ind  = i & (-8)
407         lda     [stridex+x0]0x82,ival1          ! (Y1_1) ival = *(int*)(x)

409         cmp     ival0,MASK_0x7f800000           ! (Y0_1) if (ival >= 0x7f800000)
410         lda     [x1]0x82,ival2                  ! (Y2_1) ival = *(int*)(x);
411         fmuld   K3,%f62,%f50                    ! (Y1_0) dtmp0 = K3 * yy

413         bge,pn  %icc,.update8                   ! (Y0_1) if (ival >= 0x7f800000)
414         nop
415 .cont8:
416         cmp     ival0,MASK_0x007fffff           ! (Y0_1) if (ival <= 0x7fffff)
417         ble,pn  %icc,.update9                   ! (Y0_1) if (ival <= 0x7fffff)
418         faddd   %f22,K2,%f48                    ! (Y0_0) dtmp1 = dtmp0 + K2

420 .cont9:
421         cmp     ival1,MASK_0x7f800000           ! (Y1_1) if (ival >= 0x7f800000)
422         and     ival0,MASK_0x007fffff,iy0       ! (Y0_1) iy = ival & 0x007fffff

424         add     iy0,CONST_0x20000,ival0         ! (Y0_1) ival = iy + 0x20000
425         ldd     [LOGFTBL_P8+ind2],%f14          ! (Y2_0) ldtmp1 = *(double*)((ch
426         fpack32 ZERO,%f6,%f6                    ! (Y0_0) exp = vis_fpack32(ZERO,

428         and     ival0,MASK_0xfffc0000,ival0     ! (Y0_1) ival = ival & 0xfffc000
429         faddd   %f50,K2,%f26                    ! (Y1_0) dtmp1 = dtmp0 + K2
430         bge,pn  %icc,.update10                  ! (Y1_1) if (ival >= 0x7f800000)
431         nop
432 .cont10:
433         sub     iy0,ival0,iy0                   ! (Y0_1) iy = iy - ival
434         and     ival3,-8,ind3                   ! (Y3_0) ind  = i & (-8)
435         ld      [%fp+tmp3],%f4                  ! (Y3_0) (double) iy

437         cmp     ival1,MASK_0x007fffff           ! (Y1_1) if (ival <= 0x7fffff)
438         lda     [stridex+x1]0x82,ival3          ! (Y3_1) ival = *(int*)(x)
439         fmuld   %f48,%f46,%f50                  ! (Y0_0) dtmp2 = dtmp1 * yy
440         fitod   %f2,%f48                        ! (Y2_0) yy = (double) iy

442         st      iy0,[%fp+tmp1]                  ! (Y0_1) (double) iy
443         ble,pn  %icc,.update11                  ! (Y1_1) if (ival <= 0x7fffff)
444         nop
445 .cont11:
446         cmp     ival2,MASK_0x7f800000           ! (Y2_1) if (ival >= 0x7f800000)
447         and     ival1,MASK_0x007fffff,iy1       ! (Y1_1) iy = ival & 0x007fffff
448         bge,pn  %icc,.update12                  ! (Y2_1) if (ival >= 0x7f800000)
449         fmuld   %f26,%f62,%f42                  ! (Y1_0) dtmp2 = dtmp1 * yy
450 .cont12:
451         cmp     ival2,MASK_0x007fffff           ! (Y2_1) if (ival <= 0x7fffff)
452         ldd     [LOGFTBL_P8+ind3],%f16          ! (Y3_0) ldtmp1 = *(double*)((ch
453         ble,pn  %icc,.update13                  ! (Y2_1) if (ival <= 0x7fffff)
454         fitod   %f4,%f26                        ! (Y3_0) yy = (double) iy
455 .cont13:
456         add     iy1,CONST_0x20000,ival1         ! (Y1_1) ival = iy + 0x20000
457         and     ival2,MASK_0x007fffff,iy2       ! (Y2_1) iy = ival & 0x007fffff
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```
459         and     ival1,MASK_0xfffc0000,ival1     ! (Y1_1) ival = ival & 0xfffc000
460         add     iy2,CONST_0x20000,ival2         ! (Y2_1) ival = iy + 0x20000
461         fmuld   %f48,%f14,%f44                  ! (Y2_0) yy = yy * ldtmp1
462         faddd   %f50,K1,%f50                    ! (Y0_0) dtmp3 = dtmp2 + K1

464         cmp     ival3,MASK_0x7f800000           ! (Y3_1) if (ival >= 0x7f800000)
465         sub     iy1,ival1,iy1                   ! (Y1_1) iy = iy - ival
466         and     ival2,MASK_0xfffc0000,ival2     ! (Y2_1) ival = ival & 0xfffc000
467         fpack32 ZERO,%f8,%f8                    ! (Y1_0) exp = vis_fpack32(ZERO,

469         sub     iy2,ival2,iy2                   ! (Y2_1) iy = iy - ival
470         st      iy1,[%fp+tmp3]                  ! (Y1_1) (double) iy
471         fmuld   %f26,%f16,%f60                  ! (Y3_0) yy = yy * ldtmp1
472         faddd   %f42,K1,%f54                    ! (Y1_0) dtmp3 = dtmp2 + K1

474         st      iy2,[%fp+tmp2]                  ! (Y2_1) (double) iy
475         fmuld   K3,%f44,%f22                    ! (Y2_0) dtmp0 = K3 * yy
476         bge,pn  %icc,.update14                  ! (Y3_1) if (ival >= 0x7f800000)
477         fitod   %f6,%f40                        ! (Y0_0) (double)(*(int*)&exp)
478 .cont14:
479         cmp     ival3,MASK_0x007fffff           ! (Y3_1) if (ival <= 0x7fffff)
480         ldd     [LOGFTBL+ind1],%f58             ! (Y1_0) ldtmp0 = *(double*)((ch
481         fmuld   %f50,%f46,%f52                  ! (Y0_0) dtmp4 = dtmp3 * yy
482         fitod   %f8,%f56                        ! (Y1_0) (double)(*(int*)&exp)

484         ld      [%fp+tmp1],%f2                  ! (Y0_1) (double) iy
485         fmuld   K3,%f60,%f50                    ! (Y3_0) dtmp0 = K3 * yy
486         ble,pn  %icc,.update15                  ! (Y3_1) if (ival <= 0x7fffff)
487         nop
488 .cont15:
489         subcc   counter,7,counter
490         fmuld   %f54,%f62,%f54                  ! (Y1_0) dtmp4 = dtmp3 * yy

492         sra     ival0,14,ival0                  ! (Y0_1) i  = ival >> 14;
493         bneg,pn %icc,.tail
494         faddd   %f22,K2,%f48                    ! (Y2_0) dtmp1 = dtmp0 + K2
495
496         ba      .main_loop
497         nop

499         .align  16
500 .main_loop:
501         sra     ival2,14,ival2                  ! (Y2_1) i  = ival >> 14;
502         ldd     [LOGFTBL+ind0],%f42             ! (Y0_0) ldtmp0 = *(double*)((ch
503         fmuld   LN2,%f40,%f40                   ! (Y0_0) ty = LN2 * (double)(*(i
504         faddd   %f52,K0,%f22                    ! (Y0_0) dtmp5 = dtmp4 + K0

506         sra     ival1,14,ind1                   ! (Y1_1) i  = ival >> 14;
507         ld      [%fp+tmp3],%f4                  ! (Y1_1) (double) iy
508         fpack32 ZERO,%f10,%f18                  ! (Y2_0) exp = vis_fpack32(ZERO,
509         faddd   %f50,K2,%f26                    ! (Y3_0) dtmp1 = dtmp0 + K2

511         and     ival0,-8,ind0                   ! (Y0_1) ind  = i & (-8)
512         lda     [x0]0x82,%f6                    ! (Y0_1) *(float*)&exp = *(float
513         fmuld   LN2,%f56,%f56                   ! (Y1_0) LN2 * (double)(*(int*)&
514         faddd   %f54,K0,%f24                    ! (Y1_0) dtmp5 = dtmp4 + K0

516         and     ind1,-8,ind1                    ! (Y1_1) ind  = i & (-8)
517         ldd     [LOGFTBL_P8+ind0],%f14          ! (Y0_1) ldtmp1 = *(double*)((ch
518         fmuld   %f48,%f44,%f50                  ! (Y2_0) dtmp2 = dtmp1 * yy
519         fitod   %f2,%f48                        ! (Y0_1) yy = (double) iy

521         and     ival3,MASK_0x007fffff,iy3       ! (Y3_1) iy = ival & 0x007fffff
522         lda     [stridex+x0]0x82,%f8            ! (Y1_1) *(float*)&exp = *(float
523         fmuld   %f22,%f46,%f22                  ! (Y0_0) yy = dtmp5 * yy
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524         fsubd   %f40,%f42,%f40                  ! (Y0_0) ty = ty - ldtmp0

526         add     iy3,CONST_0x20000,ival3         ! (Y3_1) iy + 0x20000
527         ldd     [LOGFTBL_P8+ind1],%f16          ! (Y1_1) ldtmp1 = *(double*)((ch
528         fmuld   %f26,%f60,%f42                  ! (Y3_0) dtmp2 = dtmp1 * yy
529         fitod   %f4,%f26                        ! (Y1_1) yy = (double) iy

531         and     ival3,MASK_0xfffc0000,ival3     ! (Y3_1) ival = ival & 0xfffc000
532         lda     [x1]0x82,%f10                   ! (Y2_1) *(float*)&exp = *(float
533         fmuld   %f24,%f62,%f24                  ! (Y1_0) yy = dtmp5 * yy
534         fsubd   %f56,%f58,%f58                  ! (Y1_0) ty = ty - ldtmp0

536         sub     iy3,ival3,iy3                   ! (Y3_1) iy = iy - ival
537         ld      [%fp+tmp2],%f2                  ! (Y2_1) (double) iy
538         fmuld   %f48,%f14,%f46                  ! (Y0_1) yy = yy * ldtmp1
539         faddd   %f50,K1,%f50                    ! (Y2_0) dtmp3 = dtmp2 + K1

541         add     x1,stridex2,x0                  ! x += 2*stridex
542         st      iy3,[%fp+tmp3]                  ! (Y3_1) (double) iy
543         fpack32 ZERO,%f12,%f20                  ! (Y3_0) exp = vis_fpack32(ZERO,
544         faddd   %f22,%f40,%f48                  ! (Y0_0) yy = yy + ty

546         add     y,stridey,y                     ! y += stridey
547         lda     [stridex+x1]0x82,%f12           ! (Y3_1) *(float*)&exp = *(float
548         fmuld   %f26,%f16,%f62                  ! (Y1_1) yy = yy * ldtmp1
549         faddd   %f42,K1,%f54                    ! (Y3_0) dtmp3 = dtmp2 + K1

551         sra     ival3,14,ival3                  ! (Y3_1) i  = ival >> 14;
552         add     y,stridey,y                     ! y += stridey
553         lda     [x0]0x82,ival0                  ! (Y0_2) ival = *(int*)(x)
554         faddd   %f24,%f58,%f24                  ! (Y1_0) yy = yy + ty

556         add     x0,stridex2,x1                  ! x += 2*stridex
557         ldd     [LOGFTBL+ind2],%f42             ! (Y2_0) ldtmp0 = *(double*)((ch
558         fmuld   K3,%f46,%f22                    ! (Y0_1) dtmp0 = K3 * yy
559         fitod   %f18,%f40                       ! (Y2_0) (double)(*(int*)&exp)

561         and     ival2,-8,ind2                   ! (Y2_1) ind  = i & (-8)
562         lda     [stridex+x0]0x82,ival1          ! (Y1_2) ival = *(int*)(x)
563         fmuld   %f50,%f44,%f52                  ! (Y2_0) dtmp4 = dtmp3 * yy
564         fitod   %f20,%f56                       ! (Y3_0) (double)(*(int*)&exp)

566         cmp     ival0,MASK_0x7f800000           ! (Y0_2) if (ival >= 0x7f800000)
567         lda     [x1]0x82,ival2                  ! (Y2_2) ival = *(int*)(x);
568         fmuld   K3,%f62,%f50                    ! (Y1_1) dtmp0 = K3 * yy
569         fdtos   %f48,%f4                        ! (Y0_0) (float)(yy)

571         st      %f4,[y]                         ! (Y0_0) write into memory
572         fmuld   %f54,%f60,%f54                  ! (Y3_0) dtmp4 = dtmp3 * yy
573         bge,pn  %icc,.update16                  ! (Y0_2) if (ival >= 0x7f800000)
574         fdtos   %f24,%f4                        ! (Y1_0) (float)(yy)
575 .cont16:
576         cmp     ival0,MASK_0x007fffff           ! (Y0_2) if (ival <= 0x7fffff
577         ldd     [LOGFTBL+ind3],%f58             ! (Y3_0) ldtmp0 = *(double*)((ch
578         ble,pn  %icc,.update17                  ! (Y0_2) if (ival <= 0x7fffff
579         faddd   %f22,K2,%f48                    ! (Y0_1) dtmp1 = dtmp0 + K2
580 .cont17:
581         cmp     ival1,MASK_0x7f800000           ! (Y1_2) if (ival >= 0x7f800000)
582         and     ival0,MASK_0x007fffff,iy0       ! (Y0_2) iy = ival & 0x007fffff
583         st      %f4,[stridey+y]                 ! (Y1_0) write into memory
584         fmuld   LN2,%f40,%f40                   ! (Y2_0) ty = LN2 * (double)(*(i

586         add     iy0,CONST_0x20000,ival0         ! (Y0_2) ival = iy + 0x20000
587         ldd     [LOGFTBL_P8+ind2],%f14          ! (Y2_1) ldtmp1 = *(double*)((ch
588         faddd   %f52,K0,%f22                    ! (Y2_0) dtmp5 = dtmp4 + K0
589         fpack32 ZERO,%f6,%f6                    ! (Y0_1) exp = vis_fpack32(ZERO,
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591         and     ival0,MASK_0xfffc0000,ival0     ! (Y0_2) ival = ival & 0xfffc000
592         faddd   %f50,K2,%f26                    ! (Y1_1) dtmp1 = dtmp0 + K2
593         bge,pn  %icc,.update18                  ! (Y1_2) if (ival >= 0x7f800000)
594         fmuld   LN2,%f56,%f56                   ! (Y3_0) ty = LN2 * (double)(*(i
595 .cont18:
596         sub     iy0,ival0,iy0                   ! (Y0_2) iy = iy - ival
597         and     ival3,-8,ind3                   ! (Y3_1) ind  = i & (-8)
598         ld      [%fp+tmp3],%f4                  ! (Y3_1) (double) iy
599         faddd   %f54,K0,%f24                    ! (Y3_0) dtmp5 = dtmp4 + K0

601         cmp     ival1,MASK_0x007fffff           ! (Y1_2) if (ival <= 0x7fffff)
602         lda     [stridex+x1]0x82,ival3          ! (Y3_2) ival = *(int*)(x)
603         fmuld   %f48,%f46,%f50                  ! (Y0_1) dtmp2 = dtmp1 * yy
604         fitod   %f2,%f48                        ! (Y2_1) yy = (double) iy

606         st      iy0,[%fp+tmp1]                  ! (Y0_2) (double) iy
607         fmuld   %f22,%f44,%f22                  ! (Y2_0) yy = dtmp5 * yy
608         ble,pn  %icc,.update19                  ! (Y1_2) if (ival <= 0x7fffff)
609         fsubd   %f40,%f42,%f40                  ! (Y2_0) ty = ty - ldtmp0
610 .cont19:
611         cmp     ival2,MASK_0x7f800000           ! (Y2_2) if (ival >= 0x7f800000)
612         and     ival1,MASK_0x007fffff,iy1       ! (Y1_2) iy = ival & 0x007fffff
613         bge,pn  %icc,.update20                  ! (Y2_2) if (ival >= 0x7f800000)
614         fmuld   %f26,%f62,%f42                  ! (Y1_1) dtmp2 = dtmp1 * yy
615 .cont20:
616         cmp     ival2,MASK_0x007fffff           ! (Y2_2) if (ival <= 0x7fffff)
617         ldd     [LOGFTBL_P8+ind3],%f16          ! (Y3_1) ldtmp1 = *(double*)((ch
618         ble,pn  %icc,.update21                  ! (Y2_2) if (ival <= 0x7fffff)
619         fitod   %f4,%f26                        ! (Y3_1) yy = (double) iy
620 .cont21:
621         add     iy1,CONST_0x20000,ival1         ! (Y1_2) ival = iy + 0x20000
622         and     ival2,MASK_0x007fffff,iy2       ! (Y2_2) iy = ival & 0x007fffff
623         fmuld   %f24,%f60,%f24                  ! (Y3_0) yy = dtmp5 * yy
624         fsubd   %f56,%f58,%f58                  ! (Y3_0) ty = ty - ldtmp0

626         and     ival1,MASK_0xfffc0000,ival1     ! (Y1_2) ival = ival & 0xfffc000
627         add     iy2,CONST_0x20000,ival2         ! (Y2_2) ival = iy + 0x20000
628         fmuld   %f48,%f14,%f44                  ! (Y2_1) yy = yy * ldtmp1
629         faddd   %f50,K1,%f50                    ! (Y0_1) dtmp3 = dtmp2 + K1

631         sub     iy1,ival1,iy1                   ! (Y1_2) iy = iy - ival
632         and     ival2,MASK_0xfffc0000,ival2     ! (Y2_2) ival = ival & 0xfffc000
633         fpack32 ZERO,%f8,%f8                    ! (Y1_1) exp = vis_fpack32(ZERO,
634         faddd   %f22,%f40,%f48                  ! (Y2_0) yy = yy + ty

636         sub     iy2,ival2,iy2                   ! (Y2_2) iy = iy - ival
637         st      iy1,[%fp+tmp3]                  ! (Y1_2) (double) iy
638         fmuld   %f26,%f16,%f60                  ! (Y3_1) yy = yy * ldtmp1
639         faddd   %f42,K1,%f54                    ! (Y1_1) dtmp3 = dtmp2 + K1

641         cmp     ival3,MASK_0x7f800000           ! (Y3_2) if (ival >= 0x7f800000)
642         add     y,stridey,y                     ! y += stridey
643         st      iy2,[%fp+tmp2]                  ! (Y2_2) (double) iy
644         faddd   %f24,%f58,%f24                  ! (Y3_0) yy = yy + ty

646         add     y,stridey,y                     ! y += stridey
647         fmuld   K3,%f44,%f22                    ! (Y2_1) dtmp0 = K3 * yy
648         bge,pn  %icc,.update22                  ! (Y3_2) if (ival >= 0x7f800000)
649         fitod   %f6,%f40                        ! (Y0_1)(double)(*(int*)&exp)
650 .cont22:
651         cmp     ival3,MASK_0x007fffff           ! (Y3_2) if (ival <= 0x7fffff)
652         ldd     [LOGFTBL+ind1],%f58             ! (Y1_1) ldtmp0 = *(double*)((ch
653         fmuld   %f50,%f46,%f52                  ! (Y0_1) dtmp4 = dtmp3 * yy
654         fitod   %f8,%f56                        ! (Y1_1) (double)(*(int*)&exp)
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656         ld      [%fp+tmp1],%f2                  ! (Y0_2) (double) iy
657         fmuld   K3,%f60,%f50                    ! (Y3_1) dtmp0 = K3 * yy
658         ble,pn  %icc,.update23                  ! (Y3_2) if (ival <= 0x7fffff)
659         fdtos   %f48,%f4                        ! (Y2_0) (float)(yy)
660 .cont23:
661         subcc   counter,4,counter               ! update cycle counter
662         st      %f4,[y]                         ! (Y2_0) write into memory
663         fmuld   %f54,%f62,%f54                  ! (Y1_1) dtmp4 = dtmp3 * yy
664         fdtos   %f24,%f4                        ! (Y3_0)(float)(yy)

666         sra     ival0,14,ival0                  ! (Y0_2) i  = ival >> 14;
667         st      %f4,[stridey+y]                 ! (Y3_0) write into memory
668         bpos,pt %icc,.main_loop
669         faddd   %f22,K2,%f48                    ! (Y2_1) dtmp1 = dtmp0 + K2

671 .tail:
672         addcc   counter,7,counter
673         add     y,stridey,y                     ! y += stridey
674         bneg,pn %icc,.end_loop

676         sra     ival2,14,ival2                  ! (Y2_1) i  = ival >> 14;
677         ldd     [LOGFTBL+ind0],%f42             ! (Y0_0) ldtmp0 = *(double*)((ch
678         fmuld   LN2,%f40,%f40                   ! (Y0_0) ty = LN2 * (double)(*(i
679         faddd   %f52,K0,%f22                    ! (Y0_0) dtmp5 = dtmp4 + K0

681         sra     ival1,14,ind1                   ! (Y1_1) i  = ival >> 14;
682         ld      [%fp+tmp3],%f4                  ! (Y1_1) (double) iy
683         fpack32 ZERO,%f10,%f18                  ! (Y2_0) exp = vis_fpack32(ZERO,
684         faddd   %f50,K2,%f26                    ! (Y3_0) dtmp1 = dtmp0 + K2

686         and     ival0,-8,ind0                   ! (Y0_1) ind  = i & (-8)
687         lda     [x0]0x82,%f6                    ! (Y0_1) *(float*)&exp = *(float
688         fmuld   LN2,%f56,%f56                   ! (Y1_0) LN2 * (double)(*(int*)&
689         faddd   %f54,K0,%f24                    ! (Y1_0) dtmp5 = dtmp4 + K0

691         and     ind1,-8,ind1                    ! (Y1_1) ind  = i & (-8)
692         ldd     [LOGFTBL_P8+ind0],%f14          ! (Y0_1) ldtmp1 = *(double*)((ch
693         fmuld   %f48,%f44,%f50                  ! (Y2_0) dtmp2 = dtmp1 * yy
694         fitod   %f2,%f48                        ! (Y0_1) yy = (double) iy

696         and     ival3,MASK_0x007fffff,ival1     ! (Y3_1) iy = ival & 0x007fffff
697         lda     [stridex+x0]0x82,%f8            ! (Y1_1) *(float*)&exp = *(float
698         fmuld   %f22,%f46,%f22                  ! (Y0_0) yy = dtmp5 * yy
699         fsubd   %f40,%f42,%f40                  ! (Y0_0) ty = ty - ldtmp0

701         add     iy3,CONST_0x20000,ival3         ! (Y3_1) iy + 0x20000
702         ldd     [LOGFTBL_P8+ind1],%f16          ! (Y1_1) ldtmp1 = *(double*)((ch
703         fmuld   %f26,%f60,%f42                  ! (Y3_0) dtmp2 = dtmp1 * yy
704         fitod   %f4,%f26                        ! (Y1_1) yy = (double) iy

706         and     ival3,MASK_0xfffc0000,ival3     ! (Y3_1) ival = ival & 0xfffc000
707         lda     [x1]0x82,%f10                   ! (Y2_1) *(float*)&exp = *(float
708         fmuld   %f24,%f62,%f24                  ! (Y1_0) yy = dtmp5 * yy
709         fsubd   %f56,%f58,%f58                  ! (Y1_0) ty = ty - ldtmp0

711         sub     iy3,ival3,iy3                   ! (Y3_1) iy = iy - ival
712         ld      [%fp+tmp2],%f2                  ! (Y2_1) (double) iy
713         fmuld   %f48,%f14,%f46                  ! (Y0_1) yy = yy * ldtmp1
714         faddd   %f50,K1,%f50                    ! (Y2_0) dtmp3 = dtmp2 + K1

716         add     x1,stridex2,x0                  ! x += 2*stridex
717         st      iy3,[%fp+tmp3]                  ! (Y3_1) (double) iy
718         fpack32 ZERO,%f12,%f20                  ! (Y3_0) exp = vis_fpack32(ZERO,
719         faddd   %f22,%f40,%f48                  ! (Y0_0) yy = yy + ty

721         lda     [stridex+x1]0x82,%f12           ! (Y3_1) *(float*)&exp = *(float
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722         fmuld   %f26,%f16,%f62                  ! (Y1_1) yy = yy * ldtmp1
723         faddd   %f42,K1,%f54                    ! (Y3_0) dtmp3 = dtmp2 + K1

725         sra     ival3,14,ival3                  ! (Y3_1) i  = ival >> 14;
726         add     y,stridey,y                     ! y += stridey
727         faddd   %f24,%f58,%f24                  ! (Y1_0) yy = yy + ty

729         subcc   counter,1,counter
730         ldd     [LOGFTBL+ind2],%f42             ! (Y2_0) ldtmp0 = *(double*)((ch
731         fmuld   K3,%f46,%f22                    ! (Y0_1) dtmp0 = K3 * yy
732         fitod   %f18,%f40                       ! (Y2_0) (double)(*(int*)&exp)

734         and     ival2,-8,ind2                   ! (Y2_1) ind  = i & (-8)
735         fmuld   %f50,%f44,%f52                  ! (Y2_0) dtmp4 = dtmp3 * yy
736         fitod   %f20,%f56                       ! (Y3_0) (double)(*(int*)&exp)

738         fmuld   K3,%f62,%f50                    ! (Y1_1) dtmp0 = K3 * yy
739         fdtos   %f48,%f4                        ! (Y0_0) (float)(yy)

741         st      %f4,[y]                         ! (Y0_0) write into memory
742         fmuld   %f54,%f60,%f54                  ! (Y3_0) dtmp4 = dtmp3 * yy
743         bneg,pn %icc,.end_loop
744         fdtos   %f24,%f4                        ! (Y1_0) (float)(yy)

746         add     y,stridey,y                     ! y += stridey
747         subcc   counter,1,counter
748         ldd     [LOGFTBL+ind3],%f58             ! (Y3_0) ldtmp0 = *(double*)((ch
749         faddd   %f22,K2,%f48                    ! (Y0_1) dtmp1 = dtmp0 + K2

751         st      %f4,[y]                         ! (Y1_0) write into memory
752         bneg,pn %icc,.end_loop
753         fmuld   LN2,%f40,%f40                   ! (Y2_0) ty = LN2 * (double)(*(i

755         ldd     [LOGFTBL_P8+ind2],%f14          ! (Y2_1) ldtmp1 = *(double*)((ch
756         faddd   %f52,K0,%f22                    ! (Y2_0) dtmp5 = dtmp4 + K0
757         fpack32 ZERO,%f6,%f6                    ! (Y0_1) exp = vis_fpack32(ZERO,

759         faddd   %f50,K2,%f26                    ! (Y1_1) dtmp1 = dtmp0 + K2
760         fmuld   LN2,%f56,%f56                   ! (Y3_0) ty = LN2 * (double)(*(i

762         and     ival3,-8,ind3                   ! (Y3_1) ind  = i & (-8)
763         ld      [%fp+tmp3],%f4                  ! (Y3_1) (double) iy
764         faddd   %f54,K0,%f24                    ! (Y3_0) dtmp5 = dtmp4 + K0

766         fmuld   %f48,%f46,%f50                  ! (Y0_1) dtmp2 = dtmp1 * yy
767         fitod   %f2,%f48                        ! (Y2_1) yy = (double) iy

769         fmuld   %f22,%f44,%f22                  ! (Y2_0) yy = dtmp5 * yy
770         fsubd   %f40,%f42,%f40                  ! (Y2_0) ty = ty - ldtmp0

772         fmuld   %f26,%f62,%f42                  ! (Y1_1) dtmp2 = dtmp1 * yy

774         ldd     [LOGFTBL_P8+ind3],%f16          ! (Y3_1) ldtmp1 = *(double*)((ch
775         fitod   %f4,%f26                        ! (Y3_1) yy = (double) iy

777         fmuld   %f24,%f60,%f24                  ! (Y3_0) yy = dtmp5 * yy
778         fsubd   %f56,%f58,%f58                  ! (Y3_0) ty = ty - ldtmp0

780         fmuld   %f48,%f14,%f44                  ! (Y2_1) yy = yy * ldtmp1
781         faddd   %f50,K1,%f50                    ! (Y0_1) dtmp3 = dtmp2 + K1

783         fpack32 ZERO,%f8,%f8                    ! (Y1_1) exp = vis_fpack32(ZERO,
784         faddd   %f22,%f40,%f48                  ! (Y2_0) yy = yy + ty

786         fmuld   %f26,%f16,%f60                  ! (Y3_1) yy = yy * ldtmp1
787         faddd   %f42,K1,%f54                    ! (Y1_1) dtmp3 = dtmp2 + K1
```

```
789         add     y,stridey,y                     ! y += stridey
790         faddd   %f24,%f58,%f24                  ! (Y3_0) yy = yy + ty

792         subcc   counter,1,counter
793         fmuld   K3,%f44,%f22                    ! (Y2_1) dtmp0 = K3 * yy
794         fitod   %f6,%f40                        ! (Y0_1)(double)(*(int*)&exp)

796         ldd     [LOGFTBL+ind1],%f58             ! (Y1_1) ldtmp0 = *(double*)((ch
797         fmuld   %f50,%f46,%f52                  ! (Y0_1) dtmp4 = dtmp3 * yy
798         fitod   %f8,%f56                        ! (Y1_1) (double)(*(int*)&exp)

800         fmuld   K3,%f60,%f50                    ! (Y3_1) dtmp0 = K3 * yy
801         fdtos   %f48,%f4                        ! (Y2_0) (float)(yy)

803         st      %f4,[y]                         ! (Y2_0) write into memory
804         fmuld   %f54,%f62,%f54                  ! (Y1_1) dtmp4 = dtmp3 * yy
805         bneg,pn %icc,.end_loop
806         fdtos   %f24,%f4                        ! (Y3_0)(float)(yy)

808         subcc   counter,1,counter               ! update cycle counter
809         add     y,stridey,y

811         st      %f4,[y]                         ! (Y3_0) write into memory
812         bneg,pn %icc,.end_loop
813         faddd   %f22,K2,%f48                    ! (Y2_1) dtmp1 = dtmp0 + K2

815         ldd     [LOGFTBL+ind0],%f42             ! (Y0_0) ldtmp0 = *(double*)((ch
816         fmuld   LN2,%f40,%f40                   ! (Y0_0) ty = LN2 * (double)(*(i
817         faddd   %f52,K0,%f22                    ! (Y0_0) dtmp5 = dtmp4 + K0

819         fpack32 ZERO,%f10,%f18                  ! (Y2_0) exp = vis_fpack32(ZERO,

821         fmuld   LN2,%f56,%f56                   ! (Y1_0) LN2 * (double)(*(int*)&
822         faddd   %f54,K0,%f24                    ! (Y1_0) dtmp5 = dtmp4 + K0

824         fmuld   %f48,%f44,%f50                  ! (Y2_0) dtmp2 = dtmp1 * yy

826         fmuld   %f22,%f46,%f22                  ! (Y0_0) yy = dtmp5 * yy
827         fsubd   %f40,%f42,%f40                  ! (Y0_0) ty = ty - ldtmp0

829         fmuld   %f24,%f62,%f24                  ! (Y1_0) yy = dtmp5 * yy
830         fsubd   %f56,%f58,%f58                  ! (Y1_0) ty = ty - ldtmp0

832         subcc   counter,1,counter
833         faddd   %f50,K1,%f50                    ! (Y2_0) dtmp3 = dtmp2 + K1

835         faddd   %f22,%f40,%f48                  ! (Y0_0) yy = yy + ty

837         add     y,stridey,y                     ! y += stridey
838         faddd   %f24,%f58,%f24                  ! (Y1_0) yy = yy + ty

840         ldd     [LOGFTBL+ind2],%f42             ! (Y2_0) ldtmp0 = *(double*)((ch
841         fitod   %f18,%f40                       ! (Y2_0) (double)(*(int*)&exp)

843         fmuld   %f50,%f44,%f52                  ! (Y2_0) dtmp4 = dtmp3 * yy

845         fdtos   %f48,%f4                        ! (Y0_0) (float)(yy)

847         st      %f4,[y]                         ! (Y0_0) write into memory
848         bneg,pn %icc,.end_loop
849         fdtos   %f24,%f4                        ! (Y1_0) (float)(yy)

851         add     y,stridey,y                     ! y += stridey
852         subcc   counter,1,counter
853         st      %f4,[y]                         ! (Y1_0) write into memory
```



```
854         bneg,pn %icc,.end_loop
855         fmuld   LN2,%f40,%f40                   ! (Y2_0) ty = LN2 * (double)(*(i

857         faddd   %f52,K0,%f22                    ! (Y2_0) dtmp5 = dtmp4 + K0

859         fmuld   %f22,%f44,%f22                  ! (Y2_0) yy = dtmp5 * yy
860         fsubd   %f40,%f42,%f40                  ! (Y2_0) ty = ty - ldtmp0

862         add     y,stridey,y                     ! y += stridey
863         faddd   %f22,%f40,%f48                  ! (Y2_0) yy = yy + ty

865         fdtos   %f48,%f4                        ! (Y2_0) (float)(yy)

867         st      %f4,[y]                         ! (Y2_0) write into memory
868 .end_loop:
869         ba      .begin
870         nop

872 .end:
873         ret
874         restore %g0,0,%o0

876         .align  16
877 .update2:
878         cmp     counter,0
879         ble     .cont2
880         nop

882         add     x0,stridex,x0
883         stx     x0,[%fp+tmp5]
884         sub     x0,stridex,x0
885         st      counter,[%fp+tmp0]
886         or      %g0,0,counter
887         ba      .cont2
888         nop
889
890         .align  16
891 .update3:
892         cmp     counter,0
893         ble     .cont3
894         nop
895
896         add     x0,stridex,x0
897         stx     x0,[%fp+tmp5]
898         sub     x0,stridex,x0
899         st      counter,[%fp+tmp0]
900         or      %g0,0,counter
901         ba      .cont3
902         nop
903
904         .align  16
905 .update4:
906         cmp     counter,1
907         ble     .cont4
908         nop
909
910         stx     x1,[%fp+tmp5]
911         sub     counter,1,counter
912         st      counter,[%fp+tmp0]
913         or      %g0,1,counter
914         ba      .cont4
915         nop
916
917         .align  16
918 .update5:
919         cmp     counter,1
```

```
920         ble     .cont5
921         nop
922
923         stx     x1,[%fp+tmp5]
924         sub     counter,1,counter
925         st      counter,[%fp+tmp0]
926         or      %g0,1,counter
927         ba      .cont5
928         nop
929
930         .align  16
931 .update6:
932         cmp     counter,2
933         ble     .cont6
934         nop
935
936         add     x1,stridex,x1
937         stx     x1,[%fp+tmp5]
938         sub     x1,stridex,x1
939         sub     counter,2,counter
940         st      counter,[%fp+tmp0]
941         or      %g0,2,counter
942         ba      .cont6
943         nop
944
945         .align  16
946 .update7:
947         cmp     counter,2
948         ble     .cont7
949         nop
950
951         add     x1,stridex,x1
952         stx     x1,[%fp+tmp5]
953         sub     x1,stridex,x1
954         sub     counter,2,counter
955         st      counter,[%fp+tmp0]
956         or      %g0,2,counter
957         ba      .cont7
958         nop
959
960         .align  16
961 .update8:
962         cmp     counter,3
963         ble     .cont8
964         nop

966         stx     x0,[%fp+tmp5]
967         sub     counter,3,counter
968         st      counter,[%fp+tmp0]
969         or      %g0,3,counter
970         ba      .cont8
971         nop
972
973         .align  16
974 .update9:
975         cmp     counter,3
976         ble     .cont9
977         nop

979         stx     x0,[%fp+tmp5]
980         sub     counter,3,counter
981         st      counter,[%fp+tmp0]
982         or      %g0,3,counter
983         ba      .cont9
984         nop
985
```



```
986         .align  16
987 .update10:
988         cmp     counter,4
989         ble     .cont10
990         nop

992         add     x0,stridex,x0
993         stx     x0,[%fp+tmp5]
994         sub     x0, stridex, x0
995         sub     counter,4,counter
996         st      counter,[%fp+tmp0]
997         or      %g0,4,counter
998         ba      .cont10
999         nop
1000
1001        .align  16
1002 .update11:
1003        cmp     counter,4
1004        ble     .cont11
1005        nop
1006
1007        add     x0,stridex,x0
1008        stx     x0,[%fp+tmp5]
1009        sub     x0,stridex,x0
1010        sub     counter,4,counter
1011        st      counter,[%fp+tmp0]
1012        or      %g0,4,counter
1013        ba      .cont11
1014        nop
1015
1016        .align  16
1017 .update12:
1018        cmp     counter,5
1019        ble     .cont12
1020        nop
1021
1022        stx     x1,[%fp+tmp5]
1023        sub     counter,5,counter
1024        st      counter,[%fp+tmp0]
1025        or      %g0,5,counter
1026        ba      .cont12
1027        nop
1028
1029        .align  16
1030 .update13:
1031        cmp     counter,5
1032        ble     .cont13
1033        nop
1034
1035        stx     x1,[%fp+tmp5]
1036        sub     counter,5,counter
1037        st      counter,[%fp+tmp0]
1038        or      %g0,5,counter
1039        ba      .cont13
1040        nop
1041
1042        .align  16
1043 .update14:
1044        cmp     counter,6
1045        ble     .cont14
1046        nop
1047
1048        add     x1,stridex,x1
1049        stx     x1,[%fp+tmp5]
1050        sub     x1, stridex, x1
1051        sub     counter,6,counter
```

```
1052         st      counter,[%fp+tmp0]
1053         or      %g0,6,counter
1054         ba      .cont14
1055         nop
1056
1057         .align  16
1058 .update15:
1059         cmp     counter,6
1060         ble     .cont15
1061         nop
1062
1063         add     x1,stridex,x1
1064         stx     x1,[%fp+tmp5]
1065         sub     x1, stridex, x1
1066         sub     counter,6,counter
1067         st      counter,[%fp+tmp0]
1068         or      %g0,6,counter
1069         ba      .cont15
1070         nop
1071
1072         .align  16
1073 .update16:
1074         cmp     counter,0
1075         ble,pt  %icc, .cont16
1076         nop

1078         stx     x0,[%fp+tmp5]
1079         st      counter,[%fp+tmp0]
1080         or      %g0,0,counter
1081         ba      .cont16
1082         nop
1083
1084         .align  16
1085 .update17:
1086         cmp     counter,0
1087         ble,pt  %icc, .cont17
1088         nop
1089
1090         stx     x0,[%fp+tmp5]
1091         st      counter,[%fp+tmp0]
1092         or      %g0,0,counter
1093         ba      .cont17
1094         nop
1095
1096         .align  16
1097 .update18:
1098         cmp     counter,1
1099         ble,pt  %icc, .cont18
1100         nop

1102         add     x0,stridex,x0
1103         stx     x0,[%fp+tmp5]
1104         sub     x0,stridex,x0
1105         sub     counter,1,counter
1106         st      counter,[%fp+tmp0]
1107         or      %g0,1,counter
1108         ba      .cont18
1109         nop
1110
1111         .align  16
1112 .update19:
1113         cmp     counter,1
1114         ble,pt  %icc, .cont19
1115         nop
1116
1117         add     x0,stridex,x0
```



```
1118         sub     counter,1,counter
1119         stx     x0,[%fp+tmp5]
1120         sub     x0, stridex, x0
1121         st      counter,[%fp+tmp0]
1122         or      %g0,1,counter
1123         ba      .cont19
1124         nop
1125
1126         .align  16
1127 .update20:
1128         cmp     counter,2
1129         ble,pt  %icc, .cont20
1130         nop
1131
1132         stx     x1,[%fp+tmp5]
1133         sub     counter,2,counter
1134         st      counter,[%fp+tmp0]
1135         or      %g0,2,counter
1136         ba      .cont20
1137         nop
1138
1139         .align  16
1140 .update21:
1141         cmp     counter,2
1142         ble,pt  %icc, .cont21
1143         nop
1144
1145         stx x1,[%fp+tmp5]
1146         sub     counter, 2, counter
1147         st      counter,[%fp+tmp0]
1148         or      %g0,2,counter
1149         ba      .cont21
1150         nop
1151
1152         .align  16
1153 .update22:
1154         cmp     counter,3
1155         ble,pt  %icc, .cont22
1156         nop
1157
1158         add     x1,stridex,x1
1159         stx     x1,[%fp+tmp5]
1160         sub     x1,stridex,x1
1161         sub     counter,3,counter
1162         st      counter,[%fp+tmp0]
1163         or      %g0,3,counter
1164         ba      .cont22
1165         nop
1166
1167         .align  16
1168 .update23:
1169         cmp     counter,3
1170         ble,pt  %icc, .cont23
1171         nop
1172
1173         add     x1,stridex,x1
1174         stx     x1,[%fp+tmp5]
1175         sub     x1,stridex,x1
1176         sub     counter,3,counter
1177         st      counter,[%fp+tmp0]
1178         or      %g0,3,counter
1179         ba      .cont23
1180         nop
1181
1182         .align  16
1183 .spec:
```

```
1184         or      %g0,1,ind3                      ! ind3 = 1
1185         sll     ind3,31,ind3                    ! ind3 = 0x8000000
1186         add     x0,stridex,x0                   ! x += stridex
1187         sub     ind3,1,ind3                     ! ind3 = 0x7ffffff
1188         add     y,stridey,y                     ! y += stridey
1189         and     ival0,ind3,iy0                  ! ival & 0x7fffffff
1190         cmp     iy0,MASK_0x7f800000             ! if ((ival & 0x7fffffff) >= 0x7
1191         bge,pn  %icc, .spec0                    ! if ((ival & 0x7fffffff) >= 0x7
1192         st      ival0,[%fp+tmp1]
1193         cmp     ival0,0                         ! if (ival <= 0)
1194         ble,pn  %icc,.spec1                     ! if (ival <= 0)
1195         nop

1197         ld      [%fp+tmp1],%f12
1198         fitos   %f12,%f14                       ! value = (float) ival
1199         st      %f14,[%fp+tmp2]                 ! ival = *(int*) &value
1200         ld      [%fp+tmp2],ival0                ! ival = *(int*) &value

1202         and     ival0,MASK_0x007fffff,iy0       !  iy = ival & 0x007fffff
1203         sra     ival0,23,ival2                  !  iexp = ival >> 23

1205         add     iy0,CONST_0x20000,ival0         !  ival = iy + 0x20000
1206         sub     ival2,149,ival2                 !  iexp = iexp - 149

1208         and     ival0,MASK_0xfffc0000,ival0     !  ival = ival & 0xfffc0000
1209         st      ival2,[%fp+tmp2]                !  (double) iexp

1211         sub     iy0,ival0,iy0                   !  iy = iy - ival

1213         sra     ival0,14,ival0                  !  i  = ival >> 14;
1214         st      iy0,[%fp+tmp1]                  !  (double) iy

1216         and     ival0,-8,ind0                   !  ind  = i & (-8)
1217         ld      [%fp+tmp1],%f2                  !  (double) iy

1219         ldd     [LOGFTBL_P8+ind0],%f14          !  ldtmp1 = *(double*)((char*)CO
1220         fitod   %f2,%f48                        !  yy = (double) iy

1222         fmuld   %f48,%f14,%f46                  !  yy = yy * ldtmp1

1224         ld      [%fp+tmp2],%f6                  !  (double) iexp
1225         fmuld   K3,%f46,%f22                    !  dtmp0 = K3 * yy

1227         ldd     [LOGFTBL+ind0],%f42             !  ldtmp0 = *(double*)((char*)CO
1228         faddd   %f22,K2,%f48                    !  dtmp1 = dtmp0 + K2

1230         fmuld   %f48,%f46,%f50                  !  dtmp2 = dtmp1 * yy

1232         faddd   %f50,K1,%f50                    !  dtmp3 = dtmp2 + K1

1234         fitod   %f6,%f40                        !  (double) iexp
1235         fmuld   %f50,%f46,%f52                  !  dtmp4 = dtmp3 * yy

1237         fmuld   LN2,%f40,%f40                   !  ty = LN2 * (double) iexp
1238         faddd   %f52,K0,%f22                    !  dtmp5 = dtmp4 + K0

1240         fmuld   %f22,%f46,%f22                  !  yy = dtmp5 * yy
1241         fsubd   %f40,%f42,%f40                  !  ty = ty - ldtmp0

1243         faddd   %f22,%f40,%f48                  !  yy = yy + ty

1245         fdtos   %f48,%f4                        !  (float)(yy)

1247         ba      .begin1
1248         st      %f4,[y]                         ! write into memory
1249
```



```
1250         .align  16
1251 .spec0:
1252         ld      [%fp+tmp1],%f12                 ! value = *(float*) &ival
1253         fzeros  %f2                             ! y[0] = (value < 0.0f?
1254         fcmps   %fcc0,%f12,%f2                  !   0.0f : value) * value
1255         fmovsug %fcc0,%f12,%f2
1256         fmuls   %f12,%f2,%f2
1257         ba      .begin1
1258         st      %f2,[y]                         ! write into memory
1259
1260         .align  16
1261 .spec1:
1262         cmp     iy0,0                           ! if ((ival & 0x7fffffff) == 0)
1263         bne,pn  %icc,.spec2                     ! if ((ival & 0x7fffffff) == 0)
1264         nop
1265         ld      [LOGFTBL+568],%f4
1266         fdivs   %f4,ZERO,%f6                    ! y[0] = -1.0f / 0f
1267         ba      .begin1
1268         st      %f6,[y]                         ! write into memory
1269
1270         .align  16
1271 .spec2:
1272         fdivs   ZERO,ZERO,%f6                   ! y[0] = 0f / 0f
1273         ba      .begin1
1274         st      %f6,[y]                         ! write into memory

1276         SET_SIZE(__vlogf)
```

```
**********************************************************
  131847 Sat May 10 12:09:59 2014
new/usr/src/lib/libmvec/common/vis/__vpow.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */
/*
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 */

        .file   "__vpow.S"

#include "libm.h"

        RO_DATA
        .align  64

.CONST_TBL:

! __mt_constlog2[2*i] = high order rounded 32 bits log2(1+i/256)*256, i = [0, 25
! __mt_constlog2[2*i+1] = low order least bits log2(1+i/256)*256, i = [0, 255]

        .word   0x00000000,     0x00000000,     0x00000000,     0x00000000,
        .word   0x3ff709c4,     0x00000000,     0x3e9b5eab,     0x1dd2b66f,
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471         .word   0x3ff8be05,     0xbad61778,     0x3c9ecb5e,     0xfc43446e,
472         .word   0x3ff8cf32,     0x16b5448c,     0xbc70d55e,     0x32e9e3aa,
473         .word   0x3ff8e06a,     0x5e0866d9,     0xbc97114a,     0x6fc9b2e6,
474         .word   0x3ff8f1ae,     0x99157736,     0x3c85cc13,     0xa2e3976c,
475         .word   0x3ff902fe,     0xd0282c8a,     0x3c9592ca,     0x85fe3fd2,
476         .word   0x3ff9145b,     0x0b91ffc6,     0xbc9dd679,     0x2e582524,
477         .word   0x3ff925c3,     0x53aa2fe2,     0xbc83455f,     0xa639db7f,
478         .word   0x3ff93737,     0xb0cdc5e5,     0xbc675fc7,     0x81b57ebc,
479         .word   0x3ff948b8,     0x2b5f98e5,     0xbc8dc3d6,     0x797d2d99,
480         .word   0x3ff95a44,     0xcbc8520f,     0xbc764b7c,     0x96a5f039,
481         .word   0x3ff96bdd,     0x9a7670b3,     0xbc5ba596,     0x7f19c896,
482         .word   0x3ff97d82,     0x9fde4e50,     0xbc9d185b,     0x7c1b85d1,
483         .word   0x3ff98f33,     0xe47a22a2,     0x3c7cabda,     0xa24c78ec,
484         .word   0x3ff9a0f1,     0x70ca07ba,     0xbc9173bd,     0x91cee632,
485         .word   0x3ff9b2bb,     0x4d53fe0d,     0xbc9dd84e,     0x4df6d518,
486         .word   0x3ff9c491,     0x82a3f090,     0x3c7c7c46,     0xb071f2be,
487         .word   0x3ff9d674,     0x194bb8d5,     0xbc9516be,     0xa3dd8233,
488         .word   0x3ff9e863,     0x19e32323,     0x3c7824ca,     0x78e64c6e,
489         .word   0x3ff9fa5e,     0x8d07f29e,     0xbc84a9ce,     0xaaf1face,
490         .word   0x3ffa0c66,     0x7b5de565,     0xbc935949,     0x5d1cd533,
491         .word   0x3ffa1e7a,     0xed8eb8bb,     0x3c9c6618,     0xee8be70e,
492         .word   0x3ffa309b,     0xec4a2d33,     0x3c96305c,     0x7ddc36ab,
493         .word   0x3ffa42c9,     0x80460ad8,     0xbc9aa780,     0x589fb120,
494         .word   0x3ffa5503,     0xb23e255d,     0xbc9d2f6e,     0xdb8d41e1,
495         .word   0x3ffa674a,     0x8af46052,     0x3c650f56,     0x30670366,
496         .word   0x3ffa799e,     0x1330b358,     0x3c9bcb7e,     0xcac563c7,
497         .word   0x3ffa8bfe,     0x53c12e59,     0xbc94f867,     0xb2ba15a9,
498         .word   0x3ffa9e6b,     0x5579fdbf,     0x3c90fac9,     0x0ef7fd31,
499         .word   0x3ffab0e5,     0x21356eba,     0x3c889c31,     0xdae94545,
500         .word   0x3ffac36b,     0xbfd3f37a,     0xbc8f9234,     0xcae76cd0,
501         .word   0x3ffad5ff,     0x3a3c2774,     0x3c97ef3b,     0xb6b1b8e5,
502         .word   0x3ffae89f,     0x995ad3ad,     0x3c97a1cd,     0x345dcc81,
503         .word   0x3ffafb4c,     0xe622f2ff,     0xbc94b2fc,     0x0f315ecd,
504         .word   0x3ffb0e07,     0x298db666,     0xbc9bdef5,     0x4c80e425,
505         .word   0x3ffb20ce,     0x6c9a8952,     0x3c94dd02,     0x4a0756cc,
506         .word   0x3ffb33a2,     0xb84f15fb,     0xbc62805e,     0x3084d708,
507         .word   0x3ffb4684,     0x15b749b1,     0xbc7f763d,     0xe9df7c90,
508         .word   0x3ffb5972,     0x8de5593a,     0xbc9c71df,     0xbbba6de3,
509         .word   0x3ffb6c6e,     0x29f1c52a,     0x3c92a8f3,     0x52883f6e,
510         .word   0x3ffb7f76,     0xf2fb5e47,     0xbc75584f,     0x7e54ac3b,
511         .word   0x3ffb928c,     0xf22749e4,     0xbc9b7216,     0x54cb65c6,
512         .word   0x3ffba5b0,     0x30a1064a,     0xbc9efcd3,     0x0e54292e,
513         .word   0x3ffbb8e0,     0xb79a6f1f,     0xbc3f52d1,     0xc9696205,
514         .word   0x3ffbcc1e,     0x904bc1d2,     0x3c823dd0,     0x7a2d9e84,
515         .word   0x3ffbdf69,     0xc3f3a207,     0xbc3c2623,     0x60ea5b52,
516         .word   0x3ffbf2c2,     0x5bd71e09,     0xbc9efdca,     0x3f6b9c73,
517         .word   0x3ffc0628,     0x6141b33d,     0xbc8d8a5a,     0xa1fbca34,
518         .word   0x3ffc199b,     0xdd85529c,     0x3c811065,     0x895048dd,
519         .word   0x3ffc2d1c,     0xd9fa652c,     0xbc96e516,     0x17c8a5d7,
520         .word   0x3ffc40ab,     0x5fffd07a,     0x3c9b4537,     0xe083c60a,
521         .word   0x3ffc5447,     0x78fafb22,     0x3c912f07,     0x2493b5af,
522         .word   0x3ffc67f1,     0x2e57d14b,     0x3c92884d,     0xff483cad,
523         .word   0x3ffc7ba8,     0x8988c933,     0xbc8e76bb,     0xbe255559,
```

```
524         .word   0x3ffc8f6d,     0x9406e7b5,     0x3c71acbc,     0x48805c44,
525         .word   0x3ffca340,     0x5751c4db,     0xbc87f2be,     0xd10d08f5,
526         .word   0x3ffcb720,     0xdcef9069,     0x3c7503cb,     0xd1e949db,
527         .word   0x3ffccb0f,     0x2e6d1675,     0xbc7d220f,     0x86009092,
528         .word   0x3ffcdf0b,     0x555dc3fa,     0xbc8dd83b,     0x53829d72,
529         .word   0x3ffcf315,     0x5b5bab74,     0xbc9a08e9,     0xb86dff57,
530         .word   0x3ffd072d,     0x4a07897c,     0xbc9cbc37,     0x43797a9c,
531         .word   0x3ffd1b53,     0x2b08c968,     0x3c955636,     0x219a36ee,
532         .word   0x3ffd2f87,     0x080d89f2,     0xbc9d487b,     0x719d8578,
533         .word   0x3ffd43c8,     0xeacaa1d6,     0x3c93db53,     0xbf5a1614,
534         .word   0x3ffd5818,     0xdcfba487,     0x3c82ed02,     0xd75b3707,
535         .word   0x3ffd6c76,     0xe862e6d3,     0x3c5fe87a,     0x4a8165a0,
536         .word   0x3ffd80e3,     0x16c98398,     0xbc911ec1,     0x8beddfe8,
537         .word   0x3ffd955d,     0x71ff6075,     0x3c9a052d,     0xbb9af6be,
538         .word   0x3ffda9e6,     0x03db3285,     0x3c9c2300,     0x696db532,
539         .word   0x3ffdbe7c,     0xd63a8315,     0xbc9b76f1,     0x926b8be4,
540         .word   0x3ffdd321,     0xf301b460,     0x3c92da57,     0x78f018c3,
541         .word   0x3ffde7d5,     0x641c0658,     0xbc9ca552,     0x8e79ba8f,
542         .word   0x3ffdfc97,     0x337b9b5f,     0xbc91a5cd,     0x4f184b5c,
543         .word   0x3ffe1167,     0x6b197d17,     0xbc72b529,     0xbd5c7f44,
544         .word   0x3ffe2646,     0x14f5a129,     0xbc97b627,     0x817a1496,
545         .word   0x3ffe3b33,     0x3b16ee12,     0xbc99f4a4,     0x31fdc68b,
546         .word   0x3ffe502e,     0xe78b3ff6,     0x3c839e89,     0x80a9cc8f,
547         .word   0x3ffe6539,     0x24676d76,     0xbc863ff8,     0x7522b735,
548         .word   0x3ffe7a51,     0xfbc74c83,     0x3c92d522,     0xca0c8de2,
549         .word   0x3ffe8f79,     0x77cdb740,     0xbc910894,     0x80b054b1,
550         .word   0x3ffea4af,     0xa2a490da,     0xbc9e9c23,     0x179c2893,
551         .word   0x3ffeb9f4,     0x867cca6e,     0x3c94832f,     0x2293e4f2,
552         .word   0x3ffecf48,     0x2d8e67f1,     0xbc9c93f3,     0xb411ad8c,
553         .word   0x3ffee4aa,     0xa2188510,     0x3c91c68d,     0xa487568d,
554         .word   0x3ffefa1b,     0xee615a27,     0x3c9dc7f4,     0x86a4b6b0,
555         .word   0x3fff0f9c,     0x1cb6412a,     0xbc932200,     0x65181d45,
556         .word   0x3fff252b,     0x376bba97,     0x3c93a1a5,     0xbf0d8e43,
557         .word   0x3fff3ac9,     0x48dd7274,     0xbc795a5a,     0x3ed837de,
558         .word   0x3fff5076,     0x5b6e4540,     0x3c99d3e1,     0x2dd8a18b,
559         .word   0x3fff6632,     0x798844f8,     0x3c9fa37b,     0x3539343e,
560         .word   0x3fff7bfd,     0xad9cbe14,     0xbc9dbb12,     0xd006350a,
561         .word   0x3fff91d8,     0x02243c89,     0xbc612ea8,     0xa779f689,
562         .word   0x3fffa7c1,     0x819e90d8,     0x3c874853,     0xf3a5931e,
563         .word   0x3fffbdba,     0x3692d514,     0xbc796773,     0x15098eb6,
564         .word   0x3fffd3c2,     0x2b8f71f1,     0x3c62eb74,     0x966579e7,
565         .word   0x3fffe9d9,     0x6b2a23d9,     0x3c74a603,     0x7442fde3,
566 !
567         .word   0x3c900000,     0x00000000,     ! 2**(-54) = 5.55111512312578270
568         .word   0x3ff00000,     0x00000000,     ! DONE = 1.0
569         .word   0x43300000,     0x00000000,     ! DVAIN52 = 2**52 = 4.5035996273
570         .word   0xffffffff,     0x00000000,     ! MHI32   = 0xffffffff00000000
571         .word   0x4062776d,     0x8ce329bd,     ! KA5     = (5.77078604860893737
572         .word   0x406ec709,     0xdc39fc99,     ! KA3     = (9.61796693925765549
573         .word   0x40871547,     0x652b82fe,     ! KA1     = (2.88539008177792677
574         .word   0x41100000,     0x00000000,     ! HTHRESH = 262144.0
575         .word   0xc110cc00,     0x00000000,     ! LTHRESH = -275200.0
576         .word   0x3d83b2ab,     0xc07c93d0,     ! KB4     = 2.239395738118551043
577         .word   0x000fffff,     0xffffffff,     ! MMANT
578         .word   0x00000800,     0x00000000,     ! MROUND
579         .word   0xfffff000,     0x00000000,     ! MHI20

581 ! local storage indices
582 #define tmp0_lo         STACK_BIAS-4
583 #define tmp0_hi         STACK_BIAS-8
584 #define tmp1_lo         STACK_BIAS-12
585 #define tmp1_hi         STACK_BIAS-16
586 #define tmp2_lo         STACK_BIAS-20
587 #define tmp2_hi         STACK_BIAS-24
588 #define tmp3            STACK_BIAS-28
589 #define tmp4            STACK_BIAS-32
```



```
590 #define ind_buf         STACK_BIAS-48
591 #define tmp_counter     STACK_BIAS-56
592 #define tmp_px          STACK_BIAS-64
593 #define tmp_py          STACK_BIAS-72
594 #define tmp_mant        STACK_BIAS-80
595 #define tmp5            STACK_BIAS-88
596 #define tmp6            STACK_BIAS-96

598 ! sizeof temp storage - must be a multiple of 16 for V9
599 #define tmps            96

601 #define LOGTBL          %g5
602 #define EXPTBL          %g1
603 #define EXPTBL_P8       %l4

605 #define MASK_0x7fffffff %o4
606 #define MASK_0x000fffff %o3
607 #define MASK_0x3ff00000 %o1

609 #define counter         %i0
610 #define px              %i1
611 #define stridex         %l5
612 #define py              %i3
613 #define stridey         %l6
614 #define pz              %i5
615 #define stridez         %l7

617 #define HTHRESH         %f0
618 #define LTHRESH         %f2

620 #define MHI32           %f38
621 #define KA1_LO          %f40
622 #define KA1_HI          %f40

624 #define KB1             %f42
625 #define KB2             %f42
626 #define KB3             %f42
627 #define KB4             %f44
628 #define KB5             %f42

630 #define KA1             %f46
631 #define KA3             %f28
632 #define KA5             %f50

634 #define DZERO           %f24
635 #define DZERO_HI        %f24
636 #define DZERO_LO        %f25
637 #define DONE            %f18
638 #define DONE_HI         %f18
639 #define DONE_LO         %f19

641 #define XKB1            %f42
642 #define XKB2            %f40
643 #define XKB3            %f32
644 #define XKB4            %f36
645 #define XKB5            %f34

647 #define s_h             %f46
648 #define yr              %f30

650 #define ind_TINY        64
651 #define ind_HUGE        56
652 #define ind_LO          48
653 #define ind_HI          40
654 #define ind_KB5         32
655 #define ind_KB3         24
```

```
656 #define ind_KB2         16
657 #define ind_KB1         8

659 !-----------------------------------------------------------------------
660 !               !!!!!   vpow algorithm  !!!!!
661 !
662 !  hx = ((unsigned*)px)[0];
663 !  lx = ((unsigned*)px)[1];
664 !  hy = ((unsigned*)py)[0];
665 !  ly = ((unsigned*)py)[1];
666 !  sx = hx >> 31;
667 !  sy = hy >> 31;
668 !  hx &= 0x7fffffff;
669 !  hy &= 0x7fffffff;
670 !  y0 = *px;
671 !
672 !  if (hy < 0x3bf00000) {                                          /* |Y| <
673 !    if ((hy | ly) == 0) {                                         /* pow(X
674 !      *pz = DONE;
675 !      goto next;
676 !    }
677 !    if (hx > 0x7ff00000 || (hx == 0x7ff00000 && lx != 0)) {       /* |X| =
678 !      *pz = y0 * y0;
679 !      goto next;
680 !    }
681 !    else if ((hx | lx) == 0 || (hx == 0x7ff00000 && lx == 0)) {  /* X = 0
682 !      ((int*)pz)[0] = hx;
683 !      ((int*)pz)[1] = lx;
684 !      if (sy) *pz = DONE / *pz;
685 !      goto next;
686 !    }
687 !    else *pz = (sx) ? DZERO / DZERO : DONE;
688 !      goto next;
689 !  }
690 !  yisint = 0; /* Y - non-integer */
691 !  expy = hy >> 20; /* Y exponent */
692 !
693 !  if (hx >= 0x7ff00000 || expy >= 0x43e) {                  /* X=Inf,Nan or
694 !    if (hx > 0x7ff00000 || (hx == 0x7ff00000 && lx != 0) ||
695 !        hy > 0x7ff00000 || (hy == 0x7ff00000 && ly != 0))
696 !      *pz = y0 * *py; /* |X| or |Y| = Nan */
697 !      goto next;
698 !    if (hy == 0x7ff00000 && (ly == 0)) { /* |Y| = Inf */
699 !      if (hx == 0x3ff00000 && (lx == 0))
700 !        *pz = *py - *py; /* +-1 ** +-Inf */
701 !      else if ((hx < 0x3ff00000) != sy)
702 !        *pz = DZERO;
703 !      else {
704 !        ((int*)pz)[0] = hy;
705 !        ((int*)pz)[1] = ly;
706 !      }
707 !      goto next;
708 !    }
709 !    if (expy < 0x43e) {                                           /* |Y| <
710 !      if (sx) {                                                   /* X = -
711 !        if (expy >= 0x434)                                        /* |Y| >
712 !          yisint##I = 2;                                        /* Y - e
713 !        else {
714 !          if (expy >= 0x3ff) {                                    /* |Y| >
715 !            if (expy > (20 + 0x3ff)) {
716 !              i0 = ly >> (52 - (expy - 0x3ff));
717 !              if ((i0 << (52 - (expy - 0x3ff))) == ly) yisint = 2 - (i0 & 1);
718 !            }
719 !            else if (ly == 0) {
720 !              i0 = hy >> (20 - (expy - 0x3ff));
721 !              if ((i0 << (20 - (expy - 0x3ff))) == hy) yisint = 2 - (i0 & 1);
```



```
722 !            }
723 !          }
724 !        }
725 !      }
726 !      if (sy) hx = lx = 0;
727 !      hx += yisint << 31;
728 !      ((int*)pz)[0] = hx;
729 !      ((int*)pz)[1] = lx;
730 !      goto next;
731 !    }
732 !    else {                                                        /* |Y| >
733 !      if (lx == 0 &&                                              /* |X| =
734 !          (hx == 0 || hx == 0x3ff00000 || hx == 0x7ff00000)) {
735 !        ((int*)pz)[0] = hx;
736 !        ((int*)pz)[1] = lx;
737 !        if (sy) *pz = DONE / *pz;
738 !      }
739 !      else {
740 !        y0 = ((hx < 0x3ff00000) != sy) ? _TINY : _HUGE;
741 !        *pz = y0 * y0;
742 !      }
743 !      goto next;
744 !    }
745 !  }
746 !  if (sx || (hx | lx) == 0) {                                     /* X <=
747 !    if (expy >= 0x434)                                            /* |Y| >
748 !      yisint = 2;                                                 /* Y - e
749 !    else {
750 !      if (expy >= 0x3ff) {                                        /* |Y| >
751 !        if (expy > (20 + 0x3ff)) {
752 !          i0 = ly >> (52 - (expy - 0x3ff));
753 !          if ((i0 << (52 - (expy - 0x3ff))) == ly) yisint = 2 - (i0 & 1);
754 !        }
755 !        else if (ly == 0) {
756 !          i0 = hy >> (20 - (expy - 0x3ff));
757 !          if ((i0 << (20 - (expy - 0x3ff))) == hy) yisint = 2 - (i0 & 1);
758 !        }
759 !      }
760 !    }
761 !    if ((hx | lx) == 0) {                                         /* X ==
762 !      y0 = DZERO;
763 !      if (sy) y0 = DONE / y0;
764 !      if (sx & yisint) y0 = -y0;
765 !      *pz = y0;
766 !      goto next;
767 !    }
768 !    if (yisint == 0) {                                            /* pow(n
769 !      *pz = DZERO / DZERO;                                        /* NaN *
770 !      goto next;
771 !    }
772 !  }
773 !
774 !  *((int*)&x + 1) = ((unsigned*)px)[1];
775 !  *((int*)&ax + 1) = 0;
776 !  exp = hx;
777 !  hx &= 0xfffff;
778 !  hx |= 0x3ff00000;
779 !  *(int*)&x = hx;
780 !  hx += 0x800;
781 !  hx &= 0xfffff000;
782 !  *(int*)&ax = hx;
783 !  if (exp <= 0xfffff) {
784 !    y0 = vis_fand(x, MMANT);
785 !    ax = (double) ((long long *) & y0)[0];
786 !    x = vis_fand(ax, MMANT);
787 !    x = vis_for(x, DONE);
```

```
!    exp = ((unsigned int*) & ax)[0];
!    exp -= (1023 + 51) << 20;
!    hx = exp & 0xfffff;
!    hx |= 0x3ff00000;
!    hx += 0x800;
!    *(int*)&ax = hx;
!  }
!  exp = (exp >> 20);
!  exp = exp - 2046;
!  ux = x + ax;
!  yd = DONE / ux;
!  u = x - ax;
!  s = u * yd;
!  ux = vis_fand(ux, MHI32);
!  y = s * s;
!  s_h = vis_fand(s, MHI32);
!  dtmp8 = KA5 * y;
!  dtmp8 = dtmp8 + KA3;
!  dtmp8 = dtmp8 * y;
!  s = dtmp8 * s;
!  dtmp0 = (ux - ax);
!  s_l = (x - dtmp0);
!  dtmp0 = s_h * ux;
!  dtmp1 = s_h * s_l;
!  s_l = u - dtmp0;
!  s_l -= dtmp1;
!  dtmp0 = KA1 * yd;
!  s_l = dtmp0 * s_l;
!  i = (hx >> 8);
!  i = i & 0xff0;
!  itmp0 = (hx >> 20);
!  exp += itmp0;
!  yd = KA1_HI * s_h;
!  y = *(double *)((char*)__mt_constlog2 + i);
!  itmp0 = exp << 8;
!  y += (double)itmp0;
!  m_h = y + yd;
!  dtmp2 = m_h - y;
!  dtmp2 -= yd;
!  dtmp2 -= s_l;
!  y = s - dtmp2;
!  dtmp0 = *(double *)((char*)__mt_constlog2 + i + 8);
!  dtmp1 = KA1_LO * s_h;
!  dtmp0 += dtmp1;
!  y += dtmp0;
!  dtmp0 = y + m_h;
!  s_h = vis_fand(dtmp0, MHI32);
!  dtmp0 = (s_h - m_h);
!  y = y - dtmp0;
!  yd = *py;
!  s = vis_fand(yd, MHI32);
!  dtmp0 = (yd - s);
!  dtmp1 = yd * y;
!  dtmp0 *= s_h;
!  yd = dtmp0 + dtmp1;
!  s = s_h * s;
!  if (s > HTHRESH) {s = HTHRESH; yd = DZERO;}
!  if (s < LTHRESH) {s = LTHRESH; yd = DZERO;}
!  dtmp0 = (s + yd);
!  ind = (int)dtmp0;
!  i = ind & 0xff;
!  i = i << 4;
!  u = (double)(int)dtmp0;
!  ind >>= 8;
!  y = s - u;
!  y = y + yd;
```



```
!  u = *(double*)((char*)__mt_constexp2 + i);
!  dtmp0 = KB5 * y;
!  dtmp1 = dtmp0 + KB4;
!  dtmp2 = dtmp1 * y;
!  dtmp3 = dtmp2 + KB3;
!  dtmp4 = dtmp3 * y;
!  dtmp5 = dtmp4 + KB2;
!  dtmp6 = dtmp5 * y;
!  dtmp7 = dtmp6 + KB1;
!  y = dtmp7 * y;
!  eflag = (ind + 1021);
!  eflag = eflag >> 31;
!  gflag = (1022 - ind);
!  gflag = gflag >> 31;
!  dtmp0 = *(double*)((char*)__mt_constexp2 + i + 8);
!  dtmp1 = u * y;
!  dtmp2 = dtmp0 + dtmp1;
!  u = dtmp2 + u;
!  ind = yisint + ind;
!  itmp0 = 54 & eflag;
!  itmp1 = 52 & gflag;
!  ind = ind + itmp0;
!  ind = ind - itmp1;
!  ind <<= 20;
!  *(int*)&dtmp0 = ind;
!  *((int*)&dtmp0 + 1) = 0;
!  u = vis_fpadd32(u, dtmp0);
!  ind = eflag - gflag;
!  ind += 1;
!  ind *= 8;
!  dtmp1 = (*(double*)((char*)lconst + ind);
!  dtmp1 = u * dtmp1;
!  *pz = dtmp1;
!-----------------------------------------------------------------------
!               !!!!!   vpowx algorithm !!!!! (x > 0 and x != Inf, NaN)
!
!                   /* perform s_h + yr = 256*log2(x) */
!
!  exp = ((unsigned*)px)[0];
!  y0 = px[0];
!  if (exp <= 0xfffff) {
!    y0 = (double) ((long long *) & y0)[0];
!    exp = ((unsigned int*) & y0)[0];
!    exp -= (1023 + 51) << 20;
!  }
!  x = vis_fand(y0, MMANT);
!  x = vis_for(x, DONE);
!  ax = vis_fpadd32(x, MROUND);
!  ax = vis_fand(ax, MHI20);
!  hx = *(int*)&ax;
!  exp = (exp >> 20);
!  exp = exp - 2046;
!  ux = x + ax;
!  yd = DONE / ux;
!  u = x - ax;
!  s = u * yd;
!  ux = vis_fand(ux, MHI32);
!  y = s * s;
!  s_h = vis_fand(s, MHI32);
!  dtmp8 = KA5 * y;
!  dtmp8 = dtmp8 + KA3;
!  dtmp8 = dtmp8 * y;
!  s = dtmp8 * s;
!  dtmp0 = (ux - ax);
!  s_l = (x - dtmp0);
!  dtmp0 = s_h * ux;
```

```
!  dtmp1 = s_h * s_l;
!  s_l = u - dtmp0;
!  s_l -= dtmp1;
!  dtmp0 = KA1 * yd;
!  s_l = dtmp0 * s_l;
!  i = (hx >> 8);
!  i = i & 0xff0;
!  itmp0 = (hx >> 20);
!  exp += itmp0;
!  yd = KA1_HI * s_h;
!  y = *(double *)((char*)__mt_constlog2 + i);
!  itmp0 = exp << 8;
!  y += (double)itmp0;
!  m_h = y + yd;
!  dtmp2 = m_h - y;
!  dtmp2 -= yd;
!  dtmp2 -= s_l;
!  y = s - dtmp2;
!  dtmp0 = *(double *)((char*)__mt_constlog2 + i + 8);
!  dtmp1 = KA1_LO * s_h;
!  dtmp0 += dtmp1;
!  y += dtmp0;
!  dtmp0 = y + m_h;
!  s_h = vis_fand(dtmp0, MHI32);
!  dtmp0 = (s_h - m_h);
!  yr = y - dtmp0;
!
!  hy = ((unsigned*)py)[0];
!  ly = ((unsigned*)py)[1];
!  hx = ((unsigned*)px)[0];
!  lx = ((unsigned*)px)[1];
!  sy = hy >> 31;
!  hy &= 0x7fffffff;
!
!  if (hy < 0x3bf00000) {/* |Y| < 2^(-64) */
!    *pz = DONE;
!    goto next;
!  }
!
!  if (hy >= 0x43e00000) {                     /* |Y|>2^63,Inf,Nan */
!    if (hy == 0x7ff00000 && (ly == 0)) {      /* |Y| = Inf */
!      if (hx == 0x3ff00000 && (lx == 0))
!        *pz = *py - *py;                      /* 1 ** +-Inf */
!      else if ((hx < 0x3ff00000) != sy)
!        *pz = DZERO;
!      else {
!        ((int*)pz)[0] = hy;
!        ((int*)pz)[1] = ly;
!      }
!      goto next;
!    }
!    if (hy >= 0x7ff00000) {
!      *pz = *px + *py;                        /* |Y| = Nan */
!      goto next;
!    }
!                                              /* |Y| >= 2^63   */
!    if (lx == 0 && (hx == 0x3ff00000)) {      /*  X = 1 */
!      *pz = DONE;
!    }
!    else {
!      y0 = ((hx < 0x3ff00000) != sy) ? _TINY : _HUGE;
!      *pz = y0 * y0;
!    }
!    goto next;
!  }
!
```



```
!  yd = *py;
!  s = vis_fand(yd, MHI32);
!  dtmp0 = (yd - s);
!  dtmp1 = yd * yr;
!  dtmp0 *= s_h;
!  yd = dtmp0 + dtmp1;
!  s = s_h * s;
!  if (s > HTHRESH) {s = HTHRESH; yd = DZERO;}
!  if (s < LTHRESH) {s = LTHRESH; yd = DZERO;}
!  dtmp0 = (s + yd);
!  ind = (int)dtmp0;
!  i = ind & 0xff;
!  i = i << 4;
!  u = (double)(int)dtmp0;
!  ind >>= 8;
!  y = s - u;
!  y = y + yd;
!  u = *(double*)((char*)__mt_constexp2 + i);
!  dtmp0 = XKB5 * y;
!  dtmp1 = dtmp0 + XKB4;
!  dtmp2 = dtmp1 * y;
!  dtmp3 = dtmp2 + XKB3;
!  dtmp4 = dtmp3 * y;
!  dtmp5 = dtmp4 + XKB2;
!  dtmp6 = dtmp5 * y;
!  dtmp7 = dtmp6 + XKB1;
!  y = dtmp7 * y;
!  eflag = (ind + 1021);
!  eflag = eflag >> 31;
!  gflag = (1022 - ind);
!  gflag = gflag >> 31;
!  dtmp0 = *(double*)((char*)__mt_constexp2 + i + 8);
!  dtmp1 = u * y;
!  dtmp2 = dtmp0 + dtmp1;
!  u = dtmp2 + u;
!  itmp0 = 54 & eflag;
!  itmp1 = 52 & gflag;
!  ind = ind + itmp0;
!  ind = ind - itmp1;
!  ind <<= 20;
!  *(int*)&dtmp0 = ind;
!  *((int*)&dtmp0 + 1) = 0;
!  u = vis_fpadd32(u, dtmp0);
!  ind = eflag - gflag;
!  ind += 1;
!  ind *= 8;
!  dtmp1 = (*(double*)((char*)__mt_constexp2 + ind);
!  dtmp1 = u * dtmp1;
!  *pz = dtmp1;
!-----------------------------------------------------------------------

        ENTRY(__vpow)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,g5)
        wr      %g0,0x82,%asi                   ! set %asi for non-faulting load

        cmp     counter,0
        ble,pn  %icc,.end

#ifdef  __sparcv9
        ldx     [%fp+STACK_BIAS+176],stridez
#else
        ld      [%fp+STACK_BIAS+92],stridez
#endif
```

```
1052          ld      [px],%o0
1053          add     LOGTBL,4095,EXPTBL
1054          st      counter,[%fp+tmp_counter]
1055          add     EXPTBL,65,EXPTBL
1056          sra     %i2,0,stridex
1057          stx     px,[%fp+tmp_px]
1058          add     EXPTBL,4095,%l0
1059          fzero   DZERO
1060          stx     py,[%fp+tmp_py]

1062          cmp     stridex,0
1063          bne,pt  %icc,.common_case
1064          add     %l0,1,%l0

1066          cmp     %o0,0
1067          ble,pt  %icc,.common_case
1068          sethi   %hi(0x7f800000),%o1

1070          cmp     %o0,%o1
1071          bl,pn   %icc,.stridex_zero
1072          nop

1074  .common_case:
1075          sra     stridez,0,stridez
1076          ldd     [%l0+8],DONE
1077          ldd     [%l0+24],MHI32
1078          sra     %i4,0,stridey
1079          ldd     [%l0+32],KA5
1080          sethi   %hi(0x7ffffc00),MASK_0x7fffffff
1081          ldd     [%l0+40],KA3
1082          sethi   %hi(0xffc00),MASK_0x000fffff
1083          ldd     [%l0+48],KA1
1084          sethi   %hi(0x3ff00000),MASK_0x3ff00000
1085          ldd     [%l0+56],HTHRESH
1086          sllx    stridex,3,stridex
1087          add     MASK_0x7fffffff,0x3ff,MASK_0x7fffffff
1088          ldd     [%l0+64],LTHRESH
1089          sllx    stridey,3,stridey
1090          add     MASK_0x000fffff,0x3ff,MASK_0x000fffff
1091          ldd     [%l0+72],KB4
1092          sllx    stridez,3,stridez
1093          st      %g0,[%fp+tmp1_lo]               ! *((int*)&ax + 1) = 0;
1094          sub     %g0,1,%o2
1095          st      %g0,[%fp+tmp2_lo]               ! (Y0_0) *((int*)&dtmp0 + 1) = 0
1096          st      MASK_0x000fffff,[%fp+tmp_mant]
1097          sub     pz,stridez,pz
1098          st      %o2,[%fp+tmp_mant+4]

1100  .begin:
1101          ld      [%fp+tmp_counter],counter
1102          ldx     [%fp+tmp_px],px
1103          ldx     [%fp+tmp_py],py
1104          st      %g0,[%fp+tmp_counter]
1105  .begin1:
1106          subcc   counter,1,counter
1107          bneg,pn %icc,.end
1108          or      %g0,ind_buf,%o7

1110          lda     [py]%asi,%o2                    ! (Y0_1) hy = *py;

1112          and     %o2,MASK_0x7fffffff,%l1         ! (Y0_3) hy &= 0x7fffffff;
1113          lda     [px]%asi,%l0                    ! (Y0_3) hx = ((unsigned*)px)[0]

1115          sra     %l1,20,%o0                      ! (Y0_3) expy = hy >> 20;
1116          lda     [px+4]%asi,%i2                  ! (Y0_3) *((int*)&x + 1) = ((uns
```



```
1118          and     MASK_0x000fffff,%l0,%o5         ! (Y0_3) hx &= 0xfffff;

1120          or      MASK_0x3ff00000,%o5,%o5         ! (Y0_3) hx |= 0x3ff00000;

1122          st      %o5,[%fp+tmp0_hi]               ! (Y0_3) *(int*)&x = hx;

1124          add     %o5,2048,%o5                    ! (Y0_3) hx += 0x800;

1126          st      %i2,[%fp+tmp0_lo]               ! (Y0_3) *((int*)&x + 1) = ((uns
1127          and     %o5,-4096,%l4                   ! (Y0_3) hx &= 0xfffff000;

1129          add     pz,stridez,pz
1130          st      %l4,[%fp+tmp1_hi]               ! (Y0_3) *(int*)&ax = hx;

1132          and     %l0,MASK_0x7fffffff,%l3         ! (Y0_3) hx &= 0x7fffffff;

1134          sra     %l3,20,%l2                      ! (Y0_3) exp = (exp >> 20);

1136          cmp     %o0,959                         ! (Y0_3) if (expy < 0x3fb);
1137          bl,pn   %icc,.spec0                     ! (Y0_3) if (expy < 0x3fb);
1138          st      %g0,[%fp+%o7]                   ! (Y0_3) yisint = 0;

1140          cmp     %o0,1086                        ! (Y0_3) if (expy >= 0x43e);
1141          bge,pn  %icc,.spec1                     ! (Y0_3) if (expy >= 0x43e);
1142          nop

1144          cmp     %l2,2047                        ! (Y0_2) if (exp >= 0x7ff)
1145          bge,pn  %icc,.spec1                     ! (Y0_2) if (exp >= 0x7ff)
1146          nop

1148          cmp     %l0,MASK_0x000fffff             ! (Y0_2) if (hx <= 0xfffff)

1150          ldd     [%fp+tmp0_hi],%f32              ! (Y0_2) *(int*)&x = hx;
1151          ble,pn  %icc,.update0                   ! (Y0_2) if (hx <= 0xfffff)
1152          nop
1153  .cont0:
1154          sub     %o7,ind_buf,%o7                 ! stack buffer pointer update
1155          sub     pz,stridez,pz
1156          ldd     [%fp+tmp1_hi],%f54              ! (Y0_2) *(int*)&ax = hx;

1158          add     %o7,4,%o7                       ! stack buffer pointer update
1159          faddd   %f32,%f54,%f12                  ! (Y0_2) ux = x + ax;

1161          and     %o7,15,%o7                      ! stack buffer pointer update

1163          add     %o7,ind_buf,%o7                 ! stack buffer pointer update
1164          add     px,stridex,px                   ! px += stridex;

1166          lda     [px]%asi,%l0                    ! (Y1_2) hx = ((unsigned*)px)[0]

1168          lda     [px+4]%asi,%i2                  ! (Y1_2) *((int*)&x + 1) = ((uns
1169          and     MASK_0x000fffff,%l0,%i4         ! (Y1_2) hx &= 0xfffff;

1171          st      %g0,[%fp+%o7]                   ! (Y1_2) yisint = 0;
1172          or      MASK_0x3ff00000,%i4,%i4         ! (Y1_2) hx |= 0x3ff00000;

1174          st      %i4,[%fp+tmp0_hi]               ! (Y1_2) *(int*)&x = hx;
1175          add     %i4,2048,%i4                    ! (Y1_2) hx += 0x800;

1177          st      %i2,[%fp+tmp0_lo]               ! (Y1_2) *((int*)&x + 1) = ((uns
1178          and     %i4,-4096,%i4                   ! (Y1_2) hx &= 0xfffff000;

1180          st      %i4,[%fp+tmp1_hi]               ! (Y1_2) *(int*)&ax = hx;
1181          and     %l0,MASK_0x7fffffff,%l2         ! (Y1_2) hx &= 0x7fffffff;
1182          cmp     %l0,MASK_0x000fffff             ! (Y1_2) if (hx <= 0xfffff)
```

```
1184          ble,pn  %icc,.update1                   ! (Y1_2) if (hx <= 0xfffff)
1185          nop
1186  .cont1:
1187          sub     %o7,ind_buf,%o7                 ! stack buffer pointer update

1189          add     %o7,4,%o7                       ! stack buffer pointer update
1190          fdivd   DONE,%f12,%f20                  ! (Y0_2) yd = DONE / ux;

1192          and     %o7,15,%o7                      ! stack buffer pointer update

1194          sra     %l3,20,%l3                      ! (Y0_2) exp = (exp >> 20);
1195          add     %o7,ind_buf,%o7                 ! stack buffer pointer update
1196          ldd     [%fp+tmp0_hi],%f8               ! (Y1_2) *(int*)&x = hx;

1198          ldd     [%fp+tmp1_hi],%f14              ! (Y1_2) *(int*)&ax = hx;
1199          sra     %l4,20,%l0                      ! (Y0_2) itmp0 = (hx >> 20);
1200          sub     %l3,2046,%o5                    ! (Y0_2) exp = exp - 2046;

1202          add     %o5,%l0,%o5                     ! (Y0_2) exp += itmp0;

1204          sll     %o5,8,%l0                       ! (Y0_2) itmp0 = exp << 8;
1205          st      %l0,[%fp+tmp3]                  ! (Y0_2) (double)itmp0;
1206          faddd   %f8,%f14,%f26                   ! (Y1_2) ux = x + ax;

1208          fand    %f12,MHI32,%f12                 ! (Y0_2) ux = vis_fand(ux, MHI32
1209          add     px,stridex,px                   ! px += stridex;

1211          ldd     [EXPTBL-ind_HI],KA1_HI          ! (Y0_2) load KA1_HI;
1212          fsubd   %f12,%f54,%f10                  ! (Y0_2) dtmp0 = (ux - ax);

1214          ld      [%fp+tmp3],%f16                 ! (Y0_2) (double)itmp0;
1215          fsubd   %f32,%f54,%f58                  ! (Y0_2) u = x - ax;

1217          sra     %l4,8,%l4                       ! (Y0_2) i = (hx >> 8);

1219          and     %l4,4080,%l4                    ! (Y0_2) i = i & 0xff0;

1221          ldd     [LOGTBL+%l4],%f62               ! (Y0_2) y = *(double *)((char*)
1222          fmuld   %f58,%f20,%f52                  ! (Y0_2) s = u * yd;
1223          fsubd   %f32,%f10,%f10                  ! (Y0_2) s_l = (x - dtmp0);

1225          fitod   %f16,%f54                       ! (Y0_2) (double)itmp0;
1226          add     %l4,8,%o0                       ! (Y0_2) i += 8;

1228          lda     [px]%asi,%l0                    ! (Y0_3) hx = ((unsigned*)px)[0]
1229          fand    %f52,MHI32,%f4                  ! (Y0_2) s_h = vis_fand(s, MHI32

1231          faddd   %f62,%f54,%f54                  ! (Y0_2) y += (double)itmp0;
1232          lda     [px+4]%asi,%i2                  ! (Y0_3) *((int*)&x + 1) = ((uns
1233          fmuld   %f4,%f12,%f32                   ! (Y0_2) dtmp0 = s_h * ux;

1235          and     MASK_0x000fffff,%l0,%o5         ! (Y0_3) hx &= 0xfffff;
1236          fmuld   %f52,%f52,%f12                  ! (Y0_2) y = s * s;

1238          or      MASK_0x3ff00000,%o5,%o5         ! (Y0_3) hx |= 0x3ff00000;

1240          st      %o5,[%fp+tmp0_hi]               ! (Y0_3) *(int*)&x = hx;
1241          fsubd   %f58,%f32,%f32                  ! (Y0_2) s_l = u - dtmp0;

1243          add     %o5,2048,%o5                    ! (Y0_3) hx += 0x800;

1245          st      %i2,[%fp+tmp0_lo]               ! (Y0_3) *((int*)&x + 1) = ((uns
1246          and     %o5,-4096,%l4                   ! (Y0_3) hx &= 0xfffff000;
1247          fmuld   KA5,%f12,%f36                   ! (Y0_2) dtmp8 = KA5 * y;

1249          st      %l4,[%fp+tmp1_hi]               ! (Y0_3) *(int*)&ax = hx;
```



```
1250          fmuld   KA1_HI,%f4,%f48                 ! (Y0_2) yd = KA1_HI * s_h;

1252          fmuld   %f4,%f10,%f10                   ! (Y0_2) dtmp1 = s_h * s_l;
1253          ldd     [EXPTBL-ind_LO],KA1_LO          ! (y0_2) load KA1_LO;
1254          and     %l0,MASK_0x7fffffff,%l3         ! (Y0_3) hx &= 0x7fffffff;
1255          faddd   %f36,KA3,%f62                   ! (Y0_2) dtmp8 = dtmp8 + KA3;

1257          st      %g0,[%fp+%o7]                   ! (Y0_3) yisint = 0;
1258          faddd   %f54,%f48,%f36                  ! (Y0_2) m_h = y + yd;

1260          fdivd   DONE,%f26,%f22                  ! (Y1_2) yd = DONE / ux;
1261          fsubd   %f32,%f10,%f10                  ! (Y0_2) s_l -= dtmp1;

1263          cmp     %l0,MASK_0x000fffff             ! (Y0_2) if (hx <= 0xfffff)

1265          sra     %l2,20,%l2                      ! (Y1_1) exp = (exp >> 20);
1266          ldd     [%fp+tmp0_hi],%f32              ! (Y0_2) *(int*)&x = hx;
1267          ble,pn  %icc,.update2                   ! (Y0_2) if (hx <= 0xfffff)
1268          fsubd   %f36,%f54,%f30                  ! (Y0_1) dtmp2 = m_h - y;
1269  .cont2:
1270          cmp     %l2,2047                        ! (Y1_1) if (exp >= 0x7ff)
1271          sub     %o7,ind_buf,%o7                 ! stack buffer pointer update
1272          ldd     [%fp+tmp1_hi],%f54              ! (Y0_2) *(int*)&ax = hx;

1274          sra     %i4,20,%l0                      ! (Y1_1) itmp0 = (hx >> 20);
1275          sub     %l2,2046,%o5                    ! (Y1_1) exp = exp - 2046;
1276          fmuld   KA1,%f20,%f20                   ! (Y0_1) dtmp0 = KA1 * yd;

1278          add     %o5,%l0,%o5                     ! (Y1_1) exp += itmp0;
1279          fmuld   %f62,%f12,%f62                  ! (Y0_1) dtmp8 = dtmp8 * y;

1281          sll     %o5,8,%l0                       ! (Y1_1) itmp0 = exp << 8;
1282          add     %o7,4,%o7                       ! stack buffer pointer update
1283          st      %l0,[%fp+tmp3]                  ! (Y1_1) (double)itmp0;
1284          faddd   %f32,%f54,%f12                  ! (Y0_2) ux = x + ax;

1286          bge,pn  %icc,.update3                   ! (Y1_1) if (exp >= 0x7ff)
1287          fsubd   %f30,%f48,%f48                  ! (Y0_1) dtmp2 -= yd;
1288  .cont3:
1289          and     %o7,15,%o7                      ! stack buffer pointer update
1290          fmuld   %f20,%f10,%f10                  ! (Y0_1) s_l = dtmp0 * s_l;

1292          add     %o7,ind_buf,%o7                 ! stack buffer pointer update
1293          fmuld   KA1_LO,%f4,%f4                  ! (Y0_1) dtmp1 = KA1_LO * s_h;
1294          fand    %f26,MHI32,%f26                 ! (Y1_1) ux = vis_fand(ux, MHI32

1296          fmuld   %f62,%f52,%f62                  ! (Y0_1) s = dtmp8 * s;
1297          ldd     [LOGTBL+%o0],%f52               ! (Y0_1) dtmp0 = *(double *)((ch
1298          fsubd   %f48,%f10,%f20                  ! (Y0_1) dtmp2 -= s_l;

1300          add     px,stridex,px                   ! px += stridex;
1301          fsubd   %f26,%f14,%f10                  ! (Y1_1) dtmp0 = (ux - ax);

1303          faddd   %f52,%f4,%f52                   ! (Y0_1) dtmp0 += dtmp1;

1305          ldd     [EXPTBL-ind_HI],KA1_HI          ! (Y1_1) load KA1_HI;
1306          fsubd   %f62,%f20,%f4                   ! (Y0_1) y = s - dtmp2;

1308          ld      [%fp+tmp3],%f16                 ! (Y1_1) (double)itmp0;
1309          fsubd   %f8,%f14,%f58                   ! (Y1_1) u = x - ax;

1311          sra     %i4,8,%o0                       ! (Y1_1) i = (hx >> 8);

1313          faddd   %f4,%f52,%f48                   ! (Y0_1) y += dtmp0;
1314          and     %o0,4080,%o0                    ! (Y1_1) i = i & 0xff0;
```

```
1316         ldd     [LOGTBL+%o0],%f62               ! (Y1_1) y = *(double *)((char*)
1317         fmuld   %f58,%f22,%f52                  ! (Y1_1) s = u * yd;
1318         fsubd   %f8,%f10,%f10                   ! (Y1_1) s_l = (x - dtmp0);

1320         lda     [py]%asi,%f30                   ! (Y0_1) yd = *py;
1321         fitod   %f16,%f14                       ! (Y1_1) (double)itmp0;

1323         lda     [py+4]%asi,%f31                 ! (Y0_1) yd = *py;
1324         faddd   %f48,%f36,%f8                   ! (Y0_1) dtmp0 = y + m_h;

1326         add     %o0,8,%o0                       ! (Y1_1) i += 8;
1327         lda     [px]%asi,%l0                    ! (Y1_2) hx = ((unsigned*)px)[0]
1328         fand    %f52,MHI32,%f4                  ! (Y1_1) s_h = vis_fand(s, MHI32

1330         faddd   %f62,%f14,%f14                  ! (Y1_1) y += (double)itmp0;

1332         lda     [px+4]%asi,%i2                  ! (Y1_2) *((int*)&x + 1) = ((uns
1333         fand    %f8,MHI32,%f20                  ! (Y0_1) s_h = vis_fand(dtmp0, M
1334         fmuld   %f4,%f26,%f8                    ! (Y1_1) dtmp0 = s_h * ux;

1336         fand    %f30,MHI32,%f6                  ! (Y0_1) s = vis_fand(yd, MHI32)
1337         and     MASK_0x000fffff,%l0,%i4         ! (Y1_2) hx &= 0xfffff;
1338         fmuld   %f52,%f52,%f26                  ! (Y1_1) y = s * s;

1340         st      %g0,[%fp+%o7]                   ! (Y1_2) yisint = 0;
1341         or      MASK_0x3ff00000,%i4,%i4         ! (Y1_2) hx |= 0x3ff00000;
1342         fsubd   %f20,%f36,%f62                  ! (Y0_1) dtmp0 = (s_h - m_h);

1344         st      %i4,[%fp+tmp0_hi]               ! (Y1_2) *(int*)&x = hx;
1345         fsubd   %f58,%f8,%f8                    ! (Y1_1) s_l = u - dtmp0;

1347         add     %i4,2048,%i4                    ! (Y1_2) hx += 0x800;
1348         fmuld   %f20,%f6,%f34                   ! (Y0_1) s = s_h * s;
1349         fsubd   %f30,%f6,%f6                    ! (Y0_1) dtmp0 = (yd - s);

1351         st      %i2,[%fp+tmp0_lo]               ! (Y1_2) *((int*)&x + 1) = ((uns
1352         and     %i4,-4096,%i4                   ! (Y1_2) hx &= 0xfffff000;
1353         fmuld   KA5,%f26,%f36                   ! (Y1_1) dtmp8 = KA5 * y;

1355         st      %i4,[%fp+tmp1_hi]               ! (Y1_2) *(int*)&ax = hx;
1356         fsubd   %f48,%f62,%f62                  ! (Y0_1) y = y - dtmp0;
1357         fmuld   KA1_HI,%f4,%f48                 ! (Y1_1) yd = KA1_HI * s_h;

1359         fmuld   %f4,%f10,%f10                   ! (Y1_1) dtmp1 = s_h * s_l;

1361         ldd     [EXPTBL-ind_LO],KA1_LO          ! (Y1_1) load KA1_LO;
1362         and     %l0,MASK_0x7fffffff,%l2         ! (Y1_2) hx &= 0x7fffffff;
1363         fmuld   %f6,%f20,%f6                    ! (Y0_1) dtmp0 *= s_h;
1364         fcmped  %fcc0,%f34,HTHRESH              ! (Y0_1) s > HTHRESH

1366         cmp     %l0,MASK_0x000fffff             ! (Y1_2) if (hx <= 0xfffff)
1367         fmuld   %f30,%f62,%f30                  ! (Y0_1) dtmp1 = yd * y;
1368         faddd   %f36,KA3,%f62                   ! (Y1_1) dtmp8 = dtmp8 + KA3;

1370         ble,pn  %icc,.update4                   ! (Y1_2) if (hx <= 0xfffff)
1371         faddd   %f14,%f48,%f36                  ! (Y1_1)  m_h = y + yd;
1372 .cont4:
1373         sub     %o7,ind_buf,%o7                 ! stack buffer pointer update
1374         fmovdg  %fcc0,HTHRESH,%f34              ! (Y0_1) s = HTHRESH

1376         add     %o7,4,%o7                       ! stack buffer pointer update
1377         fdivd   DONE,%f12,%f20                  ! (Y0_2) yd = DONE / ux;
1378         fsubd   %f8,%f10,%f10                   ! (Y1_1) s_l -= dtmp1;

1380         and     %o7,15,%o7                      ! stack buffer pointer update
1381         faddd   %f6,%f30,%f6                    ! (Y0_1) yd = dtmp0 + dtmp1;
```



```
1383         sra     %l3,20,%l3                      ! (Y0_2) exp = (exp >> 20);
1384         add     %o7,ind_buf,%o7                 ! stack buffer pointer update
1385         ldd     [%fp+tmp0_hi],%f8               ! (Y1_2) *(int*)&x = hx;
1386         fsubd   %f36,%f14,%f30                  ! (Y1_1) dtmp2 = m_h - y;

1388         cmp     %l3,2047                        ! (Y0_2) if (exp >= 0x7ff)
1389         ldd     [%fp+tmp1_hi],%f14              ! (Y1_2) *(int*)&ax = hx;
1390         fmuld   KA1,%f22,%f22                   ! (Y1_1) dtmp0 = KA1 * yd;

1392         sra     %l4,20,%l0                      ! (Y0_2) itmp0 = (hx >> 20);
1393         sub     %l3,2046,%o5                    ! (Y0_2) exp = exp - 2046;
1394         fcmped  %fcc1,%f34,LTHRESH              ! (Y0_1) s < LTHRESH

1396         add     %o5,%l0,%o5                     ! (Y0_2) exp += itmp0;
1397         add     py,stridey,py                   ! py += stridey;
1398         fmuld   %f62,%f26,%f62                  ! (Y1_1) dtmp8 = dtmp8 * y;
1399         fmovdg  %fcc0,DZERO,%f6                 ! (Y0_1) yd = DZERO

1401         sll     %o5,8,%l0                       ! (Y0_2) itmp0 = exp << 8;
1402         st      %l0,[%fp+tmp3]                  ! (Y0_2) (double)itmp0;
1403         faddd   %f8,%f14,%f26                   ! (Y1_2) ux = x + ax;

1405         bge,pn  %icc,.update5                   ! (Y0_2) if (exp >= 0x7ff)
1406         fsubd   %f30,%f48,%f48                  ! (Y1_1) dtmp2 -= yd;
1407 .cont5:
1408         lda     [py]%asi,%l1                    ! (Y1_1) hy = *py;
1409         fmuld   %f22,%f10,%f10                  ! (Y1_1) s_l = dtmp0 * s_l;
1410         fmovdl  %fcc1,LTHRESH,%f34              ! (Y0_1) s = LTHRESH

1412         fmovdl  %fcc1,DZERO,%f6                 ! (Y0_1) yd = DZERO

1414         fand    %f12,MHI32,%f12                 ! (Y0_2) ux = vis_fand(ux, MHI32
1415         fmuld   KA1_LO,%f4,%f4                  ! (Y1_1) dtmp1 = KA1_LO * s_h;

1417         fmuld   %f62,%f52,%f62                  ! (Y1_1) s = dtmp8 * s;
1418         ldd     [LOGTBL+%o0],%f52               ! (Y1_1) dtmp0 = *(double *)((ch
1419         fsubd   %f48,%f10,%f22                  ! (Y1_1) dtmp2 -= s_l;

1421         add     px,stridex,px                   ! px += stridex;
1422         faddd   %f34,%f6,%f58                   ! (Y0_1) dtmp0 = (s + yd);

1424         and     %l1,MASK_0x7fffffff,%l1         ! (Y1_1) hy &= 0x7fffffff;
1425         ldd     [EXPTBL-ind_HI],KA1_HI          ! (Y0_2) load KA1_HI;
1426         fsubd   %f12,%f54,%f10                  ! (Y0_2) dtmp0 = (ux - ax);

1428         faddd   %f52,%f4,%f52                   ! (Y1_1) dtmp0 += dtmp1;

1430         fsubd   %f62,%f22,%f4                   ! (Y1_1) y = s - dtmp2;

1432         fdtoi   %f58,%f17                       ! (Y0_1) (int)dtmp0;

1434         ld      [%fp+tmp3],%f16                 ! (Y0_2) (double)itmp0;
1435         fsubd   %f32,%f54,%f58                  ! (Y0_2) u = x - ax;
1436         sra     %l4,8,%l4                       ! (Y0_2) i = (hx >> 8);

1438         sra     %l1,20,%l1                      ! (Y1_1) expy = hy >> 20;
1439         ldd     [EXPTBL-ind_KB5],KB5                    ! (Y0_1) load KB5;
1440         faddd   %f4,%f52,%f48                   ! (Y1_1) y += dtmp0;

1442         and     %l4,4080,%l4                    ! (Y0_2) i = i & 0xff0;
1443         st      %f17,[%fp+tmp4]                 ! (Y0_1) ind = (int)dtmp0;
1444         fitod   %f17,%f4                        ! (Y0_1) u = (double)(int)dtmp0;

1446         ldd     [LOGTBL+%l4],%f62               ! (Y0_2) y = *(double *)((char*)
1447         fmuld   %f58,%f20,%f52                  ! (Y0_2) s = u * yd;
```

```
1448         fsubd   %f32,%f10,%f10                  ! (Y0_2) s_l = (x - dtmp0);

1450         lda     [py]%asi,%f30                   ! (Y1_1) yd = *py;
1451         fitod   %f16,%f54                       ! (Y0_2) (double)itmp0;

1453         lda     [py+4]%asi,%f31                 ! (Y1_1) yd = *py;
1454         faddd   %f48,%f36,%f32                  ! (Y1_1) dtmp0 = y + m_h;

1456         add     %l4,8,%o0                       ! (Y0_2) i += 8;
1457         fsubd   %f34,%f4,%f60                   ! (Y0_1) y = s - u;

1459         cmp     %l1,959                         ! (Y1_1) if (expy < 0x3fb);
1460         lda     [px]%asi,%l0                    ! (Y0_3) hx = ((unsigned*)px)[0]
1461         fand    %f52,MHI32,%f4                  ! (Y0_2) s_h = vis_fand(s, MHI32

1463         bl,pn   %icc,.update6                   ! (Y1_1) if (expy < 0x3fb);
1464         faddd   %f62,%f54,%f54                  ! (Y0_2) y += (double)itmp0;
1465 .cont6:
1466         cmp     %l1,1086                        ! (Y1_1) if (expy >= 0x43e);
1467         lda     [px+4]%asi,%i2                  ! (Y0_3) *((int*)&x + 1) = ((uns
1468         fand    %f32,MHI32,%f22                 ! (Y1_1) s_h = vis_fand(dtmp0, M

1470         fmuld   %f4,%f12,%f32                   ! (Y0_2) dtmp0 = s_h * ux;
1471         bge,pn  %icc,.update7                   ! (Y1_1) if (expy >= 0x43e);
1472         faddd   %f60,%f6,%f60                   ! (Y0_1) y = y + yd;
1473 .cont7:
1474         ld      [%fp+%o7],%o2                   ! (Y0_1) load yisint
1475         fand    %f30,MHI32,%f6                  ! (Y1_1) s = vis_fand(yd, MHI32)

1477         and     MASK_0x000fffff,%l0,%o5         ! (Y0_3) hx &= 0xfffff;
1478         fmuld   %f52,%f52,%f12                  ! (Y0_2) y = s * s;

1480         or      MASK_0x3ff00000,%o5,%o5         ! (Y0_3) hx |= 0x3ff00000;
1481         fsubd   %f22,%f36,%f62                  ! (Y1_1) dtmp0 = (s_h - m_h);

1483         st      %o5,[%fp+tmp0_hi]               ! (Y0_3) *(int*)&x = hx;
1484         fsubd   %f58,%f32,%f32                  ! (Y0_2) s_l = u - dtmp0;
1485         fmuld   KB5,%f60,%f58                   ! (Y0_1) dtmp0 = KB5 * y;

1487         ldd     [EXPTBL-ind_KB3],KB3            ! (Y0_1) load KB3;
1488         add     %o5,2048,%o5                    ! (Y0_3) hx += 0x800;
1489         fmuld   %f22,%f6,%f34                   ! (Y1_1) s = s_h * s;
1490         fsubd   %f30,%f6,%f6                    ! (Y1_1) dtmp0 = (yd - s);

1492         st      %i2,[%fp+tmp0_lo]               ! (Y0_3) *((int*)&x + 1) = ((uns
1493         and     %o5,-4096,%l4                   ! (Y0_3) hx &= 0xfffff000;
1494         fmuld   KA5,%f12,%f36                   ! (Y0_2) dtmp8 = KA5 * y;

1496         st      %l4,[%fp+tmp1_hi]               ! (Y0_3) *(int*)&ax = hx;
1497         fsubd   %f48,%f62,%f62                  ! (Y1_1) y = y - dtmp0;
1498         fmuld   KA1_HI,%f4,%f48                 ! (Y0_2) yd = KA1_HI * s_h;

1500         subcc   counter,1,counter
1501         fmuld   %f4,%f10,%f10                   ! (Y0_2) dtmp1 = s_h * s_l;
1502         faddd   %f58,KB4,%f58                   ! (Y0_1) dtmp1 = dtmp0 + KB4;

1504         ldd     [EXPTBL-ind_LO],KA1_LO          ! (y0_2) load KA1_LO;
1505         and     %l0,MASK_0x7fffffff,%l3         ! (Y0_3) hx &= 0x7fffffff;
1506         fmuld   %f6,%f22,%f6                    ! (Y1_1) dtmp0 *= s_h;
1507         fcmped  %fcc0,%f34,HTHRESH              ! (Y1_1) s > HTHRESH;

1509         fmuld   %f30,%f62,%f30                  ! (Y1_1) dtmp1 = yd * y;
1510         ba      1f
1511         faddd   %f36,KA3,%f62                   ! (Y0_2) dtmp8 = dtmp8 + KA3;

1513         .align  16
```



```
1514 1:
1515         st      %g0,[%fp+%o7]                   ! (Y0_3) yisint = 0;
1516         fmuld   %f58,%f60,%f58                  ! (Y0_1) dtmp2 = dtmp1 * y;
1517         bneg,pn %icc,.tail
1518         faddd   %f54,%f48,%f36                  ! (Y0_2) m_h = y + yd;

1520         nop
1521         fmovdg  %fcc0,HTHRESH,%f34              ! (Y1_1) s = HTHRESH;

1523         fdivd   DONE,%f26,%f22                  ! (Y1_2) yd = DONE / ux;
1524         fsubd   %f32,%f10,%f10                  ! (Y0_2) s_l -= dtmp1;

1526 .main_loop:
1527         cmp     %l0,MASK_0x000fffff             ! (Y0_2) if (hx <= 0xfffff)
1528         add     py,stridey,py                   ! py += stridey;
1529         faddd   %f6,%f30,%f6                    ! (Y1_0) yd = dtmp0 + dtmp1;

1531         sra     %l2,20,%l2                      ! (Y1_1) exp = (exp >> 20);
1532         ldd     [%fp+tmp0_hi],%f32              ! (Y0_2) *(int*)&x = hx;
1533         ble,pn  %icc,.update8                   ! (Y0_2) if (hx <= 0xfffff)
1534         fsubd   %f36,%f54,%f30                  ! (Y0_1) dtmp2 = m_h - y;
1535 .cont8:
1536         cmp     %l2,2047                        ! (Y1_1) if (exp >= 0x7ff)
1537         sub     %o7,ind_buf,%o7                 ! stack buffer pointer update
1538         ldd     [%fp+tmp1_hi],%f54              ! (Y0_2) *(int*)&ax = hx;
1539         faddd   %f58,KB3,%f58                   ! (Y0_0) dtmp3 = dtmp2 + KB3;

1541         sra     %i4,20,%l0                      ! (Y1_1) itmp0 = (hx >> 20);
1542         sub     %l2,2046,%o5                    ! (Y1_1) exp = exp - 2046;
1543         fmuld   KA1,%f20,%f20                   ! (Y0_1) dtmp0 = KA1 * yd;
1544         fcmped  %fcc1,%f34,LTHRESH              ! (Y1_0) s < LTHRESH;

1546         ldd     [EXPTBL-ind_KB2],KB2            ! (Y0_0) load KB2;
1547         add     %o5,%l0,%o5                     ! (Y1_1) exp += itmp0;
1548         fmuld   %f62,%f12,%f62                  ! (Y0_1) dtmp8 = dtmp8 * y;
1549         fmovdg  %fcc0,DZERO,%f6                 ! (Y1_0) yd = DZERO

1551         sll     %o5,8,%l0                       ! (Y1_1) itmp0 = exp << 8;
1552         add     %o7,4,%o7                       ! stack buffer pointer update
1553         st      %l0,[%fp+tmp3]                  ! (Y1_1) (double)itmp0;
1554         faddd   %f32,%f54,%f12                  ! (Y0_2) ux = x + ax;

1556         ld      [%fp+tmp4],%i2                  ! (Y0_0) ind = (int)dtmp0;
1557         fsubd   %f30,%f48,%f48                  ! (Y0_1) dtmp2 -= yd;
1558         bge,pn  %icc,.update9                   ! (Y1_1) if (exp >= 0x7ff)
1559         fmuld   %f58,%f60,%f58                  ! (Y0_0) dtmp4 = dtmp3 * y;
1560 .cont9:
1561         lda     [py]%asi,%l1                    ! (Y0_1) hy = *py;
1562         and     %o7,15,%o7                      ! stack buffer pointer update
1563         fmuld   %f20,%f10,%f10                  ! (Y0_1) s_l = dtmp0 * s_l;
1564         fmovdl  %fcc1,LTHRESH,%f34              ! (Y1_0) s = LTHRESH;

1566         add     %o7,ind_buf,%o7                 ! stack buffer pointer update
1567         fmovdl  %fcc1,DZERO,%f6                 ! (Y1_0) yd = DZERO

1569         fmuld   KA1_LO,%f4,%f4                  ! (Y0_1) dtmp1 = KA1_LO * s_h;
1570         fand    %f26,MHI32,%f26                 ! (Y1_1) ux = vis_fand(ux, MHI32

1572         fmuld   %f62,%f52,%f62                  ! (Y0_1) s = dtmp8 * s;
1573         nop
1574         faddd   %f58,KB2,%f30                   ! (Y0_0) dtmp5 = dtmp4 + KB2;

1576         nop
1577         add     pz,stridez,pz                   ! pz += stridez;
1578         ldd     [LOGTBL+%o0],%f52               ! (Y0_1) dtmp0 = *(double *)((ch
1579         fsubd   %f48,%f10,%f20                  ! (Y0_1) dtmp2 -= s_l;
```

```
1581          sra     %i2,8,%l0                       ! (Y0_0) ind >>= 8;
1582          ldd     [EXPTBL-ind_KB1],KB1            ! (Y0_0) load KB1;
1583          add     px,stridex,px                   ! px += stridex;
1584          faddd   %f34,%f6,%f58                   ! (Y1_0) dtmp0 = (s + yd);

1586          add     %l0,1021,%l2                    ! (Y0_0) eflag = (ind + 1021);
1587          sub     %g0,%l0,%o5                     ! (Y0_0) gflag = (1022 - ind);
1588          fsubd   %f26,%f14,%f10                  ! (Y1_1) dtmp0 = (ux - ax);

1590          sra     %l2,31,%l2                      ! (Y0_0) eflag = eflag >> 31;
1591          add     %o5,1022,%o5                    ! (Y0_0) gflag = (1022 - ind);
1592          fmuld   %f30,%f60,%f48                  ! (Y0_0) dtmp6 = dtmp5 * y;
1593          faddd   %f52,%f4,%f52                   ! (Y0_1) dtmp0 += dtmp1;

1595          sra     %o5,31,%o5                      ! (Y0_0) gflag = gflag >> 31;
1596          and     %l2,54,%o0                      ! (Y0_0) itmp0 = 54 & eflag;
1597          ldd     [EXPTBL-ind_HI],KA1_HI          ! (Y1_1) load KA1_HI;
1598          fsubd   %f62,%f20,%f4                   ! (Y0_1) y = s - dtmp2;

1600          lda     [py]%asi,%f30                   ! (Y0_1) yd = *py;
1601          sub     %l2,%o5,%l2                     ! (Y0_0) ind = eflag - gflag;
1602          add     %l0,%o0,%l0                     ! (Y0_0) ind = ind + itmp0;
1603          fdtoi   %f58,%f20                       ! (Y1_0) u = (double)(int)dtmp0;

1605          sra     %i4,8,%o0                       ! (Y1_1) i = (hx >> 8);
1606          and     %o5,52,%o5                      ! (Y0_0) itmp1 = 52 & gflag;
1607          ld      [%fp+tmp3],%f16                 ! (Y1_1) (double)itmp0;
1608          fsubd   %f8,%f14,%f58                   ! (Y1_1) u = x - ax;

1610          and     %o0,4080,%o0                    ! (Y1_1) i = i & 0xff0;
1611          sub     %l0,%o5,%i4                     ! (Y0_0) ind = ind - itmp1;
1612          st      %f20,[%fp+tmp4]                 ! (Y1_0) ind = (int)dtmp0;
1613          faddd   %f48,KB1,%f14                   ! (Y0_0) dtmp7 = dtmp6 + KB1;

1615          add     %o2,%i4,%i4                     ! (Y0_0) ind = yisint + ind;
1616          and     %i2,255,%o5                     ! (Y0_0) i = ind & 0xff;
1617          lda     [px]%asi,%l0                    ! (Y1_2) hx = ((unsigned*)px)[0]
1618          faddd   %f4,%f52,%f48                   ! (Y0_1) y += dtmp0;

1620          sll     %i4,20,%i4                      ! (Y0_0) ind <<= 20;
1621          ldd     [LOGTBL+%o0],%f62               ! (Y1_1) y = *(double *)((char*)
1622          and     %l1,MASK_0x7fffffff,%l1         ! (Y0_1) hy &= 0x7fffffff;
1623          fitod   %f20,%f4                        ! (Y1_0) u = (double)(int)dtmp0;

1625          lda     [px+4]%asi,%i2                  ! (Y1_2) *((int*)&x + 1) = ((uns
1626          nop
1627          fmuld   %f58,%f22,%f52                  ! (Y1_1) s = u * yd;
1628          fsubd   %f8,%f10,%f10                   ! (Y1_1) s_l = (x - dtmp0);

1630          sll     %o5,4,%o5                       ! (Y0_0) i = i << 4;
1631          st      %i4,[%fp+tmp2_hi]               ! (Y0_0) *(int*)&dtmp0 = ind;
1632          fmuld   %f14,%f60,%f20                  ! (Y0_0) y = dtmp7 * y;
1633          fitod   %f16,%f14                       ! (Y1_1) (double)itmp0;

1635          sra     %l1,20,%l1                      ! (Y0_1) expy = hy >> 20;
1636          nop
1637          ldd     [EXPTBL+%o5],%f56               ! (Y0_0) u = *(double*)((char*)_
1638          faddd   %f48,%f36,%f8                   ! (Y0_1) dtmp0 = y + m_h;

1640          add     %o5,8,%o5                       ! (Y0_0) i += 8;
1641          add     %o0,8,%o0                       ! (Y1_1) i += 8;
1642          lda     [py+4]%asi,%f31                 ! (Y0_1) yd = *py;
1643          fsubd   %f34,%f4,%f60                   ! (Y1_0) y = s - u;

1645          cmp     %l1,959                         ! (Y0_1) if (expy < 0x3fb);
```



```
1646          and     MASK_0x000fffff,%l0,%i4         ! (Y1_2) hx &= 0xfffff;
1647          ldd     [EXPTBL-ind_KB5],KB5            ! (Y1_0) load KB5;
1648          fand    %f52,MHI32,%f4                  ! (Y1_1) s_h = vis_fand(s, MHI32

1650          ldd     [EXPTBL+%o5],%f16               ! (Y0_0) dtmp0 = *(double*)((cha
1651          fmuld   %f56,%f20,%f34                  ! (Y0_0) dtmp1 = u * y;
1652          bl,pn   %icc,.update10                  ! (Y0_1) if (expy < 0x3fb);
1653          faddd   %f62,%f14,%f14                  ! (Y1_1) y += (double)itmp0;
1654  .cont10:
1655          or      MASK_0x3ff00000,%i4,%i4         ! (Y1_2) hx |= 0x3ff00000;
1656          cmp     %l1,1086                        ! (Y0_1) if (expy >= 0x43e);
1657          fand    %f8,MHI32,%f20                  ! (Y0_1) s_h = vis_fand(dtmp0, M

1659          fmuld   %f4,%f26,%f8                    ! (Y1_1) dtmp0 = s_h * ux;
1660          st      %i4,[%fp+tmp0_hi]               ! (Y1_2) *(int*)&x = hx;
1661          bge,pn  %icc,.update11                  ! (Y0_1) if (expy >= 0x43e);
1662          faddd   %f60,%f6,%f60                   ! (Y1_0) y = y + yd;
1663  .cont11:
1664          add     %i4,2048,%i4                    ! (Y1_2) hx += 0x800;
1665          ld      [%fp+%o7],%o2                   ! (Y1_0) load yisint
1666          fand    %f30,MHI32,%f6                  ! (Y0_1) s = vis_fand(yd, MHI32)

1668          st      %i2,[%fp+tmp0_lo]               ! (Y1_2) *((int*)&x + 1) = ((uns
1669          and     %i4,-4096,%i4                   ! (Y1_2) hx &= 0xfffff000;
1670          fmuld   %f52,%f52,%f26                  ! (Y1_1) y = s * s;
1671          faddd   %f16,%f34,%f16                  ! (Y0_0) dtmp2 = dtmp0 + dtmp1;

1673          st      %i4,[%fp+tmp1_hi]               ! (Y1_2) *(int*)&ax = hx;
1674          fsubd   %f20,%f36,%f62                  ! (Y0_1) dtmp0 = (s_h - m_h);

1676          fsubd   %f58,%f8,%f8                    ! (Y1_1) s_l = u - dtmp0;
1677          fmuld   KB5,%f60,%f58                   ! (Y1_0) dtmp0 = KB5 * y;

1679          ldd     [EXPTBL-ind_KB3],KB3            ! (Y1_0) load KB3;
1680          fmuld   %f20,%f6,%f34                   ! (Y0_1) s = s_h * s;
1681          fsubd   %f30,%f6,%f6                    ! (Y0_1) dtmp0 = (yd - s);

1683          faddd   %f16,%f56,%f56                  ! (Y0_0) u = dtmp2 + u;
1684          nop
1685          fmuld   KA5,%f26,%f36                   ! (Y1_1) dtmp8 = KA5 * y;

1687          nop
1688          add     %l2,513,%l2                     ! (Y0_0) ind += 513;
1689          fsubd   %f48,%f62,%f62                  ! (Y0_1) y = y - dtmp0;
1690          fmuld   KA1_HI,%f4,%f48                 ! (Y1_1) yd = KA1_HI * s_h;

1692          sll     %l2,3,%o5                       ! (Y0_0) ind *= 8;
1693          ldd     [%fp+tmp2_hi],%f16              ! (Y0_0) ld dtmp0;
1694          fmuld   %f4,%f10,%f10                   ! (Y1_1) dtmp1 = s_h * s_l;
1695          faddd   %f58,KB4,%f58                   ! (Y1_0) dtmp1 = dtmp0 + KB4;

1697          ldd     [EXPTBL-ind_LO],KA1_LO          ! (Y1_1) load KA1_LO;
1698          and     %l0,MASK_0x7fffffff,%l2         ! (Y1_2) hx &= 0x7fffffff;
1699          fmuld   %f6,%f20,%f6                    ! (Y0_1) dtmp0 *= s_h;
1700          fcmped  %fcc0,%f34,HTHRESH              ! (Y0_1) s > HTHRESH

1702          ldd     [EXPTBL+%o5],%f20               ! (Y0_0) dtmp1 = (*(double*)((ch
1703          nop
1704          nop
1705          fpadd32 %f56,%f16,%f56                  ! (Y0_0) u = vis_fpadd32(u, dtmp

1707          nop
1708          cmp     %l0,MASK_0x000fffff             ! (Y1_2) if (hx <= 0xfffff)
1709          fmuld   %f30,%f62,%f30                  ! (Y0_1) dtmp1 = yd * y;
1710          faddd   %f36,KA3,%f62                   ! (Y1_1) dtmp8 = dtmp8 + KA3;
```

```
1712         fmuld   %f58,%f60,%f58                  ! (Y1_0) dtmp2 = dtmp1 * y;
1713         st      %g0,[%fp+%o7]                   ! (Y1_2) yisint = 0;
1714         ble,pn  %icc,.update12                  ! (Y1_2) if (hx <= 0xfffff)
1715         faddd   %f14,%f48,%f36                  ! (Y1_1)  m_h = y + yd;
1716 .cont12:
1717         sra     %l3,20,%l3                      ! (Y0_2) exp = (exp >> 20);
1718         sub     %o7,ind_buf,%o7                 ! stack buffer pointer update
1719         fmuld   %f56,%f20,%f16                  ! (Y0_0) dtmp1 = u * dtmp1;
1720         fmovdg  %fcc0,HTHRESH,%f34              ! (Y0_1) s = HTHRESH

1722         cmp     %l3,2047                        ! (Y0_2) if (exp >= 0x7ff)
1723         st      %f16,[pz]                       ! (Y0_0) write into memory
1724         fdivd   DONE,%f12,%f20                  ! (Y0_2) yd = DONE / ux;
1725         fsubd   %f8,%f10,%f10                   ! (Y1_1) s_l -= dtmp1;

1727         sra     %l4,20,%l0                      ! (Y0_2) itmp0 = (hx >> 20);
1728         sub     %l3,2046,%o5                    ! (Y0_2) exp = exp - 2046;
1729         st      %f17,[pz+4]                     ! (Y0_0) write into memory
1730         faddd   %f6,%f30,%f6                    ! (Y0_1) yd = dtmp0 + dtmp1;

1732         add     %o5,%l0,%o5                     ! (Y0_2) exp += itmp0;
1733         add     py,stridey,py                   ! py += stridey;
1734         ldd     [%fp+tmp0_hi],%f8               ! (Y1_2) *(int*)&x = hx;
1735         fsubd   %f36,%f14,%f30                  ! (Y1_1) dtmp2 = m_h - y;

1737         sll     %o5,8,%l0                       ! (Y0_2) itmp0 = exp << 8;
1738         ldd     [%fp+tmp1_hi],%f14              ! (Y1_2) *(int*)&ax = hx;
1739         fmuld   KA1,%f22,%f22                   ! (Y1_1) dtmp0 = KA1 * yd;
1740         faddd   %f58,KB3,%f58                   ! (Y1_0) dtmp3 = dtmp2 + KB3;

1742         add     %o7,4,%o7                       ! stack buffer pointer update
1743         st      %l0,[%fp+tmp3]                  ! (Y0_2) (double)itmp0;
1744         fcmped  %fcc1,%f34,LTHRESH              ! (Y0_1) s < LTHRESH

1746         and     %o7,15,%o7                      ! stack buffer pointer update
1747         ld      [%fp+tmp4],%l0                  ! (Y1_0) ind = (int)dtmp0;
1748         fmuld   %f62,%f26,%f62                  ! (Y1_1) dtmp8 = dtmp8 * y;
1749         fmovdg  %fcc0,DZERO,%f6                 ! (Y0_1) yd = DZERO

1751         nop
1752         add     %o7,ind_buf,%o7                 ! stack buffer pointer update
1753         ldd     [EXPTBL-ind_KB2],KB2            ! (Y1_0) load KB2;
1754         faddd   %f8,%f14,%f26                   ! (Y1_2) ux = x + ax;

1756         fmuld   %f58,%f60,%f58                  ! (Y1_0) dtmp4 = dtmp3 * y;
1757         nop
1758         bge,pn  %icc,.update13                  ! (Y0_2) if (exp >= 0x7ff)
1759         fsubd   %f30,%f48,%f48                  ! (Y1_1) dtmp2 -= yd;
1760 .cont13:
1761         lda     [py]%asi,%l1                    ! (Y1_1) hy = *py;
1762         nop
1763         fmuld   %f22,%f10,%f10                  ! (Y1_1) s_l = dtmp0 * s_l;
1764         fmovdl  %fcc1,LTHRESH,%f34              ! (Y0_1) s = LTHRESH

1766         nop
1767         nop
1768         fmovdl  %fcc1,DZERO,%f6                 ! (Y0_1) yd = DZERO

1770         fand    %f12,MHI32,%f12                 ! (Y0_2) ux = vis_fand(ux, MHI32
1771         nop
1772         nop
1773         fmuld   KA1_LO,%f4,%f4                  ! (Y1_1) dtmp1 = KA1_LO * s_h;

1775         nop
1776         add     px,stridex,px                   ! px += stridex;
1777         faddd   %f58,KB2,%f30                   ! (Y1_0) dtmp5 = dtmp4 + KB2;
```



```
1778         fmuld   %f62,%f52,%f62                  ! (Y1_1) s = dtmp8 * s;

1780         sra     %l0,8,%i2                       ! (Y1_0) ind >>= 8;
1781         add     pz,stridez,pz                   ! pz += stridez;
1782         ldd     [LOGTBL+%o0],%f52               ! (Y1_1) dtmp0 = *(double *)((ch
1783         fsubd   %f48,%f10,%f22                  ! (Y1_1) dtmp2 -= s_l;

1785         add     %i2,1021,%l3                    ! (Y1_0) eflag = (ind + 1021);
1786         sub     %g0,%i2,%o5                     ! (Y1_0) gflag = (1022 - ind);
1787         ldd     [EXPTBL-ind_KB1],KB1            ! (Y1_0) load KB1;
1788         faddd   %f34,%f6,%f58                   ! (Y0_1) dtmp0 = (s + yd);

1790         sra     %l3,31,%l3                      ! (Y1_0) eflag = eflag >> 31;
1791         add     %o5,1022,%o5                    ! (Y1_0) gflag = (1022 - ind);
1792         ldd     [EXPTBL-ind_HI],KA1_HI          ! (Y0_2) load KA1_HI;
1793         fsubd   %f12,%f54,%f10                  ! (Y0_2) dtmp0 = (ux - ax);

1795         sra     %o5,31,%o5                      ! (Y1_0) gflag = gflag >> 31;
1796         and     %l3,54,%o0                      ! (Y1_0) itmp0 = 54 & eflag;
1797         fmuld   %f30,%f60,%f48                  ! (Y1_0) dtmp6 = dtmp5 * y;
1798         faddd   %f52,%f4,%f52                   ! (Y1_1) dtmp0 += dtmp1;

1800         sra     %l4,8,%l4                       ! (Y0_2) i = (hx >> 8);
1801         add     %i2,%o0,%i2                     ! (Y1_0) ind = ind + itmp0;
1802         fsubd   %f62,%f22,%f4                   ! (Y1_1) y = s - dtmp2;

1804         lda     [py]%asi,%f30                   ! (Y1_1) yd = *py;
1805         and     %l4,4080,%l4                    ! (Y0_2) i = i & 0xff0;
1806         and     %o5,52,%o0                      ! (Y1_0) itmp1 = 52 & gflag;
1807         fdtoi   %f58,%f22                       ! (Y0_1) (int)dtmp0;

1809         sub     %l3,%o5,%l3                     ! (Y1_0) ind = eflag - gflag;
1810         sub     %i2,%o0,%i2                     ! (Y1_0) ind = ind - itmp1;
1811         ld      [%fp+tmp3],%f16                 ! (Y0_2) (double)itmp0;
1812         fsubd   %f32,%f54,%f58                  ! (Y0_2) u = x - ax;

1814         add     %o2,%i2,%i2                     ! (Y1_0) ind = yisint + ind;
1815         and     %l0,255,%o5                     ! (Y1_0) i = ind & 0xff;
1816         st      %f22,[%fp+tmp4]                 ! (Y0_1) ind = (int)dtmp0;
1817         faddd   %f48,KB1,%f54                   ! (Y1_0) dtmp7 = dtmp6 + KB1;

1819         sll     %i2,20,%o0                      ! (Y1_0) ind <<= 20;
1820         nop
1821         lda     [px]%asi,%l0                    ! (Y0_3) hx = ((unsigned*)px)[0]
1822         faddd   %f4,%f52,%f48                   ! (Y1_1) y += dtmp0;

1824         and     %l1,MASK_0x7fffffff,%l1         ! (Y1_1) hy &= 0x7fffffff;
1825         nop
1826         st      %o0,[%fp+tmp2_hi]               ! (Y1_0) *(int*)&dtmp0 = ind;
1827         fitod   %f22,%f4                        ! (Y0_1) u = (double)(int)dtmp0;

1829         lda     [px+4]%asi,%i2                  ! (Y0_3) *((int*)&x + 1) = ((uns
1830         nop
1831         fmuld   %f58,%f20,%f52                  ! (Y0_2) s = u * yd;
1832         fsubd   %f32,%f10,%f10                  ! (Y0_2) s_l = (x - dtmp0);

1834         sll     %o5,4,%o5                       ! (Y1_0) i = i << 4;
1835         ldd     [LOGTBL+%l4],%f62               ! (Y0_2) y = *(double *)((char*)
1836         fmuld   %f54,%f60,%f22                  ! (Y1_0) y = dtmp7 * y;
1837         fitod   %f16,%f54                       ! (Y0_2) (double)itmp0;

1839         sra     %l1,20,%l1                      ! (Y1_1) expy = hy >> 20;
1840         nop
1841         ldd     [EXPTBL+%o5],%f56               ! (Y1_0) u = *(double*)((char*)_
1842         faddd   %f48,%f36,%f32                  ! (Y1_1) dtmp0 = y + m_h;
```

```
1844         add     %o5,8,%o5                       ! (Y1_0) i += 8;
1845         add     %l4,8,%o0                       ! (Y0_2) i += 8;
1846         lda     [py+4]%asi,%f31                 ! (Y1_1) yd = *py;
1847         fsubd   %f34,%f4,%f60                   ! (Y1_0) y = s - u;

1849         cmp     %l1,959                         ! (Y1_1) if (expy < 0x3fb);
1850         and     MASK_0x000fffff,%l0,%l4         ! (Y0_3) hx &= 0xfffff;
1851         fand    %f52,MHI32,%f4                  ! (Y0_2) s_h = vis_fand(s, MHI32

1853         ldd     [EXPTBL+%o5],%f16               ! (Y1_0) dtmp0 = *(double*)((cha
1854         fmuld   %f56,%f22,%f34                  ! (Y1_0) dtmp1 = u * y;
1855         bl,pn   %icc,.update14                  ! (Y1_1) if (expy < 0x3fb);
1856         faddd   %f62,%f54,%f54                  ! (Y0_2) y += (double)itmp0;
1857 .cont14:
1858         ldd     [EXPTBL-ind_KB5],KB5            ! (Y0_1) load KB5;
1859         or      MASK_0x3ff00000,%l4,%o5         ! (Y0_3) hx |= 0x3ff00000;
1860         cmp     %l1,1086                        ! (Y1_1) if (expy >= 0x43e);
1861         fand    %f32,MHI32,%f22                 ! (Y1_1) s_h = vis_fand(dtmp0, M

1863         fmuld   %f4,%f12,%f32                   ! (Y0_2) dtmp0 = s_h * ux;
1864         st      %o5,[%fp+tmp0_hi]               ! (Y0_3) *(int*)&x = hx;
1865         bge,pn  %icc,.update15                  ! (Y1_1) if (expy >= 0x43e);
1866         faddd   %f60,%f6,%f60                   ! (Y0_1) y = y + yd;
1867 .cont15:
1868         add     %o5,2048,%o5                    ! (Y0_3) hx += 0x800;
1869         nop
1870         ld      [%fp+%o7],%o2                   ! (Y0_1) load yisint
1871         fand    %f30,MHI32,%f6                  ! (Y1_1) s = vis_fand(yd, MHI32)

1873         and     %o5,-4096,%l4                   ! (Y0_3) hx &= 0xfffff000;
1874         st      %i2,[%fp+tmp0_lo]               ! (Y0_3) *((int*)&x + 1) = ((uns
1875         fmuld   %f52,%f52,%f12                  ! (Y0_2) y = s * s;
1876         faddd   %f16,%f34,%f16                  ! (Y1_0) dtmp2 = dtmp0 + dtmp1;

1878         nop
1879         nop
1880         st      %l4,[%fp+tmp1_hi]               ! (Y0_3) *(int*)&ax = hx;
1881         fsubd   %f22,%f36,%f62                  ! (Y1_1) dtmp0 = (s_h - m_h);

1883         fsubd   %f58,%f32,%f32                  ! (Y0_2) s_l = u - dtmp0;
1884         nop
1885         nop
1886         fmuld   KB5,%f60,%f58                   ! (Y0_1) dtmp0 = KB5 * y;

1888         ldd     [EXPTBL-ind_KB3],KB3            ! (Y0_1) load KB3;
1889         nop
1890         fmuld   %f22,%f6,%f34                   ! (Y1_1) s = s_h * s;
1891         fsubd   %f30,%f6,%f6                    ! (Y1_1) dtmp0 = (yd - s);

1893         fmuld   KA5,%f12,%f36                   ! (Y0_2) dtmp8 = KA5 * y;
1894         nop
1895         faddd   %f16,%f56,%f56                  ! (Y1_0) u = dtmp2 + u;

1897         add     %l3,513,%l3                     ! (Y1_0) ind += 1;
1898         fsubd   %f48,%f62,%f62                  ! (Y1_1) y = y - dtmp0;
1899         fmuld   KA1_HI,%f4,%f48                 ! (Y0_2) yd = KA1_HI * s_h;

1901         sll     %l3,3,%o5                       ! (Y1_0) ind *= 8;
1902         ldd     [%fp+tmp2_hi],%f16              ! (Y1_0) *(int*)&dtmp0 = ind;
1903         fmuld   %f4,%f10,%f10                   ! (Y0_2) dtmp1 = s_h * s_l;
1904         faddd   %f58,KB4,%f58                   ! (Y0_1) dtmp1 = dtmp0 + KB4;

1906         ldd     [EXPTBL-ind_LO],KA1_LO          ! (y0_2) load KA1_LO;
1907         and     %l0,MASK_0x7fffffff,%l3         ! (Y0_3) hx &= 0x7fffffff;
1908         fmuld   %f6,%f22,%f6                    ! (Y1_1) dtmp0 *= s_h;
1909         fcmped  %fcc0,%f34,HTHRESH              ! (Y1_1) s > HTHRESH;
```



```
1911         nop
1912         subcc   counter,2,counter               ! update cycle counter
1913         ldd     [EXPTBL+%o5],%f22               ! (Y1_0) dtmp1 = (*(double*)((ch
1914         fpadd32 %f56,%f16,%f56                  ! (Y1_0) u = vis_fpadd32(u, dtmp

1916         fmuld   %f30,%f62,%f30                  ! (Y1_1) dtmp1 = yd * y;
1917         nop
1918         nop
1919         faddd   %f36,KA3,%f62                   ! (Y0_2) dtmp8 = dtmp8 + KA3;

1921         nop
1922         st      %g0,[%fp+%o7]                   ! (Y0_3) yisint = 0;
1923         fmuld   %f58,%f60,%f58                  ! (Y0_1) dtmp2 = dtmp1 * y;
1924         faddd   %f54,%f48,%f36                  ! (Y0_2) m_h = y + yd;

1926         fmuld   %f56,%f22,%f16                  ! (Y1_0) dtmp1 = u * dtmp1;
1927         nop
1928         st      %f16,[pz]                       ! (Y1_0) write into memory
1929         fmovdg  %fcc0,HTHRESH,%f34              ! (Y1_1) s = HTHRESH;

1931         fdivd   DONE,%f26,%f22                  ! (Y1_2) yd = DONE / ux;
1932         st      %f17,[pz+4]                     ! (Y1_0) write into memory
1933         bpos,pt %icc,.main_loop
1934         fsubd   %f32,%f10,%f10                  ! (Y0_2) s_l -= dtmp1;

1936 .tail:
1937         addcc   counter,1,counter
1938         bneg,pn %icc,.end_loop

1940         faddd   %f58,KB3,%f58                   ! (Y0_0) dtmp3 = dtmp2 + KB3;
1941         ldd     [EXPTBL-ind_KB2],KB2            ! (Y0_0) load KB2;

1943         ld      [%fp+tmp4],%i2                  ! (Y0_0) ind = (int)dtmp0;
1944         fmuld   %f58,%f60,%f58                  ! (Y0_0) dtmp4 = dtmp3 * y;
1945         faddd   %f58,KB2,%f30                   ! (Y0_0) dtmp5 = dtmp4 + KB2;

1947         add     pz,stridez,pz                   ! pz += stridez;
1948         ldd     [EXPTBL-ind_KB1],KB1            ! (Y0_0) load KB1;
1949         sra     %i2,8,%l0                       ! (Y0_0) ind >>= 8;

1951         add     %l0,1021,%l2                    ! (Y0_0) eflag = (ind + 1021);
1952         sub     %g0,%l0,%o5                     ! (Y0_0) gflag = (1022 - ind);
1953         fmuld   %f30,%f60,%f48                  ! (Y0_0) dtmp6 = dtmp5 * y;

1955         sra     %l2,31,%l2                      ! (Y0_0) eflag = eflag >> 31;
1956         add     %o5,1022,%o5                    ! (Y0_0) gflag = (1022 - ind);

1958         sra     %o5,31,%o5                      ! (Y0_0) gflag = gflag >> 31;
1959         and     %l2,54,%o0                      ! (Y0_0) itmp0 = 54 & eflag;

1961         sub     %l2,%o5,%l2                     ! (Y0_0) ind = eflag - gflag;
1962         add     %l0,%o0,%l0                     ! (Y0_0) ind = ind + itmp0;

1964         and     %o5,52,%o5                      ! (Y0_0) itmp1 = 52 & gflag;
1965         faddd   %f48,KB1,%f14                   ! (Y0_0) dtmp7 = dtmp6 + KB1;

1967         sub     %l0,%o5,%l0                     ! (Y0_0) ind = ind - itmp1;
1968         and     %i2,255,%i4                     ! (Y0_0) i = ind & 0xff;

1970         sll     %i4,4,%o5                       ! (Y0_0) i = i << 4;

1972         ldd     [EXPTBL+%o5],%f56               ! (Y0_0) u = *(double*)((char*)_
1973         add     %o2,%l0,%l0                     ! (Y0_0) ind = yisint + ind;
1974         fmuld   %f14,%f60,%f20                  ! (Y0_0) y = dtmp7 * y;
```

```
1976         sll     %l0,20,%i2                      ! (Y0_0) ind <<= 20;

1978         add     %o5,8,%o5                       ! (Y0_0) i += 8;
1979         st      %i2,[%fp+tmp2_hi]               ! (Y0_0) *(int*)&dtmp0 = ind;

1981         ldd     [EXPTBL+%o5],%f16               ! (Y0_0) dtmp0 = *(double*)((cha
1982         fmuld   %f56,%f20,%f34                  ! (Y0_0) dtmp1 = u * y;

1984         faddd   %f16,%f34,%f16                  ! (Y0_0) dtmp2 = dtmp0 + dtmp1;

1986         faddd   %f16,%f56,%f56                  ! (Y0_0) u = dtmp2 + u;
1987         add     %l2,513,%l2                     ! (Y0_0) ind += 513;

1989         sll     %l2,3,%o5                       ! (Y0_0) ind *= 8;
1990         ldd     [%fp+tmp2_hi],%f16              ! (Y0_0) ld dtmp0;

1992         ldd     [EXPTBL+%o5],%f20               ! (Y0_0) dtmp1 = (*(double*)((ch
1993         fpadd32 %f56,%f16,%f56                  ! (Y0_0) u = vis_fpadd32(u, dtmp

1995         fmuld   %f56,%f20,%f16                  ! (Y0_0) dtmp1 = u * dtmp1;
1996         st      %f16,[pz]                       ! (Y0_0) write into memory
1997         st      %f17,[pz+4]                     ! (Y0_0) write into memory

1999 .end_loop:
2000         ba      .begin
2001         nop
2002 .end:
2003         ret
2004         restore %g0,0,%o0

2006         .align  16
2007 .update0:
2008         cmp     %l0,%g0                         ! if (x >= 0);
2009         fzero   %f30

2011         lda     [py+4]%asi,%l0                  ! ld ly
2012         bge,pt  %icc,.pos0                      ! if (x >= 0);
2013         or      %g0,%g0,%o5                     ! yisint = 0;

2015         cmp     %o0,1076                        ! if (expy >= 0x434);
2016         bge     .neg0                           ! if (expy >= 0x434);
2017         or      %g0,2,%o5                       ! yisint = 2;

2019         cmp     %o0,1023                        ! if (expy < 0x3ff);
2020         bl      .neg0                           ! if (expy < 0x3ff);
2021         or      %g0,0,%o5                       ! yisint = 0;

2023         cmp     %o0,1043                        ! if (expy <= (20 + 0x3ff));
2024         ble     .small0                         ! if (expy <= (20 + 0x3ff));
2025         sub     %o0,1023,%o0                    ! expy - 0x3ff;

2027         sub     %g0,%o0,%o0
2028         add     %o0,52,%o0                      ! sh = (52 - (expy - 0x3ff);
2029         srl     %l0,%o0,%i4                     ! i0 = (ly >> sh);

2031         sll     %i4,%o0,%i4                     ! (i0 << sh);

2033         srl     %l0,%o0,%o0                     ! i0 = (ly >> sh);
2034         cmp     %i4,%l0                         ! if ((i0 << sh) == ly);

2036         and     %o0,1,%o0                       ! i0 &= 1;

2038         sub     %g0,%o0,%o0
2039         add     %o0,2,%o0                       ! i0 = 2 - i0;

2041         move    %icc,%o0,%o5                    ! yisint = i0;
```



```
2043         ba      .neg0
2044         nop
2045 .small0:
2046         sub     %g0,%o0,%o0
2047         cmp     %l0,%g0                         ! if (ly != 0);

2049         add     %o0,20,%o0                      ! sh = (20 - (expy - 0x3ff);
2050         bne     .neg0                           ! if (ly != 0);
2051         or      %g0,0,%o5                       ! yisint = 0;

2053         srl     %l1,%o0,%i4                     ! i0 = (hy >> sh);

2055         sll     %i4,%o0,%i4                     ! (i0 << sh);

2057         srl     %l1,%o0,%o0                     ! i0 = (hy >> sh);
2058         cmp     %i4,%l1                         ! if ((i0 << sh) == hy);

2060         and     %o0,1,%o0                       ! i0 &= 1;

2062         sub     %g0,%o0,%o0
2063         add     %o0,2,%o0                       ! i0 = 2 - i0;

2065         move    %icc,%o0,%o5                    ! yisint = i0;
2066 .neg0:
2067         orcc    %l3,%i2,%g0                     ! if (x != 0);

2069         sra     %o2,31,%i4                      ! sy = (*((unsigned*)py)[0]) >>
2070         bne,pt  %icc,3f                         ! if (x != 0);
2071         nop

2073         cmp     %i4,%g0                         ! if (sy == 0);
2074         be      1f                              ! if (sy == 0);
2075         and     %o5,1,%i4                       ! yisint &= 1;

2077         fdivd   DONE,%f30,%f30                  ! y0 = DONE / y0;
2078 1:
2079         cmp     %i4,%g0                         ! if ((yisint & 1) == 0);
2080         be      2f                              ! if ((yisint & 1) == 0);
2081         nop

2083         fnegd   %f30,%f30                       ! y0 = -y0;
2084 2:
2085         st      %f30,[pz]
2086         ba      .update_point
2087         st      %f31,[pz+4]
2088 3:
2089         cmp     %o5,%g0                         ! if (yisint != 0);
2090         bne     .pos0                           ! if (yisint != 0);
2091         nop

2093         fdivd   DZERO,DZERO,%f30                ! y0 = DZERO / DZERO;
2094         st      %f30,[pz]
2095         ba      .update_point
2096         st      %f31,[pz+4]
2097 .pos0:
2098         orcc    %l3,%i2,%g0                     ! if (x != 0);

2100         sra     %o2,31,%i4                      ! sy = (*((unsigned*)py)[0]) >>
2101         bne,pt  %icc,.nzero0                    ! if (x != 0);
2102         nop

2104         cmp     %i4,%g0                         ! if (sy == 0);
2105         be      1f                              ! if (sy == 0);
2106         nop
```

```
2108         fdivd   DONE,%f30,%f30                  ! y0 = DONE / y0;
2109 1:
2110         st      %f30,[pz]
2111         ba      .update_point
2112         st      %f31,[pz+4]
2113 .nzero0:
2114         sll     %o5,11,%o5
2115         cmp     %l3,MASK_0x000fffff             ! if (exp > 0xfffff);

2117         bg,pt   %icc,.cont0                     ! if (exp > 0xfffff);
2118         st      %o5,[%fp+%o7]

2120         ldd     [%fp+tmp_mant],%f54

2122         or      %g0,1074,%o5
2123         fand    %f32,%f54,%f32                  ! y0 = vis_fand(x, MMANT);

2125         sll     %o5,20,%o5
2126         fxtod   %f32,%f32                       ! ax = (double) ((long long *) &

2128         std     %f32,[%fp+tmp0_hi]              ! exp = ((unsigned int*) & ax)[0
2129         fand    %f32,%f54,%f32                  ! x = vis_fand(ax, MMANT);

2131         ld      [%fp+tmp0_hi],%i2               ! exp = ((unsigned int*) & ax)[0
2132         for     %f32,DONE,%f32                  ! x = vis_for(x, DONE);

2134         sub     %i2,%o5,%l3                     ! exp -= (1023 + 51) << 20;
2135         and     MASK_0x000fffff,%i2,%l4         ! hx = exp & 0xfffff;
2136         or      MASK_0x3ff00000,%l4,%l4         ! hx |= 0x3ff00000;
2137         add     %l4,2048,%l4                    ! hx += 0x800;
2138         and     %l4,-4096,%l4                   ! hx &= 0xfffff000;

2140         ba      .cont0
2141         st      %l4,[%fp+tmp1_hi]               ! *(int*)&ax = hx;

2143         .align  16
2144 .update1:
2145         cmp     counter,0
2146         ble,pt  %icc,.cont1
2147         add     py,stridey,%o5

2149         stx     px,[%fp+tmp_px]

2151         orcc    %l2,%i2,%g0                     ! if (x == 0);
2152         bne,pt  %icc,.nzero1                    ! if (x == 0);
2153         stx     %o5,[%fp+tmp_py]
2154 .u1:
2155         st      counter,[%fp+tmp_counter]
2156         ba      .cont1
2157         or      %g0,0,counter
2158 .nzero1:
2159         lda     [%o5]%asi,%l1                   ! ld hy;
2160         cmp     %l0,%g0                         ! if (x >= 0);

2162         lda     [%o5+4]%asi,%l0                 ! ld ly
2163         bge,pt  %icc,.pos1                      ! if (x >= 0);
2164         or      %g0,%g0,%o5                     ! yisint = 0;

2166         and     %l1,MASK_0x7fffffff,%i2         ! hy &= 0x7fffffff;

2168         sra     %i2,20,%i2                      ! expy = hy >> 20;

2170         cmp     %i2,1076                        ! if (expy >= 0x434);
2171         bge     .neg1                           ! if (expy >= 0x434);
2172         or      %g0,2,%o5                       ! yisint = 2;
```



```
2174         cmp     %i2,1023                        ! if (expy < 0x3ff);
2175         bl      .neg1                           ! if (expy < 0x3ff);
2176         or      %g0,0,%o5                       ! yisint = 0;

2178         cmp     %i2,1043                        ! if (expy <= (20 + 0x3ff));
2179         ble     .small1                         ! if (expy <= (20 + 0x3ff));
2180         sub     %i2,1023,%i2                    ! expy - 0x3ff;

2182         sub     %g0,%i2,%i2
2183         add     %i2,52,%i2                      ! sh = (52 - (expy - 0x3ff);
2184         srl     %l0,%i2,%l1                     ! i0 = (ly >> sh);

2186         sll     %l1,%i2,%l1                     ! (i0 << sh);

2188         srl     %l0,%i2,%i2                     ! i0 = (ly >> sh);
2189         cmp     %l1,%l0                         ! if ((i0 << sh) == ly);

2191         and     %i2,1,%i2                       ! i0 &= 1;

2193         sub     %g0,%i2,%i2
2194         add     %i2,2,%i2                       ! i0 = 2 - i0;

2196         move    %icc,%i2,%o5                    ! yisint = i0;

2198         ba      .neg1
2199         nop
2200 .small1:
2201         sub     %g0,%i2,%i2
2202         cmp     %l0,%g0                         ! if (ly != 0);

2204         add     %i2,20,%i2                      ! sh = (20 - (expy - 0x3ff);
2205         bne     .neg1                           ! if (ly != 0);
2206         or      %g0,0,%o5                       ! yisint = 0;

2208         srl     %l1,%i2,%l0                     ! i0 = (hy >> sh);

2210         sll     %l0,%i2,%l0                     ! (i0 << sh);

2212         srl     %l1,%i2,%i2                     ! i0 = (hy >> sh);
2213         cmp     %l0,%l1                         ! if ((i0 << sh) == hy);

2215         and     %i2,1,%i2                       ! i0 &= 1;

2217         sub     %g0,%i2,%i2
2218         add     %i2,2,%i2                       ! i0 = 2 - i0;

2220         move    %icc,%i2,%o5                    ! yisint = i0;
2221 .neg1:
2222         cmp     %o5,%g0
2223         be      .u1
2224         nop
2225 .pos1:
2226         sll     %o5,11,%o5
2227         cmp     %l2,MASK_0x000fffff             ! if (exp > 0xfffff);

2229         bg,pt   %icc,.cont1                     ! if (exp > 0xfffff);
2230         st      %o5,[%fp+%o7]

2232         std     %f32,[%fp+tmp5];
2233         std     %f54,[%fp+tmp6];
2234         ldd     [%fp+tmp0_hi],%f32
2235         ldd     [%fp+tmp_mant],%f54

2237         or      %g0,1074,%o5
2238         fand    %f32,%f54,%f32                  ! y0 = vis_fand(x, MMANT);
```

```
2240         sll     %o5,20,%o5
2241         fxtod   %f32,%f32                       ! ax = (double) ((long long *) &

2243         std     %f32,[%fp+tmp0_hi]              ! exp = ((unsigned int*) & ax)[0
2244         fand    %f32,%f54,%f32                  ! x = vis_fand(ax, MMANT);

2246         ld      [%fp+tmp0_hi],%i2               ! exp = ((unsigned int*) & ax)[0
2247         for     %f32,DONE,%f32                  ! x = vis_for(x, DONE);

2249         std     %f32,[%fp+tmp0_hi];
2250         sub     %i2,%o5,%l2                     ! exp -= (1023 + 51) << 20;
2251         and     MASK_0x000fffff,%i2,%i4         ! hx = exp & 0xfffff;
2252         ldd     [%fp+tmp5],%f32
2253         or      MASK_0x3ff00000,%i4,%i4         ! hx |= 0x3ff00000;
2254         add     %i4,2048,%i4                    ! hx += 0x800;
2255         ldd     [%fp+tmp6],%f54
2256         and     %i4,-4096,%i4                   ! hx &= 0xfffff000;

2258         ba      .cont1
2259         st      %i4,[%fp+tmp1_hi]               ! *(int*)&ax = hx;

2261         .align  16
2262 .update2:
2263         cmp     counter,1
2264         ble,pt  %icc,.cont2
2265         add     py,stridey,%o5

2267         add     %o5,stridey,%o5
2268         stx     px,[%fp+tmp_px]

2270         orcc    %l3,%i2,%g0                     ! if (x == 0);
2271         bne,pt  %icc,.nzero2                    ! if (x == 0);
2272         stx     %o5,[%fp+tmp_py]
2273 .u2:
2274         sub     counter,1,counter
2275         st      counter,[%fp+tmp_counter]
2276         ba      .cont2
2277         or      %g0,1,counter
2278 .nzero2:
2279         lda     [%o5]%asi,%l1                   ! ld hy;
2280         cmp     %l0,%g0                         ! if (x >= 0);

2282         lda     [%o5+4]%asi,%l0                 ! ld ly
2283         bge,pt  %icc,.pos2                      ! if (x >= 0);
2284         or      %g0,%g0,%o5                     ! yisint = 0;

2286         and     %l1,MASK_0x7fffffff,%i2         ! hy &= 0x7fffffff;

2288         sra     %i2,20,%i2                      ! expy = hy >> 20;

2290         cmp     %i2,1076                        ! if (expy >= 0x434);
2291         bge     .neg2                           ! if (expy >= 0x434);
2292         or      %g0,2,%o5                       ! yisint = 2;

2294         cmp     %i2,1023                        ! if (expy < 0x3ff);
2295         bl      .neg2                           ! if (expy < 0x3ff);
2296         or      %g0,0,%o5                       ! yisint = 0;

2298         cmp     %i2,1043                        ! if (expy <= (20 + 0x3ff));
2299         ble     .small2                         ! if (expy <= (20 + 0x3ff));
2300         sub     %i2,1023,%i2                    ! expy - 0x3ff;

2302         sub     %g0,%i2,%i2
2303         add     %i2,52,%i2                      ! sh = (52 - (expy - 0x3ff);
2304         srl     %l0,%i2,%l1                     ! i0 = (ly >> sh);
```



```
2306         sll     %l1,%i2,%l1                     ! (i0 << sh);

2308         srl     %l0,%i2,%i2                     ! i0 = (ly >> sh);
2309         cmp     %l1,%l0                         ! if ((i0 << sh) == ly);

2311         and     %i2,1,%i2                       ! i0 &= 1;

2313         sub     %g0,%i2,%i2
2314         add     %i2,2,%i2                       ! i0 = 2 - i0;

2316         move    %icc,%i2,%o5                    ! yisint = i0;

2318         ba      .neg2
2319         nop
2320 .small2:
2321         sub     %g0,%i2,%i2
2322         cmp     %l0,%g0                         ! if (ly != 0);

2324         add     %i2,20,%i2                      ! sh = (20 - (expy - 0x3ff);
2325         bne     .neg2                           ! if (ly != 0);
2326         or      %g0,0,%o5                       ! yisint = 0;

2328         srl     %l1,%i2,%l0                     ! i0 = (hy >> sh);

2330         sll     %l0,%i2,%l0                     ! (i0 << sh);

2332         srl     %l1,%i2,%i2                     ! i0 = (hy >> sh);
2333         cmp     %l0,%l1                         ! if ((i0 << sh) == hy);

2335         and     %i2,1,%i2                       ! i0 &= 1;

2337         sub     %g0,%i2,%i2
2338         add     %i2,2,%i2                       ! i0 = 2 - i0;

2340         move    %icc,%i2,%o5                    ! yisint = i0;
2341 .neg2:
2342         cmp     %o5,%g0
2343         be      .u2
2344         nop
2345 .pos2:
2346         sll     %o5,11,%o5
2347         cmp     %l3,MASK_0x000fffff             ! if (exp > 0xfffff);

2349         bg,pt   %icc,.cont2                     ! if (exp > 0xfffff);
2350         st      %o5,[%fp+%o7]

2352         ldd     [%fp+tmp_mant],%f54

2354         or      %g0,1074,%o5
2355         fand    %f32,%f54,%f32                  ! y0 = vis_fand(x, MMANT);

2357         sll     %o5,20,%o5
2358         fxtod   %f32,%f32                       ! ax = (double) ((long long *) &

2360         std     %f32,[%fp+tmp0_hi]              ! exp = ((unsigned int*) & ax)[0
2361         fand    %f32,%f54,%f32                  ! x = vis_fand(ax, MMANT);

2363         ld      [%fp+tmp0_hi],%i2               ! exp = ((unsigned int*) & ax)[0
2364         for     %f32,DONE,%f32                  ! x = vis_for(x, DONE);

2366         sub     %i2,%o5,%l3                     ! exp -= (1023 + 51) << 20;
2367         and     MASK_0x000fffff,%i2,%l4         ! hx = exp & 0xfffff;
2368         or      MASK_0x3ff00000,%l4,%l4         ! hx |= 0x3ff00000;
2369         add     %l4,2048,%l4                    ! hx += 0x800;
2370         and     %l4,-4096,%l4                   ! hx &= 0xfffff000;
```

```
2372         ba      .cont2
2373         st      %l4,[%fp+tmp1_hi]               ! *(int*)&ax = hx;

2375         .align  16
2376 .update3:
2377         cmp     counter,0
2378         ble,pt  %icc,.cont3
2379         sub     px,stridex,%o5

2381         ld      [%fp+tmp_counter],%l1

2383         stx     %o5,[%fp+tmp_px]
2384         add     py,stridey,%o5

2386         add     %l1,counter,counter
2387         stx     %o5,[%fp+tmp_py]

2389         st      counter,[%fp+tmp_counter]
2390         ba      .cont3
2391         or      %g0,0,counter

2393         .align  16
2394 .update4:
2395         cmp     counter,2
2396         ble,pt  %icc,.cont4
2397         add     py,stridey,%o5

2399         add     %o5,stridey,%o5
2400         add     %o5,stridey,%o5
2401         stx     px,[%fp+tmp_px]

2403         orcc    %l2,%i2,%g0                     ! if (x == 0);
2404         bne,pt  %icc,.nzero4                    ! if (x == 0);
2405         stx     %o5,[%fp+tmp_py]
2406 .u4:
2407         sub     counter,2,counter
2408         st      counter,[%fp+tmp_counter]
2409         ba      .cont4
2410         or      %g0,2,counter
2411 .nzero4:
2412         lda     [%o5]%asi,%l1                   ! ld hy;
2413         cmp     %l0,%g0                         ! if (x >= 0);

2415         lda     [%o5+4]%asi,%l0                 ! ld ly
2416         bge,pt  %icc,.pos4                      ! if (x >= 0);
2417         or      %g0,%g0,%o5                     ! yisint = 0;

2419         and     %l1,MASK_0x7fffffff,%i2         ! hy &= 0x7fffffff;

2421         sra     %i2,20,%i2                      ! expy = hy >> 20;

2423         cmp     %i2,1076                        ! if (expy >= 0x434);
2424         bge     .neg4                           ! if (expy >= 0x434);
2425         or      %g0,2,%o5                       ! yisint = 2;

2427         cmp     %i2,1023                        ! if (expy < 0x3ff);
2428         bl      .neg4                           ! if (expy < 0x3ff);
2429         or      %g0,0,%o5                       ! yisint = 2;

2431         cmp     %i2,1043                        ! if (expy <= (20 + 0x3ff));
2432         ble     .small4                         ! if (expy <= (20 + 0x3ff));
2433         sub     %i2,1023,%i2                    ! expy - 0x3ff;

2435         sub     %g0,%i2,%i2
2436         add     %i2,52,%i2                      ! sh = (52 - (expy - 0x3ff);
2437         srl     %l0,%i2,%l1                     ! i0 = (ly >> sh);
```



```
2439         sll     %l1,%i2,%l1                     ! (i0 << sh);

2441         srl     %l0,%i2,%i2                     ! i0 = (ly >> sh);
2442         cmp     %l1,%l0                         ! if ((i0 << sh) == ly);

2444         and     %i2,1,%i2                       ! i0 &= 1;

2446         sub     %g0,%i2,%i2
2447         add     %i2,2,%i2                       ! i0 = 2 - i0;

2449         move    %icc,%i2,%o5                    ! yisint = i0;

2451         ba      .neg4
2452         nop
2453 .small4:
2454         sub     %g0,%i2,%i2
2455         cmp     %l0,%g0                         ! if (ly != 0);

2457         add     %i2,20,%i2                      ! sh = (20 - (expy - 0x3ff);
2458         bne     .neg4                           ! if (ly != 0);
2459         or      %g0,0,%o5                       ! yisint = 0;

2461         srl     %l1,%i2,%l0                     ! i0 = (hy >> sh);

2463         sll     %l0,%i2,%l0                     ! (i0 << sh);

2465         srl     %l1,%i2,%i2                     ! i0 = (hy >> sh);
2466         cmp     %l0,%l1                         ! if ((i0 << sh) == hy);

2468         and     %i2,1,%i2                       ! i0 &= 1;

2470         sub     %g0,%i2,%i2
2471         add     %i2,2,%i2                       ! i0 = 2 - i0;

2473         move    %icc,%i2,%o5                    ! yisint = i0;
2474 .neg4:
2475         cmp     %o5,%g0
2476         be      .u4
2477         nop
2478 .pos4:
2479         sll     %o5,11,%o5
2480         cmp     %l2,MASK_0x000fffff             ! if (exp > 0xfffff);

2482         bg,pt   %icc,.cont4                     ! if (exp > 0xfffff);
2483         st      %o5,[%fp+%o7]

2485         std     %f32,[%fp+tmp5];
2486         std     %f54,[%fp+tmp6];
2487         ldd     [%fp+tmp0_hi],%f32
2488         ldd     [%fp+tmp_mant],%f54

2490         or      %g0,1074,%o5
2491         fand    %f32,%f54,%f32                  ! y0 = vis_fand(x, MMANT);

2493         sll     %o5,20,%o5
2494         fxtod   %f32,%f32                       ! ax = (double) ((long long *) &

2496         std     %f32,[%fp+tmp0_hi]              ! exp = ((unsigned int*) & ax)[0
2497         fand    %f32,%f54,%f32                  ! x = vis_fand(ax, MMANT);

2499         ld      [%fp+tmp0_hi],%i2               ! exp = ((unsigned int*) & ax)[0
2500         for     %f32,DONE,%f32                  ! x = vis_for(x, DONE);

2502         std     %f32,[%fp+tmp0_hi];
2503         sub     %i2,%o5,%l2                     ! exp -= (1023 + 51) << 20;
```

```
2504         and     MASK_0x000fffff,%i2,%i4         ! hx = exp & 0xfffff;
2505         ldd     [%fp+tmp5],%f32
2506         or      MASK_0x3ff00000,%i4,%i4         ! hx |= 0x3ff00000;
2507         add     %i4,2048,%i4                    ! hx += 0x800;
2508         ldd     [%fp+tmp6],%f54
2509         and     %i4,-4096,%i4                   ! hx &= 0xfffff000;

2511         ba      .cont4
2512         st      %i4,[%fp+tmp1_hi]               ! *(int*)&ax = hx;

2514         .align  16
2515 .update5:
2516         cmp     counter,1
2517         ble,pt  %icc,.cont5
2518         sub     px,stridex,%o5

2520         ld      [%fp+tmp_counter],%l1

2522         stx     %o5,[%fp+tmp_px]
2523         add     py,stridey,%o5

2525         add     %l1,counter,counter
2526         stx     %o5,[%fp+tmp_py]

2528         sub     counter,1,counter
2529         st      counter,[%fp+tmp_counter]
2530         ba      .cont5
2531         or      %g0,1,counter

2533         .align  16
2534 .update6:
2535         cmp     counter,0
2536         ble,pt  %icc,.cont6
2537         fmovd   DONE,%f30

2539         ld      [%fp+tmp_counter],%o2
2540         sub     px,stridex,%o5

2542         sub     %o5,stridex,%o5
2543         stx     py,[%fp+tmp_py]

2545         add     %o2,counter,counter
2546         sub     %o5,stridex,%o5
2547         stx     %o5,[%fp+tmp_px]

2549         st      counter,[%fp+tmp_counter]
2550         ba      .cont6
2551         or      %g0,0,counter

2553         .align  16
2554 .update7:
2555         cmp     counter,0
2556         ble,pt  %icc,.cont7
2557         fmovd   DONE,%f30
2558         sub     px,stridex,%o5

2560         ld      [%fp+tmp_counter],%o2

2562         sub     %o5,stridex,%o5
2563         stx     py,[%fp+tmp_py]

2565         add     %o2,counter,counter
2566         sub     %o5,stridex,%o5
2567         stx     %o5,[%fp+tmp_px]

2569         st      counter,[%fp+tmp_counter]
```



```
2570         ba      .cont7
2571         or      %g0,0,counter

2573         .align  16
2574 .update8:
2575         cmp     counter,2
2576         ble,pt  %icc,.cont8
2577         add     py,stridey,%o5

2579         add     %o5,stridey,%o5
2580         stx     px,[%fp+tmp_px]

2582         orcc    %l3,%i2,%g0                     ! if (x == 0);
2583         bne,pt  %icc,.nzero8                    ! if (x == 0);
2584         stx     %o5,[%fp+tmp_py]
2585 .u8:
2586         sub     counter,2,counter
2587         st      counter,[%fp+tmp_counter]
2588         ba      .cont8
2589         or      %g0,2,counter
2590 .nzero8:
2591         lda     [%o5]%asi,%l1                   ! ld hy;
2592         cmp     %l0,%g0                         ! if (x >= 0);

2594         lda     [%o5+4]%asi,%l0                 ! ld ly
2595         bge,pt  %icc,.pos8                      ! if (x >= 0);
2596         or      %g0,%g0,%o5                     ! yisint = 0;

2598         and     %l1,MASK_0x7fffffff,%i2         ! hy &= 0x7fffffff;

2600         sra     %i2,20,%i2                      ! expy = hy >> 20;

2602         cmp     %i2,1076                        ! if (expy >= 0x434);
2603         bge     .pos8                           ! if (expy >= 0x434);
2604         or      %g0,2,%o5                       ! yisint = 2;

2606         cmp     %i2,1023                        ! if (expy < 0x3ff);
2607         bl      .neg8                           ! if (expy < 0x3ff);
2608         or      %g0,0,%o5                       ! yisint = 0;

2610         cmp     %i2,1043                        ! if (expy <= (20 + 0x3ff));
2611         ble     .small8                         ! if (expy <= (20 + 0x3ff));
2612         sub     %i2,1023,%i2                    ! expy - 0x3ff;

2614         sub     %g0,%i2,%i2
2615         add     %i2,52,%i2                      ! sh = (52 - (expy - 0x3ff);
2616         srl     %l0,%i2,%l1                     ! i0 = (ly >> sh);

2618         sll     %l1,%i2,%l1                     ! (i0 << sh);

2620         srl     %l0,%i2,%i2                     ! i0 = (ly >> sh);
2621         cmp     %l1,%l0                         ! if ((i0 << sh) == ly);

2623         and     %i2,1,%i2                       ! i0 &= 1;

2625         sub     %g0,%i2,%i2
2626         add     %i2,2,%i2                       ! i0 = 2 - i0;

2628         move    %icc,%i2,%o5                    ! yisint = i0;

2630         ba      .neg8
2631         nop
2632 .small8:
2633         sub     %g0,%i2,%i2
2634         cmp     %l0,%g0                         ! if (ly != 0);
```

```
2636         add     %i2,20,%i2                      ! sh = (20 - (expy - 0x3ff);
2637         bne     .neg8                           ! if (ly != 0);
2638         or      %g0,0,%o5                       ! yisint = 0;

2640         srl     %l1,%i2,%l0                     ! i0 = (hy >> sh);

2642         sll     %l0,%i2,%l0                     ! (i0 << sh);

2644         srl     %l1,%i2,%i2                     ! i0 = (hy >> sh);
2645         cmp     %l0,%l1                         ! if ((i0 << sh) == hy);

2647         and     %i2,1,%i2                       ! i0 &= 1;

2649         sub     %g0,%i2,%i2
2650         add     %i2,2,%i2                       ! i0 = 2 - i0;

2652         move    %icc,%i2,%o5                    ! yisint = i0;
2653 .neg8:
2654         cmp     %o5,%g0
2655         be      .u8
2656         nop
2657 .pos8:
2658         sll     %o5,11,%o5
2659         cmp     %l3,MASK_0x000fffff             ! if (exp > 0xfffff);

2661         bg,pt   %icc,.cont8                     ! if (exp > 0xfffff);
2662         st      %o5,[%fp+%o7]

2664         ldd     [%fp+tmp_mant],%f54

2666         or      %g0,1074,%o5
2667         fand    %f32,%f54,%f32                  ! y0 = vis_fand(x, MMANT);

2669         sll     %o5,20,%o5
2670         fxtod   %f32,%f32                       ! ax = (double) ((long long *) &

2672         std     %f32,[%fp+tmp0_hi]              ! exp = ((unsigned int*) & ax)[0
2673         fand    %f32,%f54,%f32                  ! x = vis_fand(ax, MMANT);

2675         ld      [%fp+tmp0_hi],%i2               ! exp = ((unsigned int*) & ax)[0
2676         for     %f32,DONE,%f32                  ! x = vis_for(x, DONE);

2678         sub     %i2,%o5,%l3                     ! exp -= (1023 + 51) << 20;
2679         and     MASK_0x000fffff,%i2,%l4         ! hx &= 0xfffff;
2680         or      MASK_0x3ff00000,%l4,%l4         ! hx |= 0x3ff00000;
2681         add     %l4,2048,%l4                    ! hx += 0x800;
2682         and     %l4,-4096,%l4                   ! hx &= 0xfffff000;

2684         ba      .cont8
2685         st      %l4,[%fp+tmp1_hi]               ! *(int*)&ax = hx;

2687         .align  16
2688 .update9:
2689         cmp     counter,1
2690         ble,pt  %icc,.cont9
2691         sub     px,stridex,%o5

2693         ld      [%fp+tmp_counter],%l1

2695         stx     %o5,[%fp+tmp_px]
2696         add     py,stridey,%o5

2698         add     %l1,counter,counter
2699         stx     %o5,[%fp+tmp_py]

2701         sub     counter,1,counter
```



```
2702         st      counter,[%fp+tmp_counter]
2703         ba      .cont9
2704         or      %g0,1,counter

2706         .align  16
2707 .update10:
2708         cmp     counter,0
2709         ble,pt  %icc,.cont10
2710         fmovd   DONE,%f30

2712         ld      [%fp+tmp_counter],%o2
2713         sub     px,stridex,%o5

2715         sub     %o5,stridex,%o5
2716         stx     py,[%fp+tmp_py]

2718         add     %o2,counter,counter
2719         sub     %o5,stridex,%o5
2720         stx     %o5,[%fp+tmp_px]

2722         st      counter,[%fp+tmp_counter]
2723         ba      .cont10
2724         or      %g0,0,counter

2726         .align  16
2727 .update11:
2728         cmp     counter,0
2729         ble,pt  %icc,.cont11
2730         fmovd   DONE,%f30

2732         ld      [%fp+tmp_counter],%o2
2733         sub     px,stridex,%o5

2735         sub     %o5,stridex,%o5
2736         stx     py,[%fp+tmp_py]

2738         add     %o2,counter,counter
2739         sub     %o5,stridex,%o5
2740         stx     %o5,[%fp+tmp_px]

2742         st      counter,[%fp+tmp_counter]
2743         ba      .cont11
2744         or      %g0,0,counter

2746         .align  16
2747 .update12:
2748         cmp     counter,3
2749         ble,pt  %icc,.cont12
2750         add     py,stridey,%o5

2752         add     %o5,stridey,%o5
2753         stx     px,[%fp+tmp_px]

2755         add     %o5,stridey,%o5
2756         orcc    %l2,%i2,%g0                     ! if (x == 0);

2758         bne,pt  %icc,.nzero12                   ! if (x == 0);
2759         stx     %o5,[%fp+tmp_py]
2760 .u12:
2761         sub     counter,3,counter
2762         st      counter,[%fp+tmp_counter]
2763         ba      .cont12
2764         or      %g0,3,counter
2765 .nzero12:
2766         lda     [%o5]%asi,%l1                   ! ld hy;
2767         cmp     %l0,%g0                         ! if (x >= 0);
```

```
2769         lda     [%o5+4]%asi,%l0                 ! ld ly
2770         bge,pt  %icc,.pos12                     ! if (x >= 0);
2771         or      %g0,%g0,%o5                     ! yisint = 0;

2773         and     %l1,MASK_0x7fffffff,%i2         ! hy &= 0x7fffffff;

2775         sra     %i2,20,%i2                      ! expy = hy >> 20;

2777         cmp     %i2,1076                        ! if (expy >= 0x434);
2778         bge     .neg12                          ! if (expy >= 0x434);
2779         or      %g0,2,%o5                       ! yisint = 2;

2781         cmp     %i2,1023                        ! if (expy < 0x3ff);
2782         bl      .neg12                          ! if (expy < 0x3ff);
2783         or      %g0,0,%o5                       ! yisint = 0;

2785         cmp     %i2,1043                        ! if (expy <= (20 + 0x3ff));
2786         ble     .small12                        ! if (expy <= (20 + 0x3ff));
2787         sub     %i2,1023,%i2                    ! expy - 0x3ff;

2789         sub     %g0,%i2,%i2
2790         add     %i2,52,%i2                      ! sh = (52 - (expy - 0x3ff);
2791         srl     %l0,%i2,%l1                     ! i0 = (ly >> sh);

2793         sll     %l1,%i2,%l1                     ! (i0 << sh);

2795         srl     %l0,%i2,%i2                     ! i0 = (ly >> sh);
2796         cmp     %l1,%l0                         ! if ((i0 << sh) == ly);

2798         and     %i2,1,%i2                       ! i0 &= 1;

2800         sub     %g0,%i2,%i2
2801         add     %i2,2,%i2                       ! i0 = 2 - i0;

2803         move    %icc,%i2,%o5                    ! yisint = i0;

2805         ba      .neg12
2806         nop
2807 .small12:
2808         sub     %g0,%i2,%i2
2809         cmp     %l0,%g0                         ! if (ly != 0);

2811         add     %i2,20,%i2                      ! sh = (20 - (expy - 0x3ff);
2812         bne     .neg12                          ! if (ly != 0);
2813         or      %g0,0,%o5                       ! yisint = 0;

2815         srl     %l1,%i2,%l0                     ! i0 = (hy >> sh);

2817         sll     %l0,%i2,%l0                     ! (i0 << sh);

2819         srl     %l1,%i2,%i2                     ! i0 = (hy >> sh);
2820         cmp     %l0,%l1                         ! if ((i0 << sh) == hy);

2822         and     %i2,1,%i2                       ! i0 &= 1;

2824         sub     %g0,%i2,%i2
2825         add     %i2,2,%i2                       ! i0 = 2 - i0;

2827         move    %icc,%i2,%o5                    ! yisint = i0;
2828 .neg12:
2829         cmp     %o5,%g0
2830         be      .u12
2831         nop
2832 .pos12:
2833         sll     %o5,11,%o5
```



```
2834         cmp     %l2,MASK_0x000fffff             ! y0 = vis_fand(x, MMANT);

2836         bg,pt   %icc,.cont12                    ! y0 = vis_fand(x, MMANT);
2837         st      %o5,[%fp+%o7]

2839         std     %f32,[%fp+tmp5];
2840         std     %f54,[%fp+tmp6];
2841         ldd     [%fp+tmp0_hi],%f32
2842         ldd     [%fp+tmp_mant],%f54

2844         or      %g0,1074,%o5
2845         fand    %f32,%f54,%f32                  ! y0 = vis_fand(x, MMANT);

2847         sll     %o5,20,%o5
2848         fxtod   %f32,%f32                       ! ax = (double) ((long long *) &

2850         std     %f32,[%fp+tmp0_hi]              ! exp = ((unsigned int*) & ax)[0
2851         fand    %f32,%f54,%f32                  ! x = vis_fand(ax, MMANT);

2853         ld      [%fp+tmp0_hi],%i2               ! exp = ((unsigned int*) & ax)[0
2854         for     %f32,DONE,%f32                  ! x = vis_for(x, DONE);

2856         std     %f32,[%fp+tmp0_hi];
2857         sub     %i2,%o5,%l2                     ! exp -= (1023 + 51) << 20;
2858         and     MASK_0x000fffff,%i2,%i4         ! hx &= 0xfffff;
2859         ldd     [%fp+tmp5],%f32
2860         or      MASK_0x3ff00000,%i4,%i4         ! hx |= 0x3ff00000;
2861         add     %i4,2048,%i4                    ! hx += 0x800;
2862         ldd     [%fp+tmp6],%f54
2863         and     %i4,-4096,%i4                   ! hx &= 0xfffff000;

2865         ba      .cont12
2866         st      %i4,[%fp+tmp1_hi]               ! *(int*)&ax = hx;

2868         .align  16
2869 .update13:
2870         cmp     counter,2
2871         ble,pt  %icc,.cont13
2872         sub     px,stridex,%o5

2874         ld      [%fp+tmp_counter],%l1

2876         stx     %o5,[%fp+tmp_px]
2877         add     py,stridey,%o5

2879         add     %l1,counter,counter
2880         stx     %o5,[%fp+tmp_py]

2882         sub     counter,2,counter
2883         st      counter,[%fp+tmp_counter]
2884         ba      .cont13
2885         or      %g0,2,counter

2887         .align  16
2888 .update14:
2889         cmp     counter,1
2890         ble,pt  %icc,.cont14
2891         fmovd   DONE,%f30

2893         ld      [%fp+tmp_counter],%o2
2894         sub     px,stridex,%o5

2896         sub     %o5,stridex,%o5
2897         stx     py,[%fp+tmp_py]

2899         add     %o2,counter,counter
```

```
2900         sub     %o5,stridex,%o5
2901         stx     %o5,[%fp+tmp_px]

2903         sub     counter,1,counter
2904         st      counter,[%fp+tmp_counter]
2905         ba      .cont14
2906         or      %g0,1,counter

2908         .align  16
2909 .update15:
2910         cmp     counter,1
2911         ble,pt  %icc,.cont15
2912         fmovd   DONE,%f30

2914         sub     px,stridex,%o5

2916         ld      [%fp+tmp_counter],%o2
2917         sub     %o5,stridex,%o5
2918         stx     py,[%fp+tmp_py]

2920         add     %o2,counter,counter
2921         sub     %o5,stridex,%o5
2922         stx     %o5,[%fp+tmp_px]

2924         sub     counter,1,counter
2925         st      counter,[%fp+tmp_counter]
2926         ba      .cont15
2927         or      %g0,1,counter

2929         .align  16
2930 .spec0:
2931         lda     [py+4]%asi,%o5                  ! ld ly;
2932         lda     [px]%asi,%f16                   ! y0 = *px;
2933         lda     [px+4]%asi,%f17                 ! y0 = *px;
2934         orcc    %l1,%o5,%g0                     ! if (hy | ly) != 0;

2936         bne,pn  %icc,1f
2937         sethi   %hi(0x7ff00000),%o5

2939         st      DONE_HI,[pz]
2940         ba      .update_point
2941         st      DONE_LO,[pz+4]
2942 1:
2943         cmp     %l3,%o5                         ! if (hx > 0x7ff00000);
2944         bgu,a,pn        %icc,6f                 ! if (hx > 0x7ff00000);
2945         fmuld   %f16,%f16,%f16                  ! *pz = y0 * y0;

2947         bne,pt  %icc,2f                         ! if (hx != 0x7ff00000);
2948         orcc    %l3,%i2,%g0                     ! if (hx | lx) != 0;

2950         cmp     %i2,0                           ! if (lx) != 0;
2951         bne,pn  %icc,5f                         ! if (lx) != 0;
2952         srl     %o2,31,%o5                      ! sy;

2954         st      %l3,[pz]                        ! ((int*)pz)[0] = hx;
2955         ba      3f
2956         cmp     %o5,0                           ! if (sy == 0);
2957 2:
2958         bne,pt  %icc,4f                         ! if (hx | lx) != 0;
2959         srl     %l0,31,%o5                      ! sx;

2961         st      %l3,[pz]                        ! ((int*)pz)[0] = hx;
2962         srl     %o2,31,%o5                      ! sy;
2963         cmp     %o5,0                           ! if (sy == 0);
2964 3:
2965         be,pt   %icc,.update_point              ! if (sy == 0);
```



```
2966         st      %i2,[pz+4]                      ! ((int*)pz)[1] = lx;

2968         ld      [pz],%f16                       ! *pz;
2969         ld      [pz+4],%f17                     ! *pz;
2970         fdivd   DONE,%f16,%f16                  ! *pz = DONE / *pz;

2972         st      %f16,[pz]
2973         ba      .update_point
2974         st      %f17,[pz+4]
2975 4:
2976         cmp     %o5,0                           ! if (sx == 0);
2977         bne,a,pt        %icc,1f
2978         nop

2980         st      DONE_HI,[pz]                    ! *pz = DONE;
2981         ba      .update_point
2982         st      DONE_LO,[pz+4]                  ! *pz = DONE;
2983 1:
2984         fdivd   DZERO,DZERO,%f16                ! *pz = DZERO / DZERO;
2985         st      %f16,[pz]
2986         ba      .update_point
2987         st      %f17,[pz+4]
2988 5:
2989         fmuld   %f16,%f16,%f16                  ! *pz = y0 * y0;
2990 6:
2991         st      %f16,[pz]
2992         ba      .update_point
2993         st      %f17,[pz+4]

2995         .align  16
2996 .spec1:
2997         lda     [px]%asi,%f14                   ! y0 = *px;
2998         lda     [px+4]%asi,%f15                 ! y0 = *px;
2999         sethi   %hi(0x7ff00000),%o5
3000         lda     [py+4]%asi,%i4                  ! ld ly;
3001         srl     %o2,31,%o2                      ! sy
3002         cmp     %l3,%o5                         ! if (hx >= 0x7ff00000);
3003         bcc,pn  %icc,3f
3004         nop

3006         cmp     %l1,%o5                         ! if (hy > 0x7ff00000);
3007         bgu,a,pt        %icc,.spec1_nan_inf     ! if (hy > 0x7ff00000);
3008         lda     [py]%asi,%f16                   ! ld y

3010         bne,a,pt        %icc,1f                 ! if (hy != 0x7ff00000);
3011         cmp     %i2,0                           ! if (lx != 0);

3013         ba      2f                              ! if (hy == 0x7ff00000);
3014         cmp     %i4,0                           ! if (ly != 0);
3015 1:
3016         bne,pt  %icc,7f                         ! if (lx != 0);
3017         nop

3019         cmp     %l3,0                           ! if (hx == 0);
3020         be,a,pt %icc,6f                         ! if (hx == 0);
3021         st      %l3,[pz]                        ! ((int*)pz)[0] = hx;

3023         cmp     %l3,MASK_0x3ff00000             ! if (hx == 0x3ff00000);
3024         be,a,pn %icc,6f                         ! if (hx == 0x3ff00000);
3025         st      %l3,[pz]                        ! ((int*)pz)[0] = hx;

3027         ba      5f
3028         cmp     %l3,%o5                         ! if (hx != 0x7ff00000);
3029 3:
3030         bgu,a,pt        %icc,.spec1_nan_inf     ! if (hx > 0x7ff00000);
3031         lda     [py]%asi,%f16                   ! ld y
```

```
3033         bne,a,pn        %icc,1f                 ! if (hx != 0x7ff00000);
3034         cmp     %l1,%o5                         ! if (hy > 0x7ff00000);

3036         cmp     %i2,0                           ! if (lx != 0);
3037         bne,a,pt        %icc,.spec1_nan_inf     ! if (lx != 0);
3038         lda     [py]%asi,%f16                   ! ld y

3040         cmp     %l1,%o5                         ! if (hy > 0x7ff00000);
3041 1:
3042         bgu,a,pt        %icc,.spec1_nan_inf     ! if (hy > 0x7ff00000);
3043         lda     [py]%asi,%f16                   ! ld y

3045         bne,pn  %icc,3f                         ! if (hy != 0x7ff00000);
3046         nop

3048         cmp     %i4,0                           ! if (ly != 0);
3049 2:
3050         bne,a,pn        %icc,.spec1_nan_inf     ! if (ly != 0);
3051         lda     [py]%asi,%f16                   ! ld y

3053         cmp     %l3,MASK_0x3ff00000             ! if (hx != 0x3ff00000);
3054         bne,pn  %icc,1f                         ! if (hx != 0x3ff00000);
3055         cmp     %i2,0                           ! if (lx != 0);

3057         bne,pn  %icc,1f                         ! if (lx != 0);
3058         nop

3060         ld      [py],%f16                       ! ld y
3061         ld      [py+4],%f17                     ! ld y
3062         fzero   %f14
3063         fmuld   %f16,%f14,%f14                  ! *pz = *py * 0.0;
3064         st      %f14,[pz]
3065         ba      .update_point
3066         st      %f15,[pz+4]
3067 1:
3068         sub     %l3,MASK_0x3ff00000,%o7         ! (hx - 0x3ff00000);
3069         srlx    %o7,63,%l2                      ! (hx - 0x3ff00000) >> 63;

3071         cmp     %l2,%o2                         ! if ((hx < 0x3ff00000) == sy)
3072         be,a,pn %icc,1f                         ! if ((hx < 0x3ff00000) == sy)
3073         st      %l1,[pz]                        ! ((int*)pz)[0] = hy;

3075         st      DZERO_HI,[pz]                   ! *pz = DZERO;
3076         ba      .update_point
3077         st      DZERO_LO,[pz+4]                 ! *pz = DZERO;
3078 1:
3079         ba      .update_point
3080         st      %i4,[pz+4]                      ! ((int*)pz)[0] = ly;
3081 3:
3082         cmp     %o0,1086                        ! if (expy >= 0x43e);
3083         bge,pn  %icc,4f                         ! if (expy >= 0x43e)
3084         nop

3086         srl     %l0,31,%l0                      ! sx;
3087         cmp     %l0,0                           ! if (sx == 0);
3088         be,pn   %icc,2f
3089         or      %g0,0,%l4

3091         cmp     %o0,1076                        ! if (expy >= 0x434);

3093         bge,pn  %icc,2f                         ! if (expy >= 0x434);
3094         or      %g0,2,%l4                       ! yisint = 2;

3096         cmp     %o0,1023                        ! if (expy < 0x3ff);
3097         bl,a,pn %icc,2f                         ! if (expy < 0x3ff);
```



```
3098         or      %g0,0,%l4                       ! yisint = 0;

3100         cmp     %o0,1043                        ! if (expy <= (20 + 0x3ff));
3101         ble,pn  %icc,1f
3102         sub     %o0,1023,%l2                    ! (expy - 0x3ff);

3104         sub     %g0,%l2,%l2                     ! 0 - (expy - 0x3ff);
3105         add     %l2,52,%l2                      ! sh = 52 - (expy - 0x3ff);
3106         srl     %i4,%l2,%o0                     ! i0 = ly >> sh;
3107         sll     %o0,%l2,%l2                     ! i0 << sh;
3108         cmp     %l2,%i4                         ! if ((i0 << sh) != ly);
3109         bne,a,pn        %icc,2f                 ! if ((i0 << sh) != ly);
3110         or      %g0,0,%l4                       ! yisint = 0;

3112         and     %o0,1,%o0                       ! i0 &= 1;
3113         sub     %g0,%o0,%o0

3115         ba      2f
3116         add     %o0,2,%l4                       ! yisint = 2 - (i0 & 1);
3117 1:
3118         cmp     %i4,0                           ! if (ly != 0)
3119         bne,a,pn        %icc,2f                 ! if (ly != 0)
3120         or      %g0,0,%l4                       ! yisint = 0;

3122         sub     %o0,1023,%l2                    ! (expy - 0x3ff);
3123         sub     %g0,%l2,%l2                     ! 0 - (expy - 0x3ff);
3124         add     %l2,20,%l2                      ! sh = 20 - (expy - 0x3ff);
3125         srl     %l1,%l2,%o0                     ! i0 = hy >> sh;
3126         sll     %o0,%l2,%l2                     ! i0 << sh;
3127         cmp     %l2,%l1                         ! if ((i0 << sh) != hy);
3128         bne,a,pn        %icc,2f                 ! if ((i0 << sh) != hy);
3129         or      %g0,0,%l4                       ! yisint = 0;

3131         and     %o0,1,%o0                       ! i0 &= 1;
3132         sub     %g0,%o0,%o0
3133         add     %o0,2,%l4                       ! yisint = 2 - (i0 & 1);
3134 2:
3135         cmp     %o2,0                           ! if (sy == 0);
3136         sll     %l4,31,%l4                      ! yisint << 31;
3137         be,pt   %icc,1f                         ! if (sy == 0);
3138         add     %l3,%l4,%l3                     ! hx += yisint << 31;

3140         or      %g0,%l4,%l3                     ! hx = yisint << 31;
3141         or      %g0,0,%i2                       ! lx = 0;
3142 1:
3143         st      %l3,[pz]                        ! ((int*)pz)[0] = hx;
3144         ba      .update_point
3145         st      %i2,[pz+4]                      ! ((int*)pz)[1] = lx;
3146 4:
3147         cmp     %i2,0                           ! if (lx != 0);
3148         bne,pn  %icc,7f                         ! if (lx != 0);
3149         nop

3151         cmp     %l3,%o5                         ! if (hx != 0x7ff00000);
3152 5:
3153         bne,pn  %icc,7f                         ! if (hx != 0x7ff00000);
3154         nop

3156         st      %l3,[pz]                        ! ((int*)pz)[0] = hx;
3157 6:
3158         cmp     %o2,0                           ! if (sy == 0);
3159         be,pt   %icc,.update_point
3160         st      %i2,[pz+4]                      ! ((int*)pz)[1] = lx;

3162         ld      [pz],%f14                       ! ld *pz;
3163         ld      [pz+4],%f15                     ! ld *pz;
```

```
3164         fdivd   DONE,%f14,%f14                  ! *pz = DONE / *pz;
3165         st      %f14,[pz]
3166         ba      .update_point
3167         st      %f15,[pz+4]
3168 7:
3169         sub     %l3,MASK_0x3ff00000,%o7         ! hx - 0x3ff00000;
3170         srlx    %o7,63,%l2                      ! (hx - 0x3ff00000) >> 63;
3171         cmp     %l2,%o2                         ! if (hx < 0x3ff00000) == sy);
3172         be,a,pn %icc,1f                         ! if (hx < 0x3ff00000) == sy);
3173         ldd     [EXPTBL-ind_HUGE],%f14          ! y0 = _HUGE;

3175         ldd     [EXPTBL-ind_TINY],%f14          ! y0 = _TINY;
3176 1:
3177         fmuld   %f14,%f14,%f14                  ! *pz = y0 * y0

3179         st      %f14,[pz]
3180         ba .update_point
3181         st      %f15,[pz+4]

3183         .align  16
3184 .spec1_nan_inf:
3185         lda     [py+4]%asi,%f17                 ! ld y
3186         fmuld   %f14,%f16,%f16                  ! *pz = *px * *py
3187         st      %f16,[pz]
3188         ba      .update_point
3189         st      %f17,[pz+4]


3192         .align  16
3193 .update_point:
3194         add     px,stridex,px
3195         ba      .begin1
3196         add     py,stridey,py

3198         .align  64
3199 .stridex_zero:

3201         sra     stridez,0,stridez
3202         ld      [%i1],%f18                      ! y0 = px[0];
3203         ld      [%i1+4],%f19                    ! y0 = px[0];

3205         sra     %i4,0,stridey
3206         sethi   %hi(0xffc00),MASK_0x000fffff
3207         ldd     [%l0+80],%f12                   ! ld MMANT

3209         sllx    stridez,3,stridez
3210         add     MASK_0x000fffff,0x3ff,MASK_0x000fffff
3211         ldd     [%l0+8],%f56                    ! ld  DONE

3213         sllx    stridey,3,stridey
3214         ldd     [%l0+88],%f14                   ! ld  MROUND

3216         ldd     [%l0+96],%f16                   ! ld  MHI20
3217         cmp     %o0,MASK_0x000fffff             ! if (exp <= 0xffffff)

3219         bg,pt   %icc,1f
3220         srl     %o0,20,%o0                      ! exp = (exp >> 20);

3222         fxtod   %f18,%f18                       ! y0 = (double) ((long long *) &
3223         std     %f18,[%fp+tmp0_hi]              ! exp = ((unsigned int*) & y0)[0
3224         or      %g0,1074,%i2
3225         ld      [%fp+tmp0_hi],%o0               ! exp = ((unsigned int*) & y0)[0
3226         srl     %o0,20,%o0                      ! exp = (exp >> 20);
3227         sub     %o0,%i2,%o0                     ! exp -= (1023 + 51) << 20;
3228 1:
3229         ldd     [%l0+24],MHI32
```



```
3230         sub     %o0,2046,%l5                    ! exp = exp - 2046;
3231         fand    %f18,%f12,%f18                  ! x = vis_fand(y0, MMANT);

3233         ldd     [%l0+48],%f10                   ! ld KA1
3234         for     %f18,%f56,%f18                  ! x = vis_for(x, DONE);

3236         ldd     [EXPTBL-ind_HI],%f28            ! ld KA1_HI
3237         fpadd32 %f18,%f14,%f44                  ! ax = vis_fpadd32(x, MROUND);

3239         ldd     [%l0+32],%f46                   ! ld KA5
3240         fand    %f44,%f16,%f60                  ! ax = vis_fand(ax, MHI20);

3242         std     %f60,[%fp+tmp0_hi]              ! itmp0 = (hx >> 20);
3243         faddd   %f18,%f60,%f50                  ! ux = x + ax;

3245         ldd     [EXPTBL-ind_LO],%f52            ! ld KA1_LO
3246         fsubd   %f18,%f60,%f30                  ! u = x - ax;

3248         ld      [%fp+tmp0_hi],%i2               ! itmp0 = (hx >> 20);
3249         fdivd   %f56,%f50,%f56                  ! yd = DONE / ux;
3250         fand    %f50,MHI32,%f50                 ! ux = vis_fand(ux, MHI32);

3252         srl     %i2,20,%l3                      ! itmp0 = (hx >> 20);
3253         ldd     [%l0+40],%f26                   ! ld KA3

3255         srl     %i2,8,%i2                       ! i = (hx >> 8);
3256         add     %l5,%l3,%l5                     ! exp += itmp0;

3258         and     %i2,4080,%o3                    ! i = i & 0xff0;
3259         sll     %l5,8,%l3                       ! itmp0 = exp << 8;
3260         st      %l3,[%fp+tmp1_hi]               ! (double)itmp0;
3261         fsubd   %f50,%f60,%f60                  ! dtmp0 = (ux - ax);

3263         add     %o3,8,%i2
3264         ldd     [%o3+LOGTBL],%f58               ! y = *(double *)((char*)__mt_co

3266         ldd     [%i2+LOGTBL],%f20               ! dtmp0 = *(double *)((char*)__m

3268         ld      [%fp+tmp1_hi],%f8               ! (double)itmp0;

3270         fitod   %f8,%f62                        ! (double)itmp0;

3272         faddd   %f58,%f62,%f22                  ! y += (double)itmp0;

3274         fsubd   %f18,%f60,%f62                  ! s_l = (x - dtmp0);
3275         fmuld   %f30,%f56,%f16                  ! s = u * yd;

3277         fmuld   %f10,%f56,%f8                   ! dtmp0 = KA1 * yd;
3278         fand    %f16,MHI32,%f58                 ! s_h = vis_fand(s, MHI32);

3280         ldd     [%l0+56],HTHRESH
3281         fmuld   %f16,%f16,%f18                  ! y = s * s;

3283         ldd     [%l0+64],LTHRESH
3284         fmuld   %f58,%f50,%f60                  ! dtmp0 = s_h * ux;

3286         ldd     [%l0+72],XKB4
3287         fmuld   %f28,%f58,%f50                  ! yd = KA1_HI * s_h;

3289         ldd     [EXPTBL-ind_KB1],XKB1
3290         fmuld   %f46,%f18,%f56                  ! dtmp8 = KA5 * y;

3292         ldd     [EXPTBL-ind_KB2],XKB2
3293         fmuld   %f58,%f62,%f46                  ! dtmp1 = s_h * s_l;
3294         fsubd   %f30,%f60,%f62                  ! s_l = u - dtmp0;
```

```
3296         ldd     [EXPTBL-ind_KB3],XKB3
3297         fmuld   %f52,%f58,%f10                  ! dtmp1 = KA1_LO * s_h;
3298         faddd   %f22,%f50,%f28                  ! m_h = y + yd;

3300         ldd     [EXPTBL-ind_KB5],XKB5
3301         faddd   %f56,%f26,%f58                  ! dtmp8 = dtmp8 + KA3;

3303         add     EXPTBL,8,EXPTBL_P8
3304         fsubd   %f62,%f46,%f46                  ! s_l -= dtmp1;

3306         fsubd   %f28,%f22,%f60                  ! dtmp2 = m_h - y;

3308         st      %g0,[%fp+tmp0_lo]               ! *((int*)&dtmp0 + 1) = 0;
3309         faddd   %f20,%f10,%f56                  ! dtmp0 += dtmp1;

3311         st      %g0,[%fp+tmp1_lo]               ! *((int*)&dtmp0 + 1) = 0;
3312         fmuld   %f58,%f18,%f18                  ! dtmp8 = dtmp8 * y;

3314         st      %g0,[%fp+tmp2_lo]               ! *((int*)&dtmp0 + 1) = 0;
3315         fmuld   %f8,%f46,%f62                   ! s_l = dtmp0 * s_l;

3317         fsubd   %f60,%f50,%f10                  ! dtmp2 -= yd;

3319         fmuld   %f18,%f16,%f58                  ! s = dtmp8 * s;

3321         fsubd   %f10,%f62,%f46                  ! dtmp2 -= s_l;

3323         fsubd   %f58,%f46,%f50                  ! y = s - dtmp2;

3325         faddd   %f50,%f56,%f60                  ! y += dtmp0;

3327         faddd   %f60,%f28,%f18                  ! dtmp0 = y + m_h;

3329         fand    %f18,MHI32,s_h                  ! s_h = vis_fand(dtmp0, MHI32);

3331         fsubd   s_h,%f28,%f62                   ! dtmp0 = (s_h - m_h);

3333         fsubd   %f60,%f62,yr                    ! yr = y - dtmp0;

3335 .xbegin:
3336         ld      [%fp+tmp_counter],counter
3337         ldx     [%fp+tmp_py],py
3338         st      %g0,[%fp+tmp_counter]
3339 .xbegin1:
3340         subcc   counter,1,counter
3341         bneg,pn %icc,.end
3342         nop

3344         lda     [py]0x82,%l2                    ! (Y0_3) hy = *py;

3346         lda     [py]0x82,%f18                   ! (Y0_3) yd = *py;
3347         lda     [py+4]%asi,%f19                 ! (Y0_3) yd = *py;

3349         sra     %l2,20,%l5                      ! (Y0_3) expy = hy >> 20;

3351         and     %l5,0x7ff,%l5                   ! (Y0_3) expy &= 0x7ff;

3353         cmp     %l5,959                         ! (Y0_3) if (expy < 0x3fb);

3355         bl,pn   %icc,.xspec0                    ! (Y0_3) if (expy < 0x3fb);
3356         nop

3358         cmp     %l5,1086                        ! (Y0_2) if (expy >= 0x43e);

3360         bge,pn  %icc,.xspec1                    ! (Y0_2) if (expy >= 0x43e);
3361         nop
```



```
3363         add     py,stridey,py                   ! y += stridey;
3364         fand    %f18,MHI32,%f12                 ! (Y0_2) s = vis_fand(yd, MHI32)

3366         lda     [py]0x82,%l5                    ! (Y1_2) hy = *py;

3368         lda     [py]0x82,%f10                   ! (Y1_2) yd = *py;
3369         lda     [py+4]%asi,%f11                 ! (Y1_2) yd = *py;

3371         sra     %l5,20,%l5                      ! (Y1_2) expy = hy >> 20;

3373         and     %l5,0x7ff,%l5                   ! (Y1_2) expy &= 0x7ff;

3375         cmp     %l5,959                         ! (Y1_2) if (expy < 0x3fb);
3376         add     py,stridey,py                   ! y += stridey;
3377         fmuld   s_h,%f12,%f50                   ! (Y0_2) s = s_h * s;
3378         fsubd   %f18,%f12,%f56                  ! (Y0_2) dtmp0 = (yd - s);

3380         fmuld   %f18,yr,%f26                    ! (Y0_2) dtmp1 = yd * yr;
3381         bl,pn   %icc,.xupdate0                  ! (Y1_2) if (expy < 0x3fb);
3382         nop
3383 .xcont0:
3384         cmp     %l5,1086                        ! (Y1_2) if (expy >= 0x43e);
3385         bge,pn  %icc,.xupdate1                  ! (Y0_2) if (expy >= 0x43e);
3386         nop
3387 .xcont1:
3388         fmuld   %f56,s_h,%f58                   ! (Y0_2) dtmp0 *= s_h;
3389         fand    %f10,MHI32,%f12                 ! (Y1_2) s = vis_fand(yd, MHI32)

3391         fcmped  %fcc0,%f50,HTHRESH              ! (Y0_2) if (s > HTHRESH);

3393         faddd   %f58,%f26,%f48                  ! (Y0_2) yd = dtmp0 + dtmp1;

3395         lda     [py]0x82,%l5                    ! (Y2_2) hy = *py;
3396         fmovdg  %fcc0,HTHRESH,%f50              ! (Y0_2) s = HTHRESH;

3398         fmovdg  %fcc0,DZERO,%f48                ! (Y0_2) yd = DZERO;

3400         fcmped  %fcc1,%f50,LTHRESH              ! (Y0_2) if (s < LTHRESH);

3402         lda     [py]0x82,%f14                   ! (Y2_2) yd = *py;
3403         lda     [py+4]%asi,%f15                 ! (Y2_2) yd = *py;

3405         sra     %l5,20,%l5                      ! (Y2_2) expy = hy >> 20;

3407         fmovdl  %fcc1,DZERO,%f48                ! (Y0_2) yd = DZERO;

3409         add     py,stridey,py                   ! y += stridey;
3410         and     %l5,0x7ff,%l5                   ! (Y2_2) expy &= 0x7ff;
3411         fmovdl  %fcc1,LTHRESH,%f50              ! (Y0_2) s = LTHRESH;

3413         cmp     %l5,959                         ! (Y2_2) if (expy < 0x3fb);

3415         fmuld   s_h,%f12,%f16                   ! (Y1_2) s = s_h * s;
3416         bl,pn   %icc,.xupdate2                  ! (Y2_2) if (expy < 0x3fb);
3417         fsubd   %f10,%f12,%f56                  ! (Y1_2) dtmp0 = (yd - s);
3418 .xcont2:
3419         cmp     %l5,1086                        ! (Y2_2) if (expy >= 0x43e);
3420         fmuld   %f10,yr,%f8                     ! (Y1_2) dtmp1 = yd * yr;
3421         faddd   %f50,%f48,%f28                  ! (Y0_2) dtmp0 = (s + yd);

3423         lda     [py]0x82,%l5                    ! (Y0_3) hy = *py;
3424         bge,pn  %icc,.xupdate3                  ! (Y2_2) if (expy >= 0x43e);
3425         nop
3426 .xcont3:
3427         fmuld   %f56,s_h,%f58                   ! (Y1_2) dtmp0 *= s_h;
```

```
3428         fand    %f14,MHI32,%f44                 ! (Y2_2) s = vis_fand(yd, MHI32)

3430         fcmped  %fcc0,%f16,HTHRESH              ! (Y1_2) if (s > HTHRESH);

3432         fdtoi   %f28,%f3                        ! (Y0_2) u = (double)(int)dtmp0;

3434         st      %f3,[%fp+tmp3]                  ! (Y0_2) ind = (int)dtmp0;

3436         faddd   %f58,%f8,%f10                   ! (Y1_2) yd = dtmp0 + dtmp1;

3438         lda     [py]0x82,%f18                   ! (Y0_3) yd = *py;
3439         lda     [py+4]%asi,%f19                 ! (Y0_3) yd = *py;
3440         fmovdg  %fcc0,HTHRESH,%f16              ! (Y1_2) s = HTHRESH;

3442         fitod   %f3,%f58                        ! (Y0_2) u = (double)(int)dtmp0;

3444         fmovdg  %fcc0,DZERO,%f10                ! (Y1_2) yd = DZERO;

3446         sra     %l5,20,%l5                      ! (Y0_3) expy = hy >> 20;
3447         fcmped  %fcc1,%f16,LTHRESH              ! (Y1_2) if (s < LTHRESH);

3449         and     %l5,0x7ff,%l5                   ! (Y0_3) expy &= 0x7ff;
3450         fsubd   %f50,%f58,%f54                  ! (Y0_2) y = s - u;

3452         cmp     %l5,959                         ! (Y0_3) if (expy < 0x3fb);

3454         bl,pn   %icc,.xupdate4                  ! (Y0_3) if (expy < 0x3fb);
3455         nop
3456 .xcont4:
3457         fmovdl  %fcc1,DZERO,%f10                ! (Y1_2) yd = DZERO;

3459         fmovdl  %fcc1,LTHRESH,%f16              ! (Y1_2) s = LTHRESH;

3461         faddd   %f54,%f48,%f54                  ! (Y0_2) y = y + yd;

3463         ld      [%fp+tmp3],%o2                  ! (Y0_2) ind = (int)dtmp0;


3466         fsubd   %f14,%f44,%f50                  ! (Y2_1) dtmp0 = (yd - s);

3468         cmp     %l5,1086                        ! (Y0_2) if (expy >= 0x43e);

3470         fmuld   s_h,%f44,%f44                   ! (Y2_1) s = s_h * s;
3471         bge,pn  %icc,.xupdate5                  ! (Y0_2) if (expy >= 0x43e);
3472         faddd   %f16,%f10,%f22                  ! (Y1_1) dtmp0 = (s + yd);
3473 .xcont5:
3474         sra     %o2,8,%o0                       ! (Y0_1) ind >>= 8;
3475         add     py,stridey,py                   ! y += stridey;
3476         fmuld   %f14,yr,%f20                    ! (Y2_1) dtmp1 = yd * yr;

3478         add     %o0,1021,%i1                    ! (Y0_1) eflag = (ind + 1021);
3479         fmuld   XKB5,%f54,%f48                  ! (Y0_1) dtmp0 = XKB5 * y;

3481         sub     %g0,%o0,%o3                     ! (Y0_1) gflag = (1022 - ind);
3482         fmuld   %f50,s_h,%f52                   ! (Y2_1) dtmp0 *= s_h;
3483         fand    %f18,MHI32,%f12                 ! (Y0_2) s = vis_fand(yd, MHI32)

3485         sra     %i1,31,%o1                      ! (Y0_1) eflag = eflag >> 31;
3486         add     %o3,1022,%l0                    ! (Y0_1) gflag = (1022 - ind);
3487         fcmped  %fcc0,%f44,HTHRESH              ! (Y2_1) if (s > HTHRESH);

3489         sra     %l0,31,%o4                      ! (Y0_1) gflag = gflag >> 31;
3490         and     %o1,54,%i4                      ! (Y0_1) itmp0 = 54 & eflag;
3491         fdtoi   %f22,%f4                        ! (Y1_1) u = (double)(int)dtmp0;

3493         add     %o0,%i4,%i2                     ! (Y0_1) ind = ind + itmp0;
```



```
3494         and     %o4,52,%l3                      ! (Y0_1) itmp1 = 52 & gflag;
3495         st      %f4,[%fp+tmp4]                  ! (Y1_1) ind = (int)dtmp0;
3496         faddd   %f48,XKB4,%f60                  ! (Y0_1) dtmp1 = dtmp0 + XKB4;

3498         sub     %i2,%l3,%l2                     ! (Y0_1) ind = ind - itmp1;
3499         sub     %o1,%o4,%o4                     ! (Y0_1) ind = eflag - gflag;
3500         faddd   %f52,%f20,%f62                  ! (Y2_1) yd = dtmp0 + dtmp1;

3502         sll     %l2,20,%o3                      ! (Y0_1) ind <<= 20;
3503         lda     [py]0x82,%l5                    ! (Y1_2) hy = *py;
3504         fmovdg  %fcc0,HTHRESH,%f44              ! (Y2_1) s = HTHRESH;

3506         st      %o3,[%fp+tmp0_hi]               ! (Y0_1) *(int*)&dtmp0 = ind;
3507         fitod   %f4,%f48                        ! (Y1_1) u = (double)(int)dtmp0;

3509         fmuld   %f60,%f54,%f60                  ! (Y0_1) dtmp2 = dtmp1 * y;

3511         lda     [py]0x82,%f20                   ! (Y1_2) yd = *py;
3512         lda     [py+4]%asi,%f21                 ! (Y1_2) yd = *py;
3513         fmovdg  %fcc0,DZERO,%f62                ! (Y2_1) yd = DZERO;

3515         fcmped  %fcc1,%f44,LTHRESH              ! (Y2_1) if (s < LTHRESH);

3517         fsubd   %f16,%f48,%f50                  ! (Y1_1) y = s - u;

3519         faddd   %f60,XKB3,%f60                  ! (Y0_1) dtmp3 = dtmp2 + XKB3;

3521         sra     %l5,20,%l5                      ! (Y1_2) expy = hy >> 20;

3523         fmovdl  %fcc1,DZERO,%f62                ! (Y2_1) yd = DZERO;

3525         and     %l5,0x7ff,%l5                   ! (Y1_2) expy &= 0x7ff;
3526         fmovdl  %fcc1,LTHRESH,%f44              ! (Y2_1) s = LTHRESH;

3528         cmp     %l5,959                         ! (Y1_2) if (expy < 0x3fb);
3529         fmuld   %f60,%f54,%f48                  ! (Y0_1) dtmp4 = dtmp3 * y;
3530         faddd   %f50,%f10,%f52                  ! (Y1_1) y = y + yd;

3532         ld      [%fp+tmp4],%o1                  ! (Y1_1) ind = (int)dtmp0;

3534         add     py,stridey,py                   ! y += stridey;
3535         fmuld   s_h,%f12,%f50                   ! (Y0_2) s = s_h * s;
3536         fsubd   %f18,%f12,%f56                  ! (Y0_2) dtmp0 = (yd - s);

3538         fmuld   %f18,yr,%f26                    ! (Y0_2) dtmp1 = yd * yr;
3539         bl,pn   %icc,.xupdate6                  ! (Y1_2) if (expy < 0x3fb);
3540         faddd   %f44,%f62,%f28                  ! (Y2_1) dtmp0 = (s + yd);
3541 .xcont6:
3542         sra     %o1,8,%o3                       ! (Y1_1) ind >>= 8;
3543         cmp     %l5,1086                        ! (Y1_2) if (expy >= 0x43e);
3544         fmuld   XKB5,%f52,%f22                  ! (Y1_1) dtmp0 = XKB5 * y;
3545         faddd   %f48,XKB2,%f14                  ! (Y0_1) dtmp5 = dtmp4 + XKB2;

3547         add     %o3,1021,%o0                    ! (Y1_1) eflag = (ind + 1021);
3548         bge,pn  %icc,.xupdate7                  ! (Y0_2) if (expy >= 0x43e);
3549         nop
3550 .xcont7:
3551         sub     %g0,%o3,%i2                     ! (Y1_1) gflag = (1022 - ind);
3552         fmuld   %f56,s_h,%f58                   ! (Y0_2) dtmp0 *= s_h;
3553         fand    %f20,MHI32,%f12                 ! (Y1_2) s = vis_fand(yd, MHI32)

3555         sra     %o0,31,%l3                      ! (Y1_1) eflag = eflag >> 31;
3556         add     %i2,1022,%l2                    ! (Y1_1) gflag = (1022 - ind);
3557         fcmped  %fcc0,%f50,HTHRESH              ! (Y0_2) if (s > HTHRESH);

3559         sra     %l2,31,%o7                      ! (Y1_1) gflag = gflag >> 31;
```

```
3560         and     %l3,54,%i1                      ! (Y1_1) itmp0 = 54 & eflag;
3561         fdtoi   %f28,%f3                        ! (Y2_1) u = (double)(int)dtmp0;

3563         add     %o3,%i1,%l0                     ! (Y1_1) ind = ind + itmp0;
3564         and     %o7,52,%l1                      ! (Y1_1) itmp1 = 52 & gflag;
3565         st      %f3,[%fp+ind_buf]               ! (Y2_1) ind = (int)dtmp0;
3566         faddd   %f22,XKB4,%f60                  ! (Y1_1) dtmp1 = dtmp0 + XKB4;

3568         sub     %l0,%l1,%i4                     ! (Y1_1) ind = ind - itmp1;
3569         sub     %l3,%o7,%o7                     ! (Y1_1) ind = eflag - gflag;
3570         faddd   %f58,%f26,%f48                  ! (Y0_2) yd = dtmp0 + dtmp1;

3572         sll     %i4,20,%i2                      ! (Y1_1) ind <<= 20;
3573         lda     [py]0x82,%l5                    ! (Y2_2) hy = *py;
3574         fmovdg  %fcc0,HTHRESH,%f50              ! (Y0_2) s = HTHRESH;

3576         st      %i2,[%fp+tmp1_hi]               ! (Y1_1) *(int*)&dtmp0 = ind;
3577         fitod   %f3,%f18                        ! (Y2_1) u = (double)(int)dtmp0;

3579         fmuld   %f60,%f52,%f60                  ! (Y1_1) dtmp2 = dtmp1 * y;

3581         fmuld   %f14,%f54,%f56                  ! (Y0_1) dtmp6 = dtmp5 * y;
3582         fmovdg  %fcc0,DZERO,%f48                ! (Y0_2) yd = DZERO;

3584         fcmped  %fcc1,%f50,LTHRESH              ! (Y0_2) if (s < LTHRESH);

3586         lda     [py]0x82,%f26                   ! (Y2_2) yd = *py;
3587         lda     [py+4]%asi,%f27                 ! (Y2_2) yd = *py;
3588         fsubd   %f44,%f18,%f18                  ! (Y2_1) y = s - u;

3590         faddd   %f60,XKB3,%f44                  ! (Y1_1) dtmp3 = dtmp2 + XKB3;

3592         sra     %l5,20,%l5                      ! (Y2_2) expy = hy >> 20;
3593         and     %o2,255,%o2                     ! (Y0_1) i = ind & 0xff;
3594         faddd   %f56,XKB1,%f58                  ! (Y0_1) dtmp7 = dtmp6 + XKB1;

3596         sll     %o2,4,%l2                       ! (Y0_1) i = i << 4;
3597         fmovdl  %fcc1,DZERO,%f48                ! (Y0_2) yd = DZERO;

3599         add     py,stridey,py                   ! y += stridey;
3600         and     %l5,0x7ff,%l5                   ! (Y2_2) expy &= 0x7ff;
3601         fmovdl  %fcc1,LTHRESH,%f50              ! (Y0_2) s = LTHRESH;

3603         cmp     %l5,959                         ! (Y2_2) if (expy < 0x3fb);
3604         ldd     [EXPTBL+%l2],%f22               ! (Y0_1) u = *(double*)((char*)_
3605         faddd   %f18,%f62,%f18                  ! (Y2_1) y = y + yd;
3606         fmuld   %f44,%f52,%f62                  ! (Y1_1) dtmp4 = dtmp3 * y;

3608         ld      [%fp+ind_buf],%l1               ! (Y2_1) ind = (int)dtmp0;
3609         fmuld   %f58,%f54,%f54                  ! (Y0_1) y = dtmp7 * y;

3611         fmuld   s_h,%f12,%f16                   ! (Y1_2) s = s_h * s;
3612         bl,pn   %icc,.xupdate8                  ! (Y2_2) if (expy < 0x3fb);
3613         fsubd   %f20,%f12,%f56                  ! (Y1_2) dtmp0 = (yd - s);
3614 .xcont8:
3615         cmp     %l5,1086                        ! (Y2_2) if (expy >= 0x43e);
3616         fmuld   %f20,yr,%f8                     ! (Y1_2) dtmp1 = yd * yr;
3617         faddd   %f50,%f48,%f28                  ! (Y0_2) dtmp0 = (s + yd);

3619         sra     %l1,8,%o2                       ! (Y2_1) ind >>= 8;
3620         lda     [py]0x82,%l5                    ! (Y0_3) hy = *py;
3621         fmuld   XKB5,%f18,%f20                  ! (Y2_1) dtmp0 = XKB5 * y;
3622         faddd   %f62,XKB2,%f12                  ! (Y1_1) dtmp5 = dtmp4 + XKB2;

3624         add     %o2,1021,%l0                    ! (Y2_1) eflag = (ind + 1021);
3625         bge,pn  %icc,.xupdate9                  ! (Y2_2) if (expy >= 0x43e);
```



```
3626         nop
3627 .xcont9:
3628         sub     %g0,%o2,%l3                     ! (Y2_1) gflag = (1022 - ind);
3629         ldd     [EXPTBL_P8+%l2],%f14            ! (Y0_1) dtmp0 = *(double*)((cha
3630         fmuld   %f56,s_h,%f58                   ! (Y1_2) dtmp0 *= s_h;
3631         fand    %f26,MHI32,%f44                 ! (Y2_2) s = vis_fand(yd, MHI32)

3633         sra     %l0,31,%o0                      ! (Y2_1) eflag = eflag >> 31;
3634         add     %l3,1022,%i4                    ! (Y2_1) gflag = (1022 - ind);
3635         fmuld   %f22,%f54,%f56                  ! (Y0_1) dtmp1 = u * y;
3636         fcmped  %fcc0,%f16,HTHRESH              ! (Y1_2) if (s > HTHRESH);

3638         sra     %i4,31,%o5                      ! (Y2_1) gflag = gflag >> 31;
3639         and     %o0,54,%i2                      ! (Y2_1) itmp0 = 54 & eflag;
3640         fdtoi   %f28,%f3                        ! (Y0_2) u = (double)(int)dtmp0;

3642         add     %o2,%i2,%i1                     ! (Y2_1) ind = ind + itmp0;
3643         and     %o5,52,%l2                      ! (Y2_1) itmp1 = 52 & gflag;
3644         st      %f3,[%fp+tmp3]                  ! (Y0_2) ind = (int)dtmp0;
3645         faddd   %f20,XKB4,%f60                  ! (Y2_1) dtmp1 = dtmp0 + XKB4;

3647         sub     %i1,%l2,%o3                     ! (Y2_1) ind = ind - itmp1;
3648         sub     %o0,%o5,%o5                     ! (Y2_1) ind = eflag - gflag;
3649         faddd   %f58,%f8,%f10                   ! (Y1_2) yd = dtmp0 + dtmp1;

3651         sll     %o3,20,%l3                      ! (Y2_1) ind <<= 20;
3652         lda     [py]0x82,%f28                   ! (Y0_3) yd = *py;
3653         lda     [py+4]%asi,%f29                 ! (Y0_3) yd = *py;
3654         fmovdg  %fcc0,HTHRESH,%f16              ! (Y1_2) s = HTHRESH;

3656         st      %l3,[%fp+tmp2_hi]               ! (Y2_1) *(int*)&dtmp0 = ind;
3657         fitod   %f3,%f58                        ! (Y0_2) u = (double)(int)dtmp0;

3659         fmuld   %f60,%f18,%f60                  ! (Y2_1) dtmp2 = dtmp1 * y;
3660         faddd   %f14,%f56,%f20                  ! (Y0_1) dtmp2 = dtmp0 + dtmp1;

3662         fmuld   %f12,%f52,%f56                  ! (Y1_1) dtmp6 = dtmp5 * y;
3663         fmovdg  %fcc0,DZERO,%f10                ! (Y1_2) yd = DZERO;

3665         sra     %l5,20,%l5                      ! (Y0_3) expy = hy >> 20;
3666         fcmped  %fcc1,%f16,LTHRESH              ! (Y1_2) if (s < LTHRESH);

3668         and     %l5,0x7ff,%l5                   ! (Y0_3) expy &= 0x7ff;
3669         fsubd   %f50,%f58,%f54                  ! (Y0_2) y = s - u;

3671         cmp     %l5,959                         ! (Y0_3) if (expy < 0x3fb);
3672         faddd   %f60,XKB3,%f60                  ! (Y2_1) dtmp3 = dtmp2 + XKB3;

3674         and     %o1,255,%o1                     ! (Y1_1) i = ind & 0xff;
3675         bl,pn   %icc,.xupdate10                 ! (Y0_3) if (expy < 0x3fb);
3676         faddd   %f56,XKB1,%f8                   ! (Y1_1) dtmp7 = dtmp6 + XKB1;
3677 .xcont10:
3678         sll     %o1,4,%l0                       ! (Y1_1) i = i << 4;
3679         fmovdl  %fcc1,DZERO,%f10                ! (Y1_2) yd = DZERO;

3681         nop
3682         ba      1f
3683         fmovdl  %fcc1,LTHRESH,%f16              ! (Y1_2) s = LTHRESH;

3685         .align  16
3686 1:
3687         subcc   counter,2,counter
3688         ldd     [EXPTBL+%l0],%f56               ! (Y1_1) u = *(double*)((char*)_
3689         fmuld   %f60,%f18,%f58                  ! (Y2_1) dtmp4 = dtmp3 * y;
3690         faddd   %f54,%f48,%f54                  ! (Y0_2) y = y + yd;
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3692         fmuld   %f8,%f52,%f60                  ! (Y1_1) y = dtmp7 * y;
3693         ld      [%fp+tmp3],%o2                 ! (Y0_2) ind = (int)dtmp0;
3694         bneg,pn %icc,.xtail
3695         faddd   %f20,%f22,%f12                 ! (Y0_1) u = dtmp2 + u;

3697 .xmain_loop:
3698         cmp     %l5,1086                       ! (Y0_2) if (expy >= 0x43e);
3699         add     %o4,513,%o4                    ! (Y0_0) ind += 513;
3700         ldd     [%fp+tmp0_hi],%f52             ! (Y0_0) *(int*)&dtmp0 = ind;
3701         fsubd   %f26,%f44,%f50                 ! (Y2_1) dtmp0 = (yd - s);

3703         fmuld   s_h,%f44,%f44                  ! (Y2_1) s = s_h * s;
3704         sra     %o2,8,%o0                      ! (Y0_1) ind >>= 8;
3705         bge,pn  %icc,.xupdate11                ! (Y0_2) if (expy >= 0x43e);
3706         faddd   %f16,%f10,%f22                 ! (Y1_1) dtmp0 = (s + yd);
3707 .xcont11:
3708         sll     %o4,3,%l2                      ! (Y0_0) ind *= 8;
3709         add     py,stridey,py                  ! y += stridey;
3710         fmuld   %f26,yr,%f20                   ! (Y2_1) dtmp1 = yd * yr;
3711         faddd   %f58,XKB2,%f14                 ! (Y2_0) dtmp5 = dtmp4 + XKB2;

3713         add     %o0,1021,%i1                   ! (Y0_1) eflag = (ind + 1021);
3714         ldd     [%l2+EXPTBL],%f62              ! (Y0_0) dtmp1 = (*(double*)((ch
3715         fmuld   XKB5,%f54,%f48                 ! (Y0_1) dtmp0 = XKB5 * y;
3716         fpadd32 %f12,%f52,%f58                 ! (Y0_0) u = vis_fpadd32(u, dtmp

3718         sub     %g0,%o0,%o3                    ! (Y0_1) gflag = (1022 - ind);
3719         ldd     [EXPTBL_P8+%l0],%f8            ! (Y1_0) dtmp0 = *(double*)((cha
3720         fand    %f28,MHI32,%f12                ! (Y0_2) s = vis_fand(yd, MHI32)
3721         fmuld   %f50,s_h,%f52                  ! (Y2_1) dtmp0 *= s_h;

3723         sra     %i1,31,%o1                     ! (Y0_1) eflag = eflag >> 31;
3724         add     %o3,1022,%l0                   ! (Y0_1) gflag = (1022 - ind);
3725         fmuld   %f56,%f60,%f26                 ! (Y1_0) dtmp1 = u * y;
3726         fcmped  %fcc0,%f44,HTHRESH             ! (Y2_1) if (s > HTHRESH);

3728         sra     %l0,31,%o4                     ! (Y0_1) gflag = gflag >> 31;
3729         and     %o1,54,%i4                     ! (Y0_1) itmp0 = 54 & eflag;
3730         fmuld   %f58,%f62,%f6                  ! (Y0_0) dtmp1 = u * dtmp1;
3731         fdtoi   %f22,%f4                       ! (Y1_1) u = (double)(int)dtmp0;

3733         add     %o0,%i4,%i2                    ! (Y0_1) ind = ind + itmp0;
3734         and     %o4,52,%l3                     ! (Y0_1) itmp1 = 52 & gflag;
3735         st      %f4,[%fp+tmp4]                 ! (Y1_1) ind = (int)dtmp0;
3736         faddd   %f48,XKB4,%f60                 ! (Y0_1) dtmp1 = dtmp0 + XKB4;

3738         sub     %i2,%l3,%l2                    ! (Y0_1) ind = ind - itmp1;
3739         sub     %o1,%o4,%o4                    ! (Y0_1) ind = eflag - gflag;
3740         st      %f6,[pz]                       ! (Y0_0) write into memory
3741         faddd   %f52,%f20,%f62                 ! (Y2_1) yd = dtmp0 + dtmp1;

3743         sll     %l2,20,%o3                     ! (Y0_1) ind <<= 20;
3744         nop
3745         st      %o3,[%fp+tmp0_hi]              ! (Y0_1) *(int*)&dtmp0 = ind;
3746         fmovdg  %fcc0,HTHRESH,%f44             ! (Y2_1) s = HTHRESH;

3748         lda     [py]0x82,%l5                   ! (Y1_2) hy = *py;
3749         nop
3750         fitod   %f4,%f48                       ! (Y1_1) u = (double)(int)dtmp0;

3752         fmuld   %f60,%f54,%f60                 ! (Y0_1) dtmp2 = dtmp1 * y;
3753         nop
3754         st      %f7,[pz+4]                     ! (Y0_0) write into memory
3755         faddd   %f8,%f26,%f26                  ! (Y1_0) dtmp2 = dtmp0 + dtmp1;

3757         lda     [py]0x82,%f8                   ! (Y1_2) yd = *py;
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3758         nop
3759         fmuld   %f14,%f18,%f52                 ! (Y2_0) dtmp6 = dtmp5 * y;
3760         fmovdg  %fcc0,DZERO,%f62               ! (Y2_1) yd = DZERO;

3762         lda     [py+4]%asi,%f9                 ! (Y1_2) yd = *py;
3763         add     pz,stridez,pz                  ! z += stridez;
3764         fcmped  %fcc1,%f44,LTHRESH             ! (Y2_1) if (s < LTHRESH);

3766         fsubd   %f16,%f48,%f50                 ! (Y1_1) y = s - u;

3768         faddd   %f60,XKB3,%f60                 ! (Y0_1) dtmp3 = dtmp2 + XKB3;

3770         sra     %l5,20,%l5                     ! (Y1_2) expy = hy >> 20;
3771         and     %l1,255,%l1                    ! (Y2_0) i = ind & 0xff;
3772         faddd   %f52,XKB1,%f58                 ! (Y2_0) dtmp7 = dtmp6 + XKB1;

3774         sll     %l1,4,%l0                      ! (Y2_0) i = i << 4;
3775         fmovdl  %fcc1,DZERO,%f62               ! (Y2_1) yd = DZERO;

3777         and     %l5,0x7ff,%l5                  ! (Y1_2) expy &= 0x7ff;
3778         nop
3779         fmovdl  %fcc1,LTHRESH,%f44             ! (Y2_1) s = LTHRESH;

3781         cmp     %l5,959                        ! (Y1_2) if (expy < 0x3fb);
3782         ldd     [EXPTBL+%l0],%f20              ! (Y2_0) u = *(double*)((char*)_
3783         fmuld   %f60,%f54,%f48                 ! (Y0_1) dtmp4 = dtmp3 * y;
3784         faddd   %f50,%f10,%f52                 ! (Y1_1) y = y + yd;

3786         add     %o7,513,%o7                    ! (Y1_0) ind += 513;
3787         ld      [%fp+tmp4],%o1                 ! (Y1_1) ind = (int)dtmp0;
3788         fmuld   %f58,%f18,%f18                 ! (Y2_0) y = dtmp7 * y;
3789         faddd   %f26,%f56,%f58                 ! (Y1_0) u = dtmp2 + u;

3791         add     py,stridey,py                  ! y += stridey;
3792         ldd     [%fp+tmp1_hi],%f60             ! (Y1_0) *(int*)&dtmp0 = ind;
3793         fmuld   s_h,%f12,%f50                  ! (Y0_2) s = s_h * s;
3794         fsubd   %f28,%f12,%f56                 ! (Y0_2) dtmp0 = (yd - s);

3796         sll     %o7,3,%l3                      ! (Y1_0) ind *= 8;
3797         fmuld   %f28,yr,%f26                   ! (Y0_2) dtmp1 = yd * yr;
3798         bl,pn   %icc,.xupdate12                ! (Y1_2) if (expy < 0x3fb);
3799         faddd   %f44,%f62,%f28                 ! (Y2_1) dtmp0 = (s + yd);
3800 .xcont12:
3801         sra     %o1,8,%o3                      ! (Y1_1) ind >>= 8;
3802         cmp     %l5,1086                       ! (Y1_2) if (expy >= 0x43e);
3803         fmuld   XKB5,%f52,%f22                 ! (Y1_1) dtmp0 = XKB5 * y;
3804         faddd   %f48,XKB2,%f14                 ! (Y0_1) dtmp5 = dtmp4 + XKB2;

3806         add     %o3,1021,%o0                   ! (Y1_1) eflag = (ind + 1021);
3807         ldd     [%l3+EXPTBL],%f48              ! (Y1_0) dtmp1 = (*(double*)((ch
3808         bge,pn  %icc,.xupdate13                ! (Y1_2) if (expy >= 0x43e);
3809         fpadd32 %f58,%f60,%f60                 ! (Y1_0) u = vis_fpadd32(u, dtmp
3810 .xcont13:
3811         sub     %g0,%o3,%i2                    ! (Y1_1) gflag = (1022 - ind);
3812         ldd     [EXPTBL_P8+%l0],%f16           ! (Y2_0) dtmp0 = *(double*)((cha
3813         fmuld   %f56,s_h,%f58                  ! (Y0_2) dtmp0 *= s_h;
3814         fand    %f8,MHI32,%f12                 ! (Y1_2) s = vis_fand(yd, MHI32)

3816         sra     %o0,31,%l3                     ! (Y1_1) eflag = eflag >> 31;
3817         add     %i2,1022,%l2                   ! (Y1_1) gflag = (1022 - ind);
3818         fmuld   %f20,%f18,%f56                 ! (Y2_0) dtmp1 = u * y;
3819         fcmped  %fcc0,%f50,HTHRESH             ! (Y0_2) if (s > HTHRESH);

3821         sra     %l2,31,%o7                     ! (Y1_1) gflag = gflag >> 31;
3822         and     %l3,54,%i1                     ! (Y1_1) itmp0 = 54 & eflag;
3823         fmuld   %f60,%f48,%f18                 ! (Y1_0) dtmp1 = u * dtmp1;
```

```
3824         fdtoi   %f28,%f3                        ! (Y2_1) u = (double)(int)dtmp0;

3826         add     %o3,%i1,%l0                     ! (Y1_1) ind = ind + itmp0;
3827         and     %o7,52,%l1                      ! (Y1_1) itmp1 = 52 & gflag;
3828         st      %f3,[%fp+ind_buf]               ! (Y2_1) ind = (int)dtmp0;
3829         faddd   %f22,XKB4,%f60                  ! (Y1_1) dtmp1 = dtmp0 + XKB4;

3831         sub     %l0,%l1,%i4                     ! (Y1_1) ind = ind - itmp1;
3832         sub     %l3,%o7,%o7                     ! (Y1_1) ind = eflag - gflag;
3833         st      %f18,[pz]                       ! (Y1_0) write into memory
3834         faddd   %f58,%f26,%f48                  ! (Y0_2) yd = dtmp0 + dtmp1;

3836         sll     %i4,20,%i2                      ! (Y1_1) ind <<= 20;
3837         lda     [py]0x82,%l5                    ! (Y2_2) hy = *py;
3838         fmovdg  %fcc0,HTHRESH,%f50              ! (Y0_2) s = HTHRESH;

3840         st      %i2,[%fp+tmp1_hi]               ! (Y1_1) *(int*)&dtmp0 = ind;
3841         fitod   %f3,%f10                        ! (Y2_1) u = (double)(int)dtmp0;

3843         fmuld   %f60,%f52,%f60                  ! (Y1_1) dtmp2 = dtmp1 * y;
3844         st      %f19,[pz+4]                     ! (Y1_0) write into memory
3845         faddd   %f16,%f56,%f28                  ! (Y2_0) dtmp2 = dtmp0 + dtmp1;

3847         fmuld   %f14,%f54,%f56                  ! (Y0_1) dtmp6 = dtmp5 * y;
3848         fmovdg  %fcc0,DZERO,%f48                ! (Y0_2) yd = DZERO;

3850         add     pz,stridez,pz                   ! z += stridez;
3851         fcmped  %fcc1,%f50,LTHRESH              ! (Y0_2) if (s < LTHRESH);

3853         lda     [py]0x82,%f26                   ! (Y2_2) yd = *py;
3854         fsubd   %f44,%f10,%f18                  ! (Y2_1) y = s - u;

3856         lda     [py+4]%asi,%f27                 ! (Y2_2) yd = *py;
3857         faddd   %f60,XKB3,%f44                  ! (Y1_1) dtmp3 = dtmp2 + XKB3;

3859         sra     %l5,20,%l5                      ! (Y2_2) expy = hy >> 20;
3860         and     %o2,255,%o2                     ! (Y0_1) i = ind & 0xff;
3861         faddd   %f56,XKB1,%f58                  ! (Y0_1) dtmp7 = dtmp6 + XKB1;

3863         sll     %o2,4,%l2                       ! (Y0_1) i = i << 4;
3864         fmovdl  %fcc1,DZERO,%f48                ! (Y0_2) yd = DZERO;

3866         add     py,stridey,py                   ! y += stridey;
3867         and     %l5,0x7ff,%l5                   ! (Y2_2) expy &= 0x7ff;
3868         fmovdl  %fcc1,LTHRESH,%f50              ! (Y0_2) s = LTHRESH;

3870         cmp     %l5,959                         ! (Y2_2) if (expy < 0x3fb);
3871         ldd     [EXPTBL+%l2],%f22               ! (Y0_1) u = *(double*)((char*)_
3872         faddd   %f18,%f62,%f18                  ! (Y2_1) y = y + yd;
3873         fmuld   %f44,%f52,%f62                  ! (Y1_1) dtmp4 = dtmp3 * y;

3875         add     %o5,513,%o5                     ! (Y2_0) ind += 513;
3876         ld      [%fp+ind_buf],%l1               ! (Y2_1) ind = (int)dtmp0;
3877         fmuld   %f58,%f54,%f54                  ! (Y0_1) y = dtmp7 * y;
3878         faddd   %f28,%f20,%f58                  ! (Y2_0) u = dtmp2 + u;

3880         ldd     [%fp+tmp2_hi],%f60              ! (Y2_0) *(int*)&dtmp0 = ind;
3881         fmuld   s_h,%f12,%f16                   ! (Y1_2) s = s_h * s;
3882         bl,pn   %icc,.xupdate14                 ! (Y2_2) if (expy < 0x3fb);
3883         fsubd   %f8,%f12,%f56                   ! (Y1_2) dtmp0 = (yd - s);
3884 .xcont14:
3885         sll     %o5,3,%i1                       ! (Y2_0) ind *= 8;
3886         cmp     %l5,1086                        ! (Y2_2) if (expy >= 0x43e);
3887         fmuld   %f8,yr,%f8                      ! (Y1_2) dtmp1 = yd * yr;
3888         faddd   %f50,%f48,%f28                  ! (Y0_2) dtmp0 = (s + yd);
```



```
3890         sra     %l1,8,%o2                       ! (Y2_1) ind >>= 8;
3891         lda     [py]0x82,%l5                    ! (Y0_3) hy = *py;
3892         fmuld   XKB5,%f18,%f20                  ! (Y2_1) dtmp0 = XKB5 * y;
3893         faddd   %f62,XKB2,%f12                  ! (Y1_1) dtmp5 = dtmp4 + XKB2;

3895         add     %o2,1021,%l0                    ! (Y2_1) eflag = (ind + 1021);
3896         ldd     [%i1+EXPTBL],%f62               ! (Y2_0) dtmp1 = (*(double*)((ch
3897         bge,pn  %icc,.xupdate15                 ! (Y2_2) if (expy >= 0x43e);
3898         fpadd32 %f58,%f60,%f60                  ! (Y2_0) u = vis_fpadd32(u, dtmp
3899 .xcont15:
3900         sub     %g0,%o2,%l3                     ! (Y2_1) gflag = (1022 - ind);
3901         ldd     [EXPTBL_P8+%l2],%f14            ! (Y0_1) dtmp0 = *(double*)((cha
3902         fmuld   %f56,s_h,%f58                   ! (Y1_2) dtmp0 *= s_h;
3903         fand    %f26,MHI32,%f44                 ! (Y2_2) s = vis_fand(yd, MHI32)

3905         sra     %l0,31,%o0                      ! (Y2_1) eflag = eflag >> 31;
3906         add     %l3,1022,%i4                    ! (Y2_1) gflag = (1022 - ind);
3907         fmuld   %f22,%f54,%f56                  ! (Y0_1) dtmp1 = u * y;
3908         fcmped  %fcc0,%f16,HTHRESH              ! (Y1_2) if (s > HTHRESH);

3910         sra     %i4,31,%o5                      ! (Y2_1) gflag = gflag >> 31;
3911         and     %o0,54,%i2                      ! (Y2_1) itmp0 = 54 & eflag;
3912         fmuld   %f60,%f62,%f6                   ! (Y2_0) dtmp1 = u * dtmp1;
3913         fdtoi   %f28,%f3                        ! (Y0_2) u = (double)(int)dtmp0;

3915         add     %o2,%i2,%i1                     ! (Y2_1) ind = ind + itmp0;
3916         and     %o5,52,%l2                      ! (Y2_1) itmp1 = 52 & gflag;
3917         st      %f3,[%fp+tmp3]                  ! (Y0_2) ind = (int)dtmp0;
3918         faddd   %f20,XKB4,%f60                  ! (Y2_1) dtmp1 = dtmp0 + XKB4;

3920         sub     %i1,%l2,%o3                     ! (Y2_1) ind = ind - itmp1;
3921         sub     %o0,%o5,%o5                     ! (Y2_1) ind = eflag - gflag;
3922         st      %f6,[pz]                        ! (Y2_0) write into memory
3923         faddd   %f58,%f8,%f10                   ! (Y1_2) yd = dtmp0 + dtmp1;

3925         sll     %o3,20,%l3                      ! (Y2_1) ind <<= 20;
3926         lda     [py]0x82,%f28                   ! (Y0_3) yd = *py;
3927         fmovdg  %fcc0,HTHRESH,%f16              ! (Y1_2) s = HTHRESH;

3929         lda     [py+4]%asi,%f29                 ! (Y0_3) yd = *py;
3930         fitod   %f3,%f58                        ! (Y0_2) u = (double)(int)dtmp0;

3932         fmuld   %f60,%f18,%f60                  ! (Y2_1) dtmp2 = dtmp1 * y;
3933         st      %l3,[%fp+tmp2_hi]               ! (Y2_1) *(int*)&dtmp0 = ind;
3934         faddd   %f14,%f56,%f20                  ! (Y0_1) dtmp2 = dtmp0 + dtmp1;

3936         fmuld   %f12,%f52,%f56                  ! (Y1_1) dtmp6 = dtmp5 * y;
3937         st      %f7,[pz+4]                      ! (Y2_0) write into memory
3938         fmovdg  %fcc0,DZERO,%f10                ! (Y1_2) yd = DZERO;

3940         sra     %l5,20,%l5                      ! (Y0_3) expy = hy >> 20;
3941         add     pz,stridez,pz                   ! z += stridez;
3942         fcmped  %fcc1,%f16,LTHRESH              ! (Y1_2) if (s < LTHRESH);

3944         and     %l5,0x7ff,%l5                   ! (Y0_3) expy &= 0x7ff;
3945         fsubd   %f50,%f58,%f54                  ! (Y0_2) y = s - u;

3947         cmp     %l5,959                         ! (Y0_3) if (expy < 0x3fb);
3948         faddd   %f60,XKB3,%f60                  ! (Y2_1) dtmp3 = dtmp2 + XKB3;

3950         and     %o1,255,%o1                     ! (Y1_1) i = ind & 0xff;
3951         bl,pn   %icc,.xupdate16                 ! (Y0_3) if (expy < 0x3fb);
3952         faddd   %f56,XKB1,%f8                   ! (Y1_1) dtmp7 = dtmp6 + XKB1;
3953 .xcont16:
3954         sll     %o1,4,%l0                       ! (Y1_1) i = i << 4;
3955         fmovdl  %fcc1,DZERO,%f10                ! (Y1_2) yd = DZERO;
```

```
3957         subcc   counter,3,counter               ! update cycle counter
3958         fmovdl  %fcc1,LTHRESH,%f16              ! (Y1_2) s = LTHRESH;

3960         ldd     [EXPTBL+%l0],%f56               ! (Y1_1) u = *(double*)((char*)_
3961         fmuld   %f60,%f18,%f58                  ! (Y2_1) dtmp4 = dtmp3 * y;
3962         faddd   %f54,%f48,%f54                  ! (Y0_2) y = y + yd;

3964         fmuld   %f8,%f52,%f60                   ! (Y1_1) y = dtmp7 * y;
3965         ld      [%fp+tmp3],%o2                  ! (Y0_2) ind = (int)dtmp0;
3966         bpos,pt %icc,.xmain_loop
3967         faddd   %f20,%f22,%f12                  ! (Y0_1) u = dtmp2 + u;

3969 .xtail:
3970         addcc   counter,2,counter
3971         ldd     [%fp+tmp0_hi],%f52              ! (Y0_0) *(int*)&dtmp0 = ind;

3973         add     %o4,513,%o4                     ! (Y0_0) ind += 513;
3974         bneg,pn %icc,.xend_loop
3975         nop

3977         sll     %o4,3,%l2                       ! (Y0_0) ind *= 8;

3979         subcc   counter,1,counter
3980         ldd     [%l2+EXPTBL],%f62               ! (Y0_0) dtmp1 = (*(double*)((ch
3981         fpadd32 %f12,%f52,%f58                  ! (Y0_0) u = vis_fpadd32(u, dtmp

3983         ldd     [EXPTBL_P8+%l0],%f8             ! (Y1_0) dtmp0 = *(double*)((cha

3985         fmuld   %f56,%f60,%f26                  ! (Y1_0) dtmp1 = u * y;

3987         fmuld   %f58,%f62,%f6                   ! (Y0_0) dtmp1 = u * dtmp1;

3989         st      %f6,[pz]                        ! (Y0_0) write into memory
3990         st      %f7,[pz+4]                      ! (Y0_0) write into memory
3991         bneg,pn %icc,.xend_loop
3992         add     pz,stridez,pz                   ! z += stridez;

3994         faddd   %f8,%f26,%f26                   ! (Y1_0) dtmp2 = dtmp0 + dtmp1;

3996         add     %o7,513,%o7                     ! (Y1_0) ind += 513;
3997         faddd   %f26,%f56,%f58                  ! (Y1_0) u = dtmp2 + u;

3999         ldd     [%fp+tmp1_hi],%f60              ! (Y1_0) *(int*)&dtmp0 = ind;

4001         sll     %o7,3,%l3                       ! (Y1_0) ind *= 8;

4003         ldd     [%l3+EXPTBL],%f48               ! (Y1_0) dtmp1 = (*(double*)((ch
4004         fpadd32 %f58,%f60,%f60                  ! (Y1_0) u = vis_fpadd32(u, dtmp

4006         fmuld   %f60,%f48,%f18                  ! (Y1_0) dtmp1 = u * dtmp1;

4008         st      %f18,[pz]                       ! (Y1_0) write into memory
4009         st      %f19,[pz+4]                     ! (Y1_0) write into memory
4010         add     pz,stridez,pz                   ! z += stridez;

4012 .xend_loop:
4013         ba      .xbegin
4014         nop

4016         .align  16
4017 .xupdate0:
4018         cmp     counter,0
4019         sub     py,stridey,%i2
4020         ble,pt  %icc,.xcont0
4021         fmovd   DZERO,%f10
```



```
4023         stx     %i2,[%fp+tmp_py]

4025         st      counter,[%fp+tmp_counter]
4026         ba      .xcont0
4027         or      %g0,0,counter

4029         .align  16
4030 .xupdate1:
4031         cmp     counter,0
4032         sub     py,stridey,%i2
4033         ble,pt  %icc,.xcont1
4034         fmovd   DZERO,%f10

4036         stx     %i2,[%fp+tmp_py]

4038         st      counter,[%fp+tmp_counter]
4039         ba      .xcont1
4040         or      %g0,0,counter

4042         .align  16
4043 .xupdate2:
4044         cmp     counter,1
4045         sub     py,stridey,%l3
4046         ble,pt  %icc,.xcont2
4047         fmovd   DZERO,%f14

4049         stx     %l3,[%fp+tmp_py]
4050         sub     counter,1,counter

4052         st      counter,[%fp+tmp_counter]
4053         ba      .xcont2
4054         or      %g0,1,counter

4056         .align  16
4057 .xupdate3:
4058         cmp     counter,1
4059         sub     py,stridey,%l3
4060         ble,pt  %icc,.xcont3
4061         fmovd   DZERO,%f14

4063         stx     %l3,[%fp+tmp_py]
4064         sub     counter,1,counter

4066         st      counter,[%fp+tmp_counter]
4067         ba      .xcont3
4068         or      %g0,1,counter

4070         .align  16
4071 .xupdate4:
4072         cmp     counter,2
4073         ble,pt  %icc,.xcont4
4074         fmovd   DZERO,%f18

4076         stx     py,[%fp+tmp_py]
4077         sub     counter,2,counter

4079         st      counter,[%fp+tmp_counter]
4080         ba      .xcont4
4081         or      %g0,2,counter

4083         .align  16
4084 .xupdate5:
4085         cmp     counter,2
4086         ble,pt  %icc,.xcont5
4087         fmovd   DZERO,%f18
```

```
4089         stx     py,[%fp+tmp_py]
4090         sub     counter,2,counter

4092         st      counter,[%fp+tmp_counter]
4093         ba      .xcont5
4094         or      %g0,2,counter

4096         .align  16
4097 .xupdate6:
4098         cmp     counter,3
4099         sub     py,stridey,%i2
4100         ble,pt  %icc,.xcont6
4101         fmovd   DZERO,%f20

4103         stx     %i2,[%fp+tmp_py]
4104         sub     counter,3,counter

4106         st      counter,[%fp+tmp_counter]
4107         ba      .xcont6
4108         or      %g0,3,counter

4110         .align  16
4111 .xupdate7:
4112         cmp     counter,3
4113         sub     py,stridey,%i2
4114         ble,pt  %icc,.xcont7
4115         fmovd   DZERO,%f20

4117         stx     %i2,[%fp+tmp_py]
4118         sub     counter,3,counter

4120         st      counter,[%fp+tmp_counter]
4121         ba      .xcont7
4122         or      %g0,3,counter

4124         .align  16
4125 .xupdate8:
4126         cmp     counter,4
4127         sub     py,stridey,%l3
4128         ble,pt  %icc,.xcont8
4129         fmovd   DZERO,%f26

4131         stx     %l3,[%fp+tmp_py]
4132         sub     counter,4,counter

4134         st      counter,[%fp+tmp_counter]
4135         ba      .xcont8
4136         or      %g0,4,counter

4138         .align  16
4139 .xupdate9:
4140         cmp     counter,4
4141         sub     py,stridey,%l3
4142         ble,pt  %icc,.xcont9
4143         fmovd   DZERO,%f26

4145         stx     %l3,[%fp+tmp_py]
4146         sub     counter,4,counter

4148         st      counter,[%fp+tmp_counter]
4149         ba      .xcont9
4150         or      %g0,4,counter

4152         .align  16
4153 .xupdate10:
```



```
4154         cmp     counter,5
4155         ble,pt  %icc,.xcont10
4156         fmovd   DZERO,%f28

4158         stx     py,[%fp+tmp_py]
4159         sub     counter,5,counter

4161         st      counter,[%fp+tmp_counter]
4162         ba      .xcont10
4163         or      %g0,5,counter

4165         .align  16
4166 .xupdate11:
4167         cmp     counter,3
4168         ble,pt  %icc,.xcont11
4169         fmovd   DZERO,%f28

4171         stx     py,[%fp+tmp_py]
4172         sub     counter,3,counter

4174         st      counter,[%fp+tmp_counter]
4175         ba      .xcont11
4176         or      %g0,3,counter

4178         .align  16
4179 .xupdate12:
4180         cmp     counter,4
4181         sub     py,stridey,%i2
4182         ble,pt  %icc,.xcont12
4183         fmovd   DZERO,%f8

4185         stx     %i2,[%fp+tmp_py]
4186         sub     counter,4,counter

4188         st      counter,[%fp+tmp_counter]
4189         ba      .xcont12
4190         or      %g0,4,counter

4192         .align  16
4193 .xupdate13:
4194         cmp     counter,4
4195         sub     py,stridey,%i2
4196         ble,pt  %icc,.xcont13
4197         fmovd   DZERO,%f8

4199         stx     %i2,[%fp+tmp_py]
4200         sub     counter,4,counter

4202         st      counter,[%fp+tmp_counter]
4203         ba      .xcont13
4204         or      %g0,4,counter

4206         .align  16
4207 .xupdate14:
4208         cmp     counter,5
4209         sub     py,stridey,%l3
4210         ble,pt  %icc,.xcont14
4211         fmovd   DZERO,%f26

4213         stx     %l3,[%fp+tmp_py]
4214         sub     counter,5,counter

4216         st      counter,[%fp+tmp_counter]
4217         ba      .xcont14
4218         or      %g0,5,counter
```

```
4220         .align  16
4221 .xupdate15:
4222         cmp     counter,5
4223         sub     py,stridey,%l3
4224         ble,pt  %icc,.xcont15
4225         fmovd   DZERO,%f26

4227         stx     %l3,[%fp+tmp_py]
4228         sub     counter,5,counter

4230         st      counter,[%fp+tmp_counter]
4231         ba      .xcont15
4232         or      %g0,5,counter

4234         .align  16
4235 .xupdate16:
4236         cmp     counter,6
4237         ble,pt  %icc,.xcont16
4238         fmovd   DZERO,%f28

4240         stx     py,[%fp+tmp_py]
4241         sub     counter,6,counter

4243         st      counter,[%fp+tmp_counter]
4244         ba      .xcont16
4245         or      %g0,6,counter

4247         .align  16
4248 .xspec0:
4249         add     EXPTBL,4095,%l0
4250         add     %l0,1,%l0
4251         ldd     [%l0+8],%f20                    ! ld  DONE
4252         st      %f20,[pz]                       ! *pz = DONE;
4253         ba      .xupdate_point
4254         st      %f21,[pz+4]                     ! *pz = DONE;

4256         .align  16
4257 .xspec1:
4258         ldx     [%fp+tmp_px],%l1
4259         sethi   %hi(0x7ffffc00),MASK_0x7fffffff

4261         sethi   %hi(0x7ff00000),%o3
4262         add     MASK_0x7fffffff,0x3ff,MASK_0x7fffffff

4264         and     %l2,MASK_0x7fffffff,%o2         ! if (hy &= 0x7fffffff);
4265         sethi   %hi(0x3ff00000),MASK_0x3ff00000

4267         cmp     %o2,%o3                         ! if (hy != 0x7ff00000);
4268         bne,pn  %icc,2f                         ! if (hy != 0x7ff00000);
4269         nop

4271         ld      [py+4],%l3                      ! ld ly;
4272         cmp     %l3,0                           ! if (ly != 0);
4273         bne,a,pt        %icc,3f                 ! if (ly != 0);
4274         nop

4276         ld      [%l1],%i1                       ! ld hx;
4277         cmp     %i1,MASK_0x3ff00000             ! if (hx != 0x3ff00000);
4278         bne,a,pn        %icc,1f                 ! if (hx != 0x3ff00000);
4279         srl     %l2,31,%o7                      ! sy = hy >> 31;

4281         ld      [%l1+4],%i2                     ! ld lx;
4282         cmp     %i2,0                           ! if (lx != 0);
4283         bne,pn  %icc,1f                         ! if (lx != 0);
4284         srl     %l2,31,%o7                      ! sy = hy >> 31;
```



```
4286         fzero   %f28
4287         fmuld   %f18,%f28,%f28                  ! *pz = *py * 0.0;
4288         st      %f28,[pz]
4289         ba      .xupdate_point
4290         st      %f29,[pz+4]
4291 1:
4292         sub     %i1,MASK_0x3ff00000,%o0         ! hx - 0x3ff00000;
4293         srlx    %o0,63,%o0                      ! (hx - 0x3ff00000) >> 63;

4295         cmp     %o0,%o7                         ! if ((hx < 0x3ff00000) == sy);
4296         be,pn   %icc,1f                         ! if ((hx < 0x3ff00000) == sy);

4298         st      DZERO_HI,[pz]
4299         ba      .xupdate_point
4300         st      DZERO_LO,[pz+4]
4301 1:
4302         st      %o2,[pz]                        ! ((int*)pz)[0] = hy;
4303         ba      .xupdate_point
4304         st      %l3,[pz+4]                      ! ((int*)pz)[1] = ly;
4305 2:
4306         bl,a,pn %icc,1f                         ! if (hy < 0x7ff00000);
4307         ld      [%l1+4],%i2                     ! ld lx;
4308 3:
4309         ld      [%l1],%f20                      ! x = *px;
4310         ld      [%l1+4],%f21                    ! x = *px;
4311         fmuld   %f20,%f18,%f28                  ! *pz = *px * *py;
4312         st      %f28,[pz]
4313         ba      .xupdate_point
4314         st      %f29,[pz+4]
4315 1:
4316         ld      [%l1],%i1                       ! ld hx;
4317         cmp     %i2,0                           ! if (lx != 0);
4318         bne,pn  %icc,1f                         ! if (lx != 0);
4319         nop

4321         cmp     %i1,MASK_0x3ff00000             ! if (hx != 0x3ff00000);
4322         add     EXPTBL,4095,%l0
4323         bne,pn  %icc,1f                         ! if (hx != 0x3ff00000);
4324         add     %l0,1,%l0

4326         ldd     [%l0+8],%f20                    ! ld  DONE
4327         st      %f20,[pz]                       ! *pz = DONE;
4328         ba      .xupdate_point
4329         st      %f21,[pz+4]                     ! *pz = DONE;
4330 1:
4331         srl     %l2,31,%o7                      ! sy = hy >> 31;
4332         sub     %i1,MASK_0x3ff00000,%o0         ! hx - 0x3ff00000;

4334         srlx    %o0,63,%o0                      ! (hx - 0x3ff00000) >> 63;

4336         cmp     %o0,%o7                         ! if (hx < 0x3ff00000) == sy);
4337         be,a,pn %icc,1f                         ! if (hx < 0x3ff00000) == sy);
4338         ldd     [EXPTBL-ind_HUGE],%f20          ! y0 = _HUGE;

4340         ldd     [EXPTBL-ind_TINY],%f20          ! y0 = _TINY;
4341 1:
4342         fmuld   %f20,%f20,%f20                  ! *pz = y0 * y0
4343         st      %f20,[pz]
4344         ba      .xupdate_point
4345         st      %f21,[pz+4]

4347 .xupdate_point:
4348         add     py,stridey,py
4349         ba      .xbegin1
4350         add     pz,stridez,pz
```

```
4352         SET_SIZE(__vpow)
```

```
**********************************************************
   97328 Sat May 10 12:09:59 2014
new/usr/src/lib/libmvec/common/vis/__vpowf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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        .file   "__vpowf.S"

#include "libm.h"

        RO_DATA
        .align  64

! __mt_constexp2fa:
        .word   0x3ff00000, 0x00000000, 0x3ff00b1a, 0xfa5abcbf
        .word   0x3ff0163d, 0xa9fb3335, 0x3ff02168, 0x143b0281
        .word   0x3ff02c9a, 0x3e778061, 0x3ff037d4, 0x2e11bbcc
        .word   0x3ff04315, 0xe86e7f85, 0x3ff04e5f, 0x72f654b1
        .word   0x3ff059b0, 0xd3158574, 0x3ff0650a, 0x0e3c1f89
        .word   0x3ff0706b, 0x29ddf6de, 0x3ff07bd4, 0x2b72a836
        .word   0x3ff08745, 0x18759bc8, 0x3ff092bd, 0xf66607e0
        .word   0x3ff09e3e, 0xcac6f383, 0x3ff0a9c7, 0x9b1f3919
        .word   0x3ff0b558, 0x6cf9890f, 0x3ff0c0f1, 0x45e46c85
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504         .word   0x405ec71c, 0x2e92efda  ! KA2 =  4.809027151893566830 26e-01*256.
505         .word   0xc0671547, 0x653cbec4  ! KA1 = -7.213475205698718410 65e-01*256.
506         .word   0x40771547, 0x652af190  ! KA0 =  1.442695040880696586 45e+00*256.
507         .word   0x3ecebfbe, 0x9d182250  ! KB2 = 3.665566716607838332 61e-06
508         .word   0x3f662e43, 0xe2528362  ! KB1 = 2.707607828213929805 64e-03
509         .word   0x40e00000, 0x00000000  ! HTHRESH = 32768.0
510         .word   0xc0e2c000, 0x00000000  ! LTHRESH = -38400.0 ; 0.0f
511         .word   0x3f800000, 0x00000000  ! 1.0f               ; free

513 #define tmp_px          STACK_BIAS-48
514 #define tmp_py          STACK_BIAS-40
515 #define tmp_counter     STACK_BIAS-32
516 #define tmp0            STACK_BIAS-28
517 #define tmp1            STACK_BIAS-24
518 #define tmp2            STACK_BIAS-20
519 #define tmp3            STACK_BIAS-16
520 #define tmp4            STACK_BIAS-12
521 #define tmp5            STACK_BIAS-8
522 #define tmp6            STACK_BIAS-4
```

```
525 #define KA3             %f34
526 #define KA2             %f36
527 #define KA1             %f38
528 #define KA0             %f40
529 #define KB2             %f42
530 #define KB1             %f44
531 #define HTHRESHOLD      %f30
532 #define LTHRESHOLD      %f32

534 #define counter         %o7
535 #define stridex         %i0
536 #define stridey         %i4
537 #define stridez         %l3

539 #define CONST_0x8000    %l1
540 #define MASK_0x007fffff %l4
541 #define MASK_0x7fffffff %l5

543 ! sizeof temp storage - must be a multiple of 16 for V9
544 #define tmps            0x30

546 !--------------------------------------------------------------------
547 !              !!!!!   vpowf algorithm !!!!!
548 !  uy = *(unsigned int*)py;
549 !  ux = *(unsigned int*)px;
550 !  ay = uy & 0x7fffffff;
551 !  ax0 = ux & 0x7fffffff;
552 !  sx = ux >> 31;
553 !  yisint0 = 0;                /* Y - non-integer */
554 !  if (ax0 >= 0x7f800000 || ay >= 0x7f800000) { /* |X| or |Y| = Inf,Nan */
555 !    if (ax0 > 0x7f800000 || ay > 0x7f800000)   /* |X| or |Y| = Nan     */
556 !      pz[0] = *px * *py;
557 !      goto next;
558 !    if (ay == 0x7f800000) { /* |Y| = Inf */
559 !      float fy;
560 !      if (ax0 == 0x3f800000) fy = *py - *py; /* +-1 ** +-Inf = NaN */
561 !      else fy = ((ax0 < 0x3f800000) != (uy >> 31)) ? ZERO : *(float*) &ay;
562 !      pz[0] = fy;
563 !      goto next;
564 !    }
565 !    if (sx) {                             /* X = -Inf     */
566 !      exp = ay >> 23;
567 !      if (exp >= 0x97)                    /* |Y| >= 2^24  */
568 !        yisint0 = 2;                     /* Y - even     */
569 !      else {
570 !        if (exp >= 0x7f) {                /* |Y| >= 1     */
571 !          i0 = ay >> ((0x7f + 23) - exp);
572 !          if ((i0 << ((0x7f + 23) - exp)) == ay) yisint0 = 2 - (i0 & 1);
573 !        }
574 !      }
575 !    }
576 !    if (uy >> 31) ax0 = 0;
577 !    ax0 += yisint0 << 31;
578 !    pz[0] =  *(float*)&ax0;
579 !    goto next;
580 !  }
581 !  exp0 = (ax0 >> 23) - 127;
582 !  if ((int)ux < 0x00800000) {         /* X = denormal or negative */
583 !    if ((int)ax0 < 0x00800000) {    /* X = denormal */
584 !      *((float*) &ax0) = (float) (int)ax0;
585 !      exp0 = (ax0 >> 23) - (127 + 149);
586 !    }
587 !    if ((int)ux <= 0) {                   /* X <= 0       */
588 !      exp = ay >> 23;
589 !      if (exp >= 0x97)                    /* |Y| >= 2^24  */
```



```
590 !        yisint0 = 2;                      /* Y - even     */
591 !      else {
592 !        if (exp >= 0x7f) {                  /* |Y| >= 1     */
593 !          i0 = ay >> ((0x7f + 23) - exp);
594 !          if ((i0 << ((0x7f + 23) - exp)) == ay) yisint0 = 2 - (i0 & 1);
595 !        }
596 !      }
597 !      if (ax0 == 0) { /* pow(0,Y) */
598 !        float fy;
599 !        fy = (uy >> 31) ? ONE / ZERO : ZERO;
600 !        if (sx & yisint0) fy = -fy;
601 !        pz[0] = fy;
602 !        goto next;
603 !      }
604 !      if (yisint0 == 0) { /* pow(neg,non-integer) */
605 !        pz[0] = ZERO / ZERO;  /* NaN */
606 !        goto next;
607 !      }
608 !    }
609 !  }
610 !
611 !  ax0 = *px;
612 !  exp0 = ax0 & 0x7fffffff;
613 !  exp0 >>= 23;
614 !  exp0 -= 127;
615 !  exp0 <<= 8;
616 !  ax0 &= 0x007fffff;
617 !  i0 = ax0 + 0x8000;
618 !  i0 &= 0xffff0000;
619 !  ind0 = i0 >> 12;
620 !  ind0 &= -8;
621 !  i0 = ax0 - i0;
622 !  dtmp0 = (double) i0;
623 !  dtmp1 = *(double *)((char*)__mt_constlog4f + ind0 + 8);
624 !  y0 =  dtmp0 * dtmp1;
625 !  dtmp0 = *(double *)((char*)__mt_constlog4f + ind0);
626 !  dtmp1 = (double) exp0;
627 !  yy0 = dtmp0 + dtmp1;
628 !  dtmp0 = KA3 * y0;
629 !  dtmp0 += KA2;
630 !  dtmp0 *= y0;
631 !  dtmp0 += KA1;
632 !  dtmp0 *= y0;
633 !  dtmp0 += KA0;
634 !  dtmp0 *= y0;
635 !  yy0 += dtmp0;
636 !  ftmp0 = *py0;
637 !  dtmp0 = (double)ftmp0;
638 !  yy0 *= dtmp0;
639 !  if (yy0 >= HTHRESH)
640 !    yy0 = HTHRESH;
641 !  if (yy0 <= LTHRESH)
642 !    yy0 = LTHRESH;
643 !  ind0 = (int) yy0;
644 !  ((int*)&dtmp1)[0] = ind0;
645 !  ((int*)&dtmp1)[1] = 0;
646 !  dtmp1 = vis_fpackfix(dtmp1);
647 !  dtmp0 = (double)ind0;
648 !  y0 = yy0 - dtmp0;
649 !  dtmp0 = KB2 * y0;
650 !  dtmp0 += KB1;
651 !  yy0 = dtmp0 * y0;
652 !  ind0 &= 255;
653 !  ind0 <<= 3;
654 !  di0 = *(double*)((char*)__mt_constexp2f + ind0);
655 !  di0 = vis_fpadd32(di0,dtmp1);
```

```
656 !  yy0 *= di0;
657 !  yy0 += di0;
658 !  ftmp0 = (float)yy0;
659 !  *pz0 = ftmp0;
660 !----------------------------------------------------------------------
661 !               !!!!!   vpowf algorithm,stridex=0       !!!!!
662 !
663 !  ax = ax0 = *px;
664 !  exp0 = ax0 & 0x7fffffff;
665 !  exp0 >>= 23;
666 !  exp0 -= 127;
667 !  exp0 <<= 8;
668 !  ax0 &= 0x007fffff;
669 !  i0 = ax0 + 0x8000;
670 !  i0 &= 0xffff0000;
671 !  ind0 = i0 >> 12;
672 !  ind0 &= -8;
673 !  i0 = ax0 - i0;
674 !  dtmp0 = (double) i0;
675 !  dtmp1 = *(double *)((char*)__mt_constlog4f + ind0 + 8);
676 !  y0 =  dtmp0 * dtmp1;
677 !  dtmp0 = *(double *)((char*)__mt_constlog4f + ind0);
678 !  dtmp1 = (double) exp0;
679 !  yy0 = dtmp0 + dtmp1;
680 !  dtmp0 = KA3 * y0;
681 !  dtmp0 += KA2;
682 !  dtmp0 *= y0;
683 !  dtmp0 += KA1;
684 !  dtmp0 *= y0;
685 !  dtmp0 += KA0;
686 !  dtmp0 *= y0;
687 !  yy = yy0 + dtmp0;
688 !
689 !  uy = ((int*)py)[0];
690 !  ay = uy & 0x7fffffff;
691 !  if (ay >= 0x7f800000) {       /* |Y| = Inf or Nan */
692 !    float fy;
693 !   if (ay > 0x7f800000) fy = *py + *py;  /* |Y| = Nan     */
694 !    else fy = ((ax < 0x3f800000) != (uy >> 31)) ? ZERO : *(float*)&ay;
695 !    pz[0] = fy;
696 !    goto next;
697 !  }
698 !
699 !
700 !  ftmp0 = py[0];
701 !  dtmp0 = (double)ftmp0;
702 !  yy0 = dtmp0 * yy;
703 !  if (yy0 >= HTHRESH)
704 !  if (yy0 <= LTHRESH)
705 !  yy0 = HTHRESH;
706 !  yy0 = LTHRESH;
707 !  ii0 = (int) yy0;
708 !  dtmp0 = (double)ii0;
709 !  i0 = ii0 >> 5;
710 !  i0 &= -8;
711 !  di0 = ((double*)((char*)(__mt_constexp2fb + 150) + i0))[0];
712 !  y0 = yy0 - dtmp0;
713 !  dtmp0 = KB2 * y0;
714 !  dtmp0 += KB1;
715 !  yy0 = dtmp0 * y0;
716 !  ii0 &= 255;
717 !  ii0 <<= 3;
718 !  dtmp0 = ((double*)((char*)__mt_constexp2fa + ii0))[0];
719 !  di0 *= dtmp0;
720 !  dtmp0 = yy0 * di0;
721 !  dtmp0 += di0;
```



```
722 !  ftmp0 = (float)dtmp0;
723 !  pz[0] = ftmp0;
724 !----------------------------------------------------------------------
725         ENTRY(__vpowf)
726         save    %sp,-SA(MINFRAME)-tmps,%sp
727         PIC_SETUP(l7)
728         PIC_SET(l7,.CONST_TBL,l2)
729         wr      %g0,0x60,%gsr

731 #ifdef __sparcv9
732         ldx     [%fp+STACK_BIAS+176],stridez
733 #else
734         ld      [%fp+STACK_BIAS+92],stridez
735 #endif

737         ld      [%i1],%o3
738         add     %l2,2064,%l0
739         st      %i0,[%fp+tmp_counter]
740         add     %l0,2048,%l6
741         ldd     [%l6],KA3
742         ldd     [%l6+8],KA2
743         sll     stridey,2,stridey
744         ldd     [%l6+16],KA1
745         sll     stridez,2,stridez
746         ldd     [%l6+24],KA0
747         sll     %i2,2,stridex
748         ldd     [%l6+32],KB2
749         sethi   %hi(0x7ffffc00),MASK_0x7fffffff
750         fzero   %f2
751         ldd     [%l6+40],KB1
752         add     MASK_0x7fffffff,1023,MASK_0x7fffffff
753         fzero   %f10
754         ldd     [%l6+48],HTHRESHOLD
755         sethi   %hi(0x7ffc00),MASK_0x007fffff
756         fzero   %f20
757         ldd     [%l6+56],LTHRESHOLD
758         sethi   %hi(0x8000),CONST_0x8000
759         add     MASK_0x007fffff,1023,MASK_0x007fffff

761         cmp     stridex,0
762         bne,pt  %icc,.common_case
763         sethi   %hi(0x00800000),%l6

765         cmp     %o3,%l6
766         bl,pn   %icc,.common_case
767         sethi   %hi(0x7f800000),%o1

769         cmp     %o3,%o1
770         bge,pn  %icc,.common_case
771         sethi   %hi(0x3f800000),%l6

773         cmp     %o3,%l6
774         bne,pt  %icc,.stridex_zero
775         nop

777 .common_case:
778         stx     %i1,[%fp+tmp_px]
779         stx     %i3,[%fp+tmp_py]
780 .begin:
781         ld      [%fp+tmp_counter],counter
782         ldx     [%fp+tmp_px],%o2
783         ldx     [%fp+tmp_py],%i2
784         st      %g0,[%fp+tmp_counter]
785 .begin1:
786         cmp     counter,0
787         ble,pn  %icc,.exit
```

```
788         lda     [%o2]0x82,%i1           ! (Y0_2) ax0 = *px;

790         lda     [%i2]0x82,%l7
791         sethi   %hi(0xffff0000),%l6
792         sethi   %hi(0x7f800000),%o5

794         and     %i1,MASK_0x7fffffff,%i3 ! (Y0_2) exp0 = ax0 & 0x7fffffff;
795         and     %i1,MASK_0x007fffff,%g5 ! (Y0_2) ax0 &= 0x007fffff;

797         cmp     %i3,%o5                 ! (Y0_2) ax0 ? 0x7f800000
798         bge,pn  %icc,.spec1             ! (Y0_2) if( ax0 >= 0x7f800000 )
799         and     %l7,MASK_0x7fffffff,%o4

801         cmp     %o4,%o5                 ! (Y0_2) ay0 ? 0x7f800000
802         bge,pn  %icc,.spec1             ! (Y0_2) if( ay0 >= 0x7f800000 )
803         nop

805         cmp     %i1,MASK_0x007fffff     ! (Y0_2) ux0 ? 0x800000
806         ble,pn  %icc,.spec2             ! (Y0_2) if(ux0 < 0x800000)
807         srl     %i3,23,%o3              ! (Y0_2) exp0 >>= 23;

809         sub     %o3,127,%o3             ! (Y0_2) exp0 -= 127;

811         add     %g5,CONST_0x8000,%i3    ! (Y0_2) i0 = ax0 + 0x8000;

813         sll     %o3,8,%o4               ! (Y0_2) exp0 <<= 8;
814         and     %i3,%l6,%i3             ! (Y0_2) i0 &= 0xffff0000;
815         st      %o4,[%fp+tmp3]          ! (Y0_2) STORE exp0

817         sub     %g5,%i3,%o4             ! (Y0_2) i0 = ax0 - i0;
818         st      %o4,[%fp+tmp2]          ! (Y0_2) STORE i0
819         add     %o2,stridex,%o2         ! px += stridex

821         sra     %i3,12,%o0              ! (Y0_2) ind0 = i0 >> 12;
822         lda     [%o2]0x82,%o3           ! (Y1_2) ax0 = *px;

824         and     %o0,-8,%g5              ! (Y0_2) ind0 &= -8;
825         ld      [%fp+tmp2],%f14         ! (Y0_2) dtmp0 = (double) i0;

827         and     %o3,MASK_0x7fffffff,%i3 ! (Y1_2) exp0 = ax0 & 0x7fffffff;
828         and     %o3,MASK_0x007fffff,%o0 ! (Y1_2) ax0 &= 0x007fffff;

830         cmp     %i3,%o5                 ! (Y1_2) ax0 ? 0x7f800000
831         add     %l2,%g5,%g1             ! (Y0_2) (char*)__mt_constlog4f + ind0

833         srl     %i3,23,%i3              ! (Y1_2) exp0 >>= 23;
834         add     %o0,CONST_0x8000,%i1    ! (Y1_2) i0 = ax0 + 0x8000;

836         ldd     [%g1+8],%f48            ! (Y0_2) dtmp1 = *(double *)((char*)__mt
837         sub     %i3,127,%i3             ! (Y1_2) exp0 -= 127;
838         fitod   %f14,%f60               ! (Y0_2) dtmp0 = (double) i0;

840         sll     %i3,8,%i3               ! (Y1_2) exp0 <<= 8;
841         and     %i1,%l6,%i1             ! (Y1_2) i0 &= 0xffff0000;
842         st      %i3,[%fp+tmp4]          ! (Y1_2) STORE exp0

844         sub     %o0,%i1,%o0             ! (Y1_2) i0 = ax0 - i0;
845         st      %o0,[%fp+tmp5]          ! (Y1_2) STORE i0
846         bge,pn  %icc,.update0           ! (Y1_2) if(ax0 >= 0x7f800000)
847         nop
848 .cont0:
849         cmp     %o3,MASK_0x007fffff     ! (Y1_2) ux0 ? 0x800000

851         fmuld   %f60,%f48,%f48          ! (Y0_2) y0 =  dtmp0 * dtmp1;
852         ble,pn  %icc,.update1           ! (Y1_2) if(ux0 < 0x800000)
853         nop
```



```
854 .cont1:
855         fmuld   KA3,%f48,%f62           ! (Y0_2) dtmp0 = KA3 * y0;

857         faddd   %f62,KA2,%f22           ! (Y0_2) dtmp0 += KA2;

859         sra     %i1,12,%o1              ! (Y1_2) ind0 = i0 >> 12;
860         add     %o2,stridex,%i3         ! px += stridex
861         lda     [stridex+%o2]0x82,%g1   ! (Y2_2) ax0 = *px;

863         and     %o1,-8,%o0              ! (Y1_2) ind0 &= -8;
864         ld      [%fp+tmp5],%f12         ! (Y1_2) LOAD i0

866         and     %g1,MASK_0x7fffffff,%i1 ! (Y2_2) exp0 = ax0 & 0x7fffffff;
867         and     %g1,MASK_0x007fffff,%o2 ! (Y2_2) ax0 &= 0x007fffff;
868         lda     [%i2]0x82,%f0           ! (Y0_2) ftmp0 = *py0;

870         srl     %i1,23,%o3              ! (Y2_2) exp0 >>= 23;
871         cmp     %i1,%o5                 ! (Y2_2) ax0 ? 0x7f800000

873         fmuld   %f22,%f48,%f26          ! (Y0_2) dtmp0 *= y0;
874         add     %l2,%o0,%i1             ! (Y1_2) (char*)__mt_constlog4f + ind0
875         sub     %o3,127,%l7             ! (Y2_2) exp0 -= 127;

877         add     %o2,CONST_0x8000,%o1    ! (Y2_2) i0 = ax0 + 0x8000;
878         ldd     [%i1+8],%f50            ! (Y1_2) dtmp1 = *(double *)((char*)__mt
879         fitod   %f12,%f28               ! (Y1_2) dtmp0 = (double) i0;

881         sll     %l7,8,%l7               ! (Y2_2) exp0 <<= 8;
882         and     %o1,%l6,%o1             ! (Y2_2) i0 &= 0xffff0000;
883         st      %l7,[%fp+tmp6]          ! (Y2_2) STORE exp0

885         sub     %o2,%o1,%i1             ! (Y2_2) i0 = ax0 - i0;
886         st      %i1,[%fp+tmp2]          ! (Y2_2) STORE i0
887         bge,pn  %icc,.update2           ! (Y2_2) if(ax0 >= 0x7f800000)
888         nop
889 .cont2:
890         cmp     %g1,MASK_0x007fffff     ! (Y2_2) ux0 ? 0x800000

892         fmuld   %f28,%f50,%f46          ! (Y1_2) y0 =  dtmp0 * dtmp1;
893         ble,pn  %icc,.update3           ! (Y2_2) if(ux0 < 0x800000)
894         faddd   %f26,KA1,%f50           ! (Y0_2) dtmp0 += KA1;
895 .cont3:
896         ld      [%fp+tmp3],%f4          ! (Y0_2) dtmp1 = (double) exp0;

898         fstod   %f0,%f24                ! (Y0_2) dtmp0 = (double)ftmp0;

900         fmuld   KA3,%f46,%f28           ! (Y1_1) dtmp0 = KA3 * y0;

902         fitod   %f4,%f26                ! (Y0_1) dtmp1 = (double) exp0;

904         fmuld   %f50,%f48,%f50          ! (Y0_1) dtmp0 *= y0;

906         faddd   %f28,KA2,%f28           ! (Y1_1) dtmp0 += KA2;

908         ldd     [%l2+%g5],%f60          ! (Y0_1) dtmp0 = *(double *)((char*)__mt
909         add     %i3,stridex,%o2         ! px += stridex

911         lda     [%o2]0x82,%i1           ! (Y0_2) ax0 = *px;
912         sra     %o1,12,%g5              ! (Y2_1) ind0 = i0 >> 12;

914         faddd   %f50,KA0,%f58           ! (Y0_1) dtmp0 += KA0;
915         and     %g5,-8,%o1              ! (Y2_1) ind0 &= -8;
916         ld      [%fp+tmp2],%f6          ! (Y2_1) dtmp0 = (double) i0;

918         and     %i1,MASK_0x7fffffff,%i3 ! (Y0_2) exp0 = ax0 & 0x7fffffff;
919         and     %i1,MASK_0x007fffff,%g5 ! (Y0_2) ax0 &= 0x007fffff;
```

```
 921         srl     %i3,23,%o3              ! (Y0_2) exp0 >>= 23;
 922         add     %l2,%o1,%g1             ! (Y2_1) (char*)__mt_constlog4f + ind0
 923         faddd   %f60,%f26,%f26          ! (Y0_1) yy0 = dtmp0 + dtmp1;

 925         fmuld   %f28,%f46,%f50          ! (Y1_1) dtmp0 *= y0;
 926         sub     %o3,127,%o3             ! (Y0_2) exp0 -= 127;
 927         cmp     %i3,%o5                 ! (Y0_2) ax0 ? 0x7f800000

 929         fmuld   %f58,%f48,%f48          ! (Y0_1) dtmp0 *= y0;
 930         add     %g5,CONST_0x8000,%i3    ! (Y0_2) i0 = ax0 + 0x8000;
 931         ldd     [%g1+8],%f58            ! (Y2_1) dtmp1 = *(double *)((char*)__mt
 932         fitod   %f6,%f54                ! (Y2_1) dtmp0 = (double) i0;

 934         sll     %o3,8,%o4               ! (Y0_2) exp0 <<= 8;
 935         and     %i3,%l6,%i3             ! (Y0_2) i0 &= 0xffff0000;
 936         st      %o4,[%fp+tmp3]          ! (Y0_2) STORE exp0

 938         sub     %g5,%i3,%o4             ! (Y0_2) i0 = ax0 - i0;
 939         st      %o4,[%fp+tmp2]          ! (Y0_2) STORE i0
 940         bge,pn  %icc,.update4           ! (Y0_2) if( ax0 >= 0x7f800000 )
 941         nop
 942 .cont4:
 943         lda     [stridey+%i2]0x82,%g1   ! (Y1_1) ay0 = *(unsigned*)py0
 944         add     %i2,stridey,%o4         ! py += stridey
 945         cmp     %i1,MASK_0x007fffff     ! (Y0_2) ux0 ? 0x800000

 947         fmuld   %f54,%f58,%f28          ! (Y2_1) y0 =  dtmp0 * dtmp1;
 948         lda     [stridey+%i2]0x82,%f2   ! (Y1_1) ftmp0 = *py0;
 949         ble,pn  %icc,.update5           ! (Y0_2) if(ux0 < 0x800000)
 950         faddd   %f50,KA1,%f54           ! (Y1_1) dtmp0 += KA1;
 951 .cont5:
 952         and     %g1,MASK_0x7fffffff,%g1 ! (Y1_1) ay0 &= 0x7fffffff;
 953         ld      [%fp+tmp4],%f1          ! (Y1_1) LOAD exp0
 954         faddd   %f26,%f48,%f58          ! (Y0_1) yy0 += dtmp0;

 956         cmp     %g1,%o5                 ! (Y1_1) ay0 ? 0x7f800000
 957         bge,pn  %icc,.update6           ! (Y1_1) if(ay0 >= 0x7f800000)
 958         nop
 959 .cont6:
 960         fmuld   KA3,%f28,%f62           ! (Y2_1) dtmp0 = KA3 * y0;
 961         fstod   %f2,%f22                ! (Y1_1) dtmp0 = (double)ftmp0;

 963         fmuld   %f24,%f58,%f58          ! (Y0_1) yy0 *= dtmp0;

 965         fitod   %f1,%f48                ! (Y1_1) dtmp1 = (double) exp0;

 967         fmuld   %f54,%f46,%f54          ! (Y1_1) dtmp0 *= y0;

 969         faddd   %f62,KA2,%f26           ! (Y2_1) dtmp0 += KA2;

 971         add     %o2,stridex,%o2         ! px += stridex
 972         ldd     [%l2+%o0],%f60          ! (Y1_1) dtmp0 = *(double *)((char*)__mt
 973         fcmped  %fcc0,HTHRESHOLD,%f58   ! (Y0_1) if (yy0 >= HTHRESH)

 975         sra     %i3,12,%o0              ! (Y0_2) ind0 = i0 >> 12;
 976         lda     [%o2]0x82,%o3           ! (Y1_2) ax0 = *px;

 978         faddd   %f54,KA0,%f56           ! (Y1_1) dtmp0 += KA0;
 979         and     %o0,-8,%g5              ! (Y0_2) ind0 &= -8;
 980         ld      [%fp+tmp2],%f14         ! (Y0_2) dtmp0 = (double) i0;

 982         and     %o3,MASK_0x7fffffff,%i3 ! (Y1_2) exp0 = ax0 & 0x7fffffff;
 983         and     %o3,MASK_0x007fffff,%o0 ! (Y1_2) ax0 &= 0x007fffff;

 985         cmp     %i3,%o5                 ! (Y1_2) ax0 ? 0x7f800000
```



```
 986         add     %l2,%g5,%g1             ! (Y0_2) (char*)__mt_constlog4f + ind0
 987         faddd   %f60,%f48,%f12          ! (Y1_1) yy0 = dtmp0 + dtmp1;

 989         fmuld   %f26,%f28,%f50          ! (Y2_1) dtmp0 *= y0;
 990         srl     %i3,23,%i3              ! (Y1_2) exp0 >>= 23;
 991         add     %o0,CONST_0x8000,%i1    ! (Y1_2) i0 = ax0 + 0x8000;
 992         fcmped  %fcc1,LTHRESHOLD,%f58   ! (Y0_1) if (yy0 <= LTHRESH)

 994         fmuld   %f56,%f46,%f46          ! (Y1_1) dtmp0 *= y0;
 995         ldd     [%g1+8],%f48            ! (Y0_2) dtmp1 = *(double *)((char*)__mt
 996         sub     %i3,127,%i3             ! (Y1_2) exp0 -= 127;
 997         fitod   %f14,%f60               ! (Y0_2) dtmp0 = (double) i0;

 999         sll     %i3,8,%i2               ! (Y1_2) exp0 <<= 8;
1000         and     %i1,%l6,%i1             ! (Y1_2) i0 &= 0xffff0000;
1001         st      %i2,[%fp+tmp4]          ! (Y1_2) STORE exp0

1003         sub     %o0,%i1,%o0             ! (Y1_2) i0 = ax0 - i0;
1004         st      %o0,[%fp+tmp5]          ! (Y1_2) STORE i0
1005         bge,pn  %icc,.update7           ! (Y1_2) if(ax0 >= 0x7f800000)
1006         nop
1007 .cont7:
1008         lda     [stridey+%o4]0x82,%i3   ! Y(2_1) ay0 = *py0
1009         cmp     %o3,MASK_0x007fffff     ! (Y1_2) ux0 ? 0x800000
1010         add     %o4,stridey,%i2         ! py += stridey;
1011         fmovdl  %fcc0,HTHRESHOLD,%f58   ! (Y0_1) yy0 = HTHRESH;

1013         fmuld   %f60,%f48,%f48          ! (Y0_2) y0 =  dtmp0 * dtmp1;
1014         lda     [stridey+%o4]0x82,%f16  ! (Y2_1) ftmp0 = *py0;
1015         ble,pn  %icc,.update8           ! (Y1_2) if(ux0 < 0x800000)
1016         faddd   %f50,KA1,%f52           ! (Y2_1) dtmp0 += KA1;
1017 .cont8:
1018         and     %i3,MASK_0x7fffffff,%i3 ! (Y2_1) ay0 &= 0x7fffffff
1019         ld      [%fp+tmp6],%f17         ! (Y2_1) dtmp1 = (double) exp0;
1020         faddd   %f12,%f46,%f60          ! (Y1_1) yy0 += dtmp0;

1022         cmp     %i3,%o5                 ! (Y2_1) ay0 ? 0x7f800000
1023         bge,pn  %icc,.update9           ! (Y2_1) if(ay0 >= 0x7f800000)
1024         nop

1026 .cont9:
1027         fmovdg  %fcc1,LTHRESHOLD,%f58   ! (Y0_1) yy0 = LTHRESH;

1029         fmuld   KA3,%f48,%f62           ! (Y0_2) dtmp0 = KA3 * y0;
1030         fstod   %f16,%f54               ! (Y2_1) dtmp0 = (double)ftmp0;

1032         fmuld   %f22,%f60,%f56          ! (Y1_1) yy0 *= dtmp0;

1034         fitod   %f17,%f24               ! (Y2_1) dtmp1 = (double) exp0;

1036         fmuld   %f52,%f28,%f52          ! (Y2_1) dtmp0 *= y0;
1037         fdtoi   %f58,%f10               ! (Y0_1) ind0 = (int) yy0;

1039         st      %f10,[%fp+tmp0]         ! (Y0_1) STORE ind0
1040         faddd   %f62,KA2,%f22           ! (Y0_2) dtmp0 += KA2;

1042         fcmped  %fcc0,HTHRESHOLD,%f56   ! (Y1_1) if (yy0 >= HTHRESH)
1043         ldd     [%l2+%o1],%f60          ! (Y2_1) dtmp0 = *(double *)((char*)__mt

1045         sra     %i1,12,%o1              ! (Y1_2) ind0 = i0 >> 12;
1046         add     %o2,stridex,%i3         ! px += stridex
1047         lda     [stridex+%o2]0x82,%g1   ! (Y2_2) ax0 = *px;

1049         and     %o1,-8,%o0              ! (Y1_2) ind0 &= -8;
1050         add     %i2,stridey,%i2         ! py += stridey
1051         ld      [%fp+tmp5],%f12         ! (Y1_2) LOAD i0
```

```
1052         faddd   %f52,KA0,%f4            ! (Y2_1) dtmp0 += KA0;

1054         and     %g1,MASK_0x7fffffff,%i1 ! (Y2_2) exp0 = ax0 & 0x7fffffff;
1055         and     %g1,MASK_0x007fffff,%o2 ! (Y2_2) ax0 &= 0x007fffff;
1056         lda     [%i2]0x82,%f0           ! (Y0_2) ftmp0 = *py0;
1057         fitod   %f10,%f52               ! (Y0_1) dtmp0 = (double)ind0;

1059         srl     %i1,23,%o3              ! (Y2_2) exp0 >>= 23;
1060         cmp     %i1,%o5                 ! (Y2_2) ax0 ? 0x7f800000
1061         faddd   %f60,%f24,%f18          ! (Y2_1) yy0 = dtmp0 + dtmp1;

1063         fmuld   %f22,%f48,%f26          ! (Y0_2) dtmp0 *= y0;
1064         add     %l2,%o0,%i1             ! (Y1_2) (char*)__mt_constlog4f + ind0
1065         sub     %o3,127,%l7             ! (Y2_2) exp0 -= 127;
1066         fcmped  %fcc1,LTHRESHOLD,%f56   ! (Y1_1) if (yy0 <= LTHRESH)

1068         fmuld   %f4,%f28,%f24           ! (Y2_1) dtmp0 *= y0;
1069         add     %o2,CONST_0x8000,%o1    ! (Y2_2) i0 = ax0 + 0x8000;
1070         ldd     [%i1+8],%f50            ! (Y1_2) dtmp1 = *(double *)((char*)__mt
1071         fitod   %f12,%f28               ! (Y1_2) dtmp0 = (double) i0;

1073         sll     %l7,8,%l7               ! (Y2_2) exp0 <<= 8;
1074         and     %o1,%l6,%o1             ! (Y2_2) i0 &= 0xffff0000;
1075         st      %l7,[%fp+tmp6]          ! (Y2_2) STORE exp0
1076         fsubd   %f58,%f52,%f60          ! (Y0_1) y0 = yy0 - dtmp0;


1079         sub     %o2,%o1,%i1             ! (Y2_2) i0 = ax0 - i0;
1080         st      %i1,[%fp+tmp2]          ! (Y2_2) STORE i0
1081         bge,pn  %icc,.update10          ! (Y2_2) if(ax0 >= 0x7f800000)
1082         nop
1083 .cont10:
1084         lda     [%i2]0x82,%o2           ! (Y0_2) ay0 = *(int*)py0;
1085         cmp     %g1,MASK_0x007fffff     ! (Y2_2) ux0 ? 0x800000
1086         fmovdl  %fcc0,HTHRESHOLD,%f56   ! (Y1_1) yy0 = HTHRESH;

1088         fmuld   %f28,%f50,%f46          ! (Y1_2) y0 =  dtmp0 * dtmp1;
1089         ble,pn  %icc,.update11          ! (Y2_2) if(ux0 < 0x800000)
1090         faddd   %f26,KA1,%f50           ! (Y0_2) dtmp0 += KA1;
1091 .cont11:
1092         fmuld   KB2,%f60,%f62           ! (Y0_1) dtmp0 = KB2 * y0;
1093         and     %o2,MASK_0x7fffffff,%o2 ! (Y0_2) ay0 &= 0x7fffffff
1094         ld      [%fp+tmp3],%f4          ! (Y0_2) dtmp1 = (double) exp0;
1095         faddd   %f18,%f24,%f52          ! (Y2_1) yy0 += dtmp0;

1097         ld      [%fp+tmp0],%g1          ! (Y0_1) LAOD ind0
1098         cmp     %o2,%o5                 ! (Y0_2) ay0 ? 0x7f800000
1099         bge,pn  %icc,.update12          ! (Y0_2) if( ay0 >= 0x7f800000)
1100         nop
1101 .cont12:
1102         fstod   %f0,%f24                ! (Y0_2) dtmp0 = (double)ftmp0;

1104         cmp     counter,6               ! counter
1105         bl,pn   %icc,.tail
1106         sub     %i5,stridez,%o4

1108         ba      .main_loop
1109         nop

1111         .align  16
1112 .main_loop:
1113         fmuld   KA3,%f46,%f28           ! (Y1_1) dtmp0 = KA3 * y0;
1114         and     %g1,255,%o2             ! (Y0_0) ind0 &= 255;
1115         sub     counter,3,counter       ! counter
1116         fmovdg  %fcc1,LTHRESHOLD,%f56   ! (Y1_0) yy0 = LTHRESH;
```



```
1118         fmuld   %f54,%f52,%f18          ! (Y2_0) yy0 *= dtmp0;
1119         sll     %o2,3,%i1               ! (Y0_0) ind0 <<= 3;
1120         add     %o4,stridez,%l7         ! pz += stridez
1121         faddd   %f62,KB1,%f62           ! (Y0_0) dtmp0 += KB1;

1123         fpackfix        %f10,%f10       ! (Y0_0) dtmp1 = vis_fpackfix(dtmp1);
1124         fitod   %f4,%f26                ! (Y0_1) dtmp1 = (double) exp0;
1125         ldd     [%l0+%i1],%f58          ! (Y0_0) di0 = *(double*)((char*)__mt_co

1127         fmuld   %f50,%f48,%f50          ! (Y0_1) dtmp0 *= y0;
1128         fdtoi   %f56,%f20               ! (Y1_0) ind0 = (int) yy0;
1129         st      %f20,[%fp+tmp1]         ! (Y1_0) STORE ind0

1131         faddd   %f28,KA2,%f28           ! (Y1_1) dtmp0 += KA2;

1133         fmuld   %f62,%f60,%f62          ! (Y0_0) yy0 = dtmp0 * y0;
1134         ldd     [%l2+%g5],%f60          ! (Y0_1) dtmp0 = *(double *)((char*)__mt
1135         add     %i3,stridex,%o2         ! px += stridex
1136         fcmped  %fcc0,HTHRESHOLD,%f18   ! (Y2_0) if (yy0 >= HTHRESH)

1138         lda     [%o2]0x82,%i1           ! (Y0_2) ax0 = *px;
1139         sra     %o1,12,%g5              ! (Y2_1) ind0 = i0 >> 12;
1140         fpadd32 %f10,%f58,%f22          ! (Y0_0) di0 = vis_fpadd32(di0,dtmp1);

1142         faddd   %f50,KA0,%f58           ! (Y0_1) dtmp0 += KA0;
1143         and     %g5,-8,%o1              ! (Y2_1) ind0 &= -8;
1144         ld      [%fp+tmp2],%f6          ! (Y2_1) dtmp0 = (double) i0;

1146         fitod   %f20,%f52               ! (Y1_0) dtmp0 = (double)ind0;
1147         and     %i1,MASK_0x7fffffff,%i3 ! (Y0_2) exp0 = ax0 & 0x7fffffff;
1148         and     %i1,MASK_0x007fffff,%g5 ! (Y0_2) ax0 &= 0x007fffff;

1150         fmuld   %f62,%f22,%f62          ! (Y0_0) yy0 *= di0;
1151         srl     %i3,23,%o3              ! (Y0_2) exp0 >>= 23;
1152         add     %l2,%o1,%g1             ! (Y2_1) (char*)__mt_constlog4f + ind0
1153         faddd   %f60,%f26,%f26          ! (Y0_1) yy0 = dtmp0 + dtmp1;

1155         fmuld   %f28,%f46,%f50          ! (Y1_1) dtmp0 *= y0;
1156         sub     %o3,127,%o3             ! (Y0_2) exp0 -= 127;
1157         cmp     %i3,%o5                 ! (Y0_2) ax0 ? 0x7f800000
1158         fcmped  %fcc1,LTHRESHOLD,%f18   ! (Y2_0) if (yy0 <= LTHRESH)

1160         fmuld   %f58,%f48,%f48          ! (Y0_1) dtmp0 *= y0;
1161         add     %g5,CONST_0x8000,%i3    ! (Y0_2) i0 = ax0 + 0x8000;
1162         ldd     [%g1+8],%f58            ! (Y2_1) dtmp1 = *(double *)((char*)__mt
1163         fitod   %f6,%f54                ! (Y2_1) dtmp0 = (double) i0;

1165         sll     %o3,8,%o4               ! (Y0_2) exp0 <<= 8;
1166         and     %i3,%l6,%i3             ! (Y0_2) i0 &= 0xffff0000;
1167         st      %o4,[%fp+tmp3]          ! (Y0_2) STORE exp0
1168         fsubd   %f56,%f52,%f52          ! (Y1_0) y0 = yy0 - dtmp0;

1170         sub     %g5,%i3,%o4             ! (Y0_2) i0 = ax0 - i0;
1171         st      %o4,[%fp+tmp2]          ! (Y0_2) STORE i0
1172         bge,pn  %icc,.update13          ! (Y0_2) if( ax0 >= 0x7f800000 )
1173         faddd   %f62,%f22,%f62          ! (Y0_0) yy0 += di0;
1174 .cont13:
1175         lda     [stridey+%i2]0x82,%g1   ! (Y1_1) ay0 = *(unsigned*)py0
1176         add     %i2,stridey,%o4         ! py += stridey
1177         cmp     %i1,MASK_0x007fffff     ! (Y0_2) ux0 ? 0x800000
1178         fmovdl  %fcc0,HTHRESHOLD,%f18   ! (Y2_0) yy0 = HTHRESH;

1180         fmuld   %f54,%f58,%f28          ! (Y2_1) y0 =  dtmp0 * dtmp1;
1181         lda     [stridey+%i2]0x82,%f2   ! (Y1_1) ftmp0 = *py0;
1182         ble,pn  %icc,.update14          ! (Y0_2) if(ux0 < 0x800000)
1183         faddd   %f50,KA1,%f54           ! (Y1_1) dtmp0 += KA1;
```

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.cont14:
        fmuld   KB2,%f52,%f56           ! (Y1_0) dtmp0 = KB2 * y0;
        and     %g1,MASK_0x7fffffff,%g1 ! (Y1_1) ay0 &= 0x7fffffff;
        ld      [%fp+tmp4],%f1          ! (Y1_1) LOAD exp0
        faddd   %f26,%f48,%f58          ! (Y0_1) yy0 += dtmp0;

        ld      [%fp+tmp1],%g5          ! (Y1_0) ind0 = (int) yy0;
        cmp     %g1,%o5                 ! (Y1_1) ay0 ? 0x7f800000
        bge,pn  %icc,.update15          ! (Y1_1) if(ay0 >= 0x7f800000)
        fdtos   %f62,%f8                ! (Y0_0) ftmp0 = (float)yy0;
.cont15:
        st      %f8,[%l7]               ! (Y0_0) *pz0 = ftmp0;
        fmovdg  %fcc1,LTHRESHOLD,%f18   ! (Y2_0) yy0 = LTHRESH;

        add     %l7,stridez,%l7         ! pz += stridez
        fmuld   KA3,%f28,%f62           ! (Y2_1) dtmp0 = KA3 * y0;
        and     %g5,255,%g5             ! (Y1_0) ind0 &= 255;
        fstod   %f2,%f22                ! (Y1_1) dtmp0 = (double)ftmp0;

        fmuld   %f24,%f58,%f58          ! (Y0_1) yy0 *= dtmp0;
        sll     %g5,3,%i2               ! (Y1_0) ind0 <<= 3;
        faddd   %f56,KB1,%f60           ! (Y1_0) dtmp0 += KB1;

        fpackfix        %f20,%f20       ! (Y1_0) dtmp1 = vis_fpackfix(dtmp1);
        fitod   %f1,%f48                ! (Y1_1) dtmp1 = (double) exp0;
        ldd     [%l0+%i2],%f56          ! (Y1_0) di0 = *(double*)((char*)__mt_co

        fmuld   %f54,%f46,%f54          ! (Y1_1) dtmp0 *= y0;
        fdtoi   %f18,%f2                ! (Y2_0) ind0 = (int) yy0;
        st      %f2,[%fp+tmp1]          ! (Y2_0) STORE ind0

        faddd   %f62,KA2,%f26           ! (Y2_1) dtmp0 += KA2;

        fmuld   %f60,%f52,%f62          ! (Y1_0) yy0 = dtmp0 * y0;
        add     %o2,stridex,%o2         ! px += stridex
        ldd     [%l2+%o0],%f60          ! (Y1_1) dtmp0 = *(double *)((char*)__mt
        fcmped  %fcc0,HTHRESHOLD,%f58   ! (Y0_1) if (yy0 >= HTHRESH)

        fpadd32 %f20,%f56,%f52          ! (Y1_0) di0 = vis_fpadd32(di0,dtmp1);
        sra     %i3,12,%o0              ! (Y0_2) ind0 = i0 >> 12;
        lda     [%o2]0x82,%o3           ! (Y1_2) ax0 = *px;

        faddd   %f54,KA0,%f56           ! (Y1_1) dtmp0 += KA0;
        and     %o0,-8,%g5              ! (Y0_2) ind0 &= -8;
        ld      [%fp+tmp2],%f14         ! (Y0_2) dtmp0 = (double) i0;

        fitod   %f2,%f54                ! (Y2_0) dtmp0 = (double)ind0;
        and     %o3,MASK_0x7fffffff,%i3 ! (Y1_2) exp0 = ax0 & 0x7fffffff;
        and     %o3,MASK_0x007fffff,%o0 ! (Y1_2) ax0 &= 0x007fffff;

        fmuld   %f62,%f52,%f62          ! (Y1_0) yy0 *= di0;
        cmp     %i3,%o5                 ! (Y1_2) ax0 ? 0x7f800000
        add     %l2,%g5,%g1             ! (Y0_2) (char*)__mt_constlog4f + ind0
        faddd   %f60,%f48,%f12          ! (Y1_1) yy0 = dtmp0 + dtmp1;

        fmuld   %f26,%f28,%f50          ! (Y2_1) dtmp0 *= y0;
        srl     %i3,23,%i3              ! (Y1_2) exp0 >>= 23;
        add     %o0,CONST_0x8000,%i1    ! (Y1_2) i0 = ax0 + 0x8000;
        fcmped  %fcc1,LTHRESHOLD,%f58   ! (Y0_1) if (yy0 <= LTHRESH)

        fmuld   %f56,%f46,%f46          ! (Y1_1) dtmp0 *= y0;
        ldd     [%g1+8],%f48            ! (Y0_2) dtmp1 = *(double *)((char*)__mt
        sub     %i3,127,%i3             ! (Y1_2) exp0 -= 127;
        fitod   %f14,%f60               ! (Y0_2) dtmp0 = (double) i0;

        sll     %i3,8,%i2               ! (Y1_2) exp0 <<= 8;
```



```
        and     %i1,%l6,%i1             ! (Y1_2) i0 &= 0xffff0000;
        st      %i2,[%fp+tmp4]          ! (Y1_2) STORE exp0
        fsubd   %f18,%f54,%f26          ! (Y2_0) y0 = yy0 - dtmp0;

        sub     %o0,%i1,%o0             ! (Y1_2) i0 = ax0 - i0;
        st      %o0,[%fp+tmp5]          ! (Y1_2) STORE i0
        bge,pn  %icc,.update16          ! (Y1_2) if(ax0 >= 0x7f800000)
        faddd   %f62,%f52,%f54          ! (Y1_0) yy0 += di0;
.cont16:
        lda     [stridey+%o4]0x82,%i3   ! Y(2_1) ay0 = *py0
        cmp     %o3,MASK_0x007fffff     ! (Y1_2) ux0 ? 0x800000
        add     %o4,stridey,%i2         ! py += stridey;
        fmovdl  %fcc0,HTHRESHOLD,%f58   ! (Y0_1) yy0 = HTHRESH;

        fmuld   %f60,%f48,%f48          ! (Y0_2) y0 =  dtmp0 * dtmp1;
        lda     [stridey+%o4]0x82,%f16  ! (Y2_1) ftmp0 = *py0;
        ble,pn  %icc,.update17          ! (Y1_2) if(ux0 < 0x800000)
        faddd   %f50,KA1,%f52           ! (Y2_1) dtmp0 += KA1;
.cont17:
        fmuld   KB2,%f26,%f4            ! (Y2_0) dtmp0 = KB2 * y0;
        and     %i3,MASK_0x7fffffff,%i3 ! (Y2_1) ay0 &= 0x7fffffff
        ld      [%fp+tmp6],%f17         ! (Y2_1) dtmp1 = (double) exp0;
        faddd   %f12,%f46,%f60          ! (Y1_1) yy0 += dtmp0;

        ld      [%fp+tmp1],%o0
        cmp     %i3,%o5                 ! (Y2_1) ay0 ? 0x7f800000
        bge,pn  %icc,.update18          ! (Y2_1) if(ay0 >= 0x7f800000)
        fdtos   %f54,%f15               ! (Y1_0) ftmp0 = (float)yy0;
.cont18:
        st      %f15,[%l7]              ! (Y1_0) *pz0 = ftmp0;
        add     %l7,stridez,%o4         ! pz += stridez
        fmovdg  %fcc1,LTHRESHOLD,%f58   ! (Y0_1) yy0 = LTHRESH;

        fmuld   KA3,%f48,%f62           ! (Y0_2) dtmp0 = KA3 * y0;
        and     %o0,255,%o0             ! (Y2_0) ind0 &= 255;
        fstod   %f16,%f54               ! (Y2_1) dtmp0 = (double)ftmp0;

        fmuld   %f22,%f60,%f56          ! (Y1_1) yy0 *= dtmp0;
        sll     %o0,3,%l7               ! (Y2_0) ind0 <<= 3;
        faddd   %f4,KB1,%f60            ! (Y2_0) dtmp0 += KB1;

        fpackfix        %f2,%f2         ! (Y2_0) dtmp1 = vis_fpackfix(dtmp1);
        fitod   %f17,%f24               ! (Y2_1) dtmp1 = (double) exp0;
        ldd     [%l0+%l7],%f4           ! (Y2_0) di0 = *(double*)((char*)__mt_co

        fmuld   %f52,%f28,%f52          ! (Y2_1) dtmp0 *= y0;
        fdtoi   %f58,%f10               ! (Y0_1) ind0 = (int) yy0;

        st      %f10,[%fp+tmp0]         ! (Y0_1) STORE ind0
        faddd   %f62,KA2,%f22           ! (Y0_2) dtmp0 += KA2;

        fmuld   %f60,%f26,%f62          ! (Y2_0) yy0 = dtmp0 * y0;
        fcmped  %fcc0,HTHRESHOLD,%f56   ! (Y1_1) if (yy0 >= HTHRESH)
        ldd     [%l2+%o1],%f60          ! (Y2_1) dtmp0 = *(double *)((char*)__mt

        sra     %i1,12,%o1              ! (Y1_2) ind0 = i0 >> 12;
        add     %o2,stridex,%i3         ! px += stridex
        lda     [stridex+%o2]0x82,%g1   ! (Y2_2) ax0 = *px;
        fpadd32 %f2,%f4,%f46            ! (Y2_0) di0 = vis_fpadd32(di0,dtmp1);

        and     %o1,-8,%o0              ! (Y1_2) ind0 &= -8;
        add     %i2,stridey,%i2         ! py += stridey
        ld      [%fp+tmp5],%f12         ! (Y1_2) LOAD i0
        faddd   %f52,KA0,%f4            ! (Y2_1) dtmp0 += KA0;

        and     %g1,MASK_0x7fffffff,%i1 ! (Y2_2) exp0 = ax0 & 0x7fffffff;
```

```
1316         and     %g1,MASK_0x007fffff,%o2 ! (Y2_2) ax0 &= 0x007fffff;
1317         lda     [%i2]0x82,%f0           ! (Y0_2) ftmp0 = *py0;
1318         fitod   %f10,%f52               ! (Y0_1) dtmp0 = (double)ind0;

1320         fmuld   %f62,%f46,%f62          ! (Y2_0) yy0 *= di0;
1321         srl     %i1,23,%o3              ! (Y2_2) exp0 >>= 23;
1322         cmp     %i1,%o5                 ! (Y2_2) ax0 ? 0x7f800000
1323         faddd   %f60,%f24,%f18          ! (Y2_1) yy0 = dtmp0 + dtmp1;

1325         fmuld   %f22,%f48,%f26          ! (Y0_2) dtmp0 *= y0;
1326         add     %l2,%o0,%i1             ! (Y1_2) (char*)__mt_constlog4f + ind0
1327         sub     %o3,127,%l7             ! (Y2_2) exp0 -= 127;
1328         fcmped  %fcc1,LTHRESHOLD,%f56   ! (Y1_1) if (yy0 <= LTHRESH)

1330         fmuld   %f4,%f28,%f24           ! (Y2_1) dtmp0 *= y0;
1331         add     %o2,CONST_0x8000,%o1    ! (Y2_2) i0 = ax0 + 0x8000;
1332         ldd     [%i1+8],%f50            ! (Y1_2) dtmp1 = *(double *)((char*)__mt
1333         fitod   %f12,%f28               ! (Y1_2) dtmp0 = (double) i0;

1335         sll     %l7,8,%l7               ! (Y2_2) exp0 <<= 8;
1336         and     %o1,%l6,%o1             ! (Y2_2) i0 &= 0xffff0000;
1337         st      %l7,[%fp+tmp6]          ! (Y2_2) STORE exp0
1338         fsubd   %f58,%f52,%f60          ! (Y0_1) y0 = yy0 - dtmp0;

1340         sub     %o2,%o1,%i1             ! (Y2_2) i0 = ax0 - i0;
1341         st      %i1,[%fp+tmp2]          ! (Y2_2) STORE i0
1342         bge,pn  %icc,.update19          ! (Y2_2) if(ax0 >= 0x7f800000)
1343         faddd   %f62,%f46,%f22          ! (Y2_0) yy0 += di0;
1344 .cont19:
1345         lda     [%i2]0x82,%o2           ! (Y0_2) ay0 = *(int*)py0;
1346         cmp     %g1,MASK_0x007fffff     ! (Y2_2) ux0 ? 0x800000
1347         fmovdl  %fcc0,HTHRESHOLD,%f56   ! (Y1_1) yy0 = HTHRESH;

1349         fmuld   %f28,%f50,%f46          ! (Y1_2) y0 =  dtmp0 * dtmp1;
1350         ble,pn  %icc,.update20          ! (Y2_2) if(ux0 < 0x800000)
1351         faddd   %f26,KA1,%f50           ! (Y0_2) dtmp0 += KA1;
1352 .cont20:
1353         fmuld   KB2,%f60,%f62           ! (Y0_1) dtmp0 = KB2 * y0;
1354         and     %o2,MASK_0x7fffffff,%o2 ! (Y0_2) ay0 &= 0x7fffffff
1355         ld      [%fp+tmp3],%f4          ! (Y0_2) dtmp1 = (double) exp0;
1356         faddd   %f18,%f24,%f52          ! (Y2_1) yy0 += dtmp0;

1358         ld      [%fp+tmp0],%g1          ! (Y0_1) LAOD ind0
1359         cmp     %o2,%o5                 ! (Y0_2) ay0 ? 0x7f800000
1360         bge,pn  %icc,.update21          ! (Y0_2) if( ay0 >= 0x7f800000)
1361         fdtos   %f22,%f12               ! (Y2_0) ftmp0 = (float)yy0;
1362 .cont21:
1363         st      %f12,[%o4]              ! (Y2_0) *pz0 = ftmp0;
1364         cmp     counter,6               ! counter
1365         bge,pt  %icc,.main_loop
1366         fstod   %f0,%f24                ! (Y0_2) dtmp0 = (double)ftmp0;

1368 .tail:
1369         subcc   counter,1,counter
1370         bneg,pn %icc,.begin
1371         add     %o4,stridez,%i5

1373         fmuld   KA3,%f46,%f28           ! (Y1_1) dtmp0 = KA3 * y0;
1374         and     %g1,255,%o2             ! (Y0_0) ind0 &= 255;
1375         fmovdg  %fcc1,LTHRESHOLD,%f56   ! (Y1_0) yy0 = LTHRESH;

1377         fmuld   %f54,%f52,%f18          ! (Y2_0) yy0 *= dtmp0;
1378         sll     %o2,3,%i1               ! (Y0_0) ind0 <<= 3;
1379         add     %o4,stridez,%l7         ! pz += stridez
1380         faddd   %f62,KB1,%f62           ! (Y0_0) dtmp0 += KB1;
```



```
1382         fpackfix        %f10,%f10       ! (Y0_0) dtmp1 = vis_fpackfix(dtmp1);
1383         fitod   %f4,%f26                ! (Y0_1) dtmp1 = (double) exp0;
1384         ldd     [%l0+%i1],%f58          ! (Y0_0) di0 = *(double*)((char*)__mt_co

1386         fmuld   %f50,%f48,%f50          ! (Y0_1) dtmp0 *= y0;
1387         fdtoi   %f56,%f20               ! (Y1_0) ind0 = (int) yy0;
1388         st      %f20,[%fp+tmp1]         ! (Y1_0) STORE ind0

1390         faddd   %f28,KA2,%f28           ! (Y1_1) dtmp0 += KA2;

1392         fmuld   %f62,%f60,%f62          ! (Y0_0) yy0 = dtmp0 * y0;
1393         ldd     [%l2+%g5],%f60          ! (Y0_1) dtmp0 = *(double *)((char*)__mt
1394         fcmped  %fcc0,HTHRESHOLD,%f18   ! (Y2_0) if (yy0 >= HTHRESH)

1396         fpadd32 %f10,%f58,%f22          ! (Y0_0) di0 = vis_fpadd32(di0,dtmp1);

1398         faddd   %f50,KA0,%f58           ! (Y0_1) dtmp0 += KA0;

1400         fitod   %f20,%f52               ! (Y1_0) dtmp0 = (double)ind0;

1402         fmuld   %f62,%f22,%f62          ! (Y0_0) yy0 *= di0;
1403         faddd   %f60,%f26,%f26          ! (Y0_1) yy0 = dtmp0 + dtmp1;

1405         fmuld   %f28,%f46,%f50          ! (Y1_1) dtmp0 *= y0;
1406         fcmped  %fcc1,LTHRESHOLD,%f18   ! (Y2_0) if (yy0 <= LTHRESH)

1408         fmuld   %f58,%f48,%f48          ! (Y0_1) dtmp0 *= y0;

1410         fsubd   %f56,%f52,%f52          ! (Y1_0) y0 = yy0 - dtmp0;

1412         faddd   %f62,%f22,%f62          ! (Y0_0) yy0 += di0;

1414         lda     [stridey+%i2]0x82,%g1   ! (Y1_1) ay0 = *(unsigned*)py0
1415         add     %i2,stridey,%o4         ! py += stridey
1416         fmovdl  %fcc0,HTHRESHOLD,%f18   ! (Y2_0) yy0 = HTHRESH;

1418         lda     [stridey+%i2]0x82,%f2   ! (Y1_1) ftmp0 = *py0;
1419         faddd   %f50,KA1,%f54           ! (Y1_1) dtmp0 += KA1;

1421         fmuld   KB2,%f52,%f56           ! (Y1_0) dtmp0 = KB2 * y0;
1422         and     %g1,MASK_0x7fffffff,%g1 ! (Y1_1) ay0 &= 0x7fffffff;
1423         ld      [%fp+tmp4],%f1          ! (Y1_1) LOAD exp0
1424         faddd   %f26,%f48,%f58          ! (Y0_1) yy0 += dtmp0;

1426         ld      [%fp+tmp1],%g5          ! (Y1_0) ind0 = (int) yy0;
1427         cmp     %g1,%o5                 ! (Y1_1) ay0 ? 0x7f800000
1428         bge,pn  %icc,.update22          ! (Y1_1) if(ay0 >= 0x7f800000)
1429         fdtos   %f62,%f8                ! (Y0_0) ftmp0 = (float)yy0;
1430 .cont22:
1431         st      %f8,[%l7]               ! (Y0_0) *pz0 = ftmp0;
1432         fmovdg  %fcc1,LTHRESHOLD,%f18   ! (Y2_0) yy0 = LTHRESH;

1434         subcc   counter,1,counter
1435         bneg,pn %icc,.begin
1436         add     %l7,stridez,%i5

1438         add     %l7,stridez,%l7         ! pz += stridez
1439         and     %g5,255,%g5             ! (Y1_0) ind0 &= 255;
1440         fstod   %f2,%f22                ! (Y1_1) dtmp0 = (double)ftmp0;

1442         fmuld   %f24,%f58,%f58          ! (Y0_1) yy0 *= dtmp0;
1443         sll     %g5,3,%i2               ! (Y1_0) ind0 <<= 3;
1444         faddd   %f56,KB1,%f60           ! (Y1_0) dtmp0 += KB1;

1446         fpackfix        %f20,%f20       ! (Y1_0) dtmp1 = vis_fpackfix(dtmp1);
1447         fitod   %f1,%f48                ! (Y1_1) dtmp1 = (double) exp0;
```

```
1448         ldd     [%l0+%i2],%f56          ! (Y1_0) di0 = *(double*)((char*)__mt_co

1450         fmuld   %f54,%f46,%f54          ! (Y1_1) dtmp0 *= y0;
1451         fdtoi   %f18,%f2                ! (Y2_0) ind0 = (int) yy0;
1452         st      %f2,[%fp+tmp1]          ! (Y2_0) STORE ind0


1455         fmuld   %f60,%f52,%f62          ! (Y1_0) yy0 = dtmp0 * y0;
1456         ldd     [%l2+%o0],%f60          ! (Y1_1) dtmp0 = *(double *)((char*)__mt
1457         fcmped  %fcc0,HTHRESHOLD,%f58   ! (Y0_1) if (yy0 >= HTHRESH)

1459         fpadd32 %f20,%f56,%f52          ! (Y1_0) di0 = vis_fpadd32(di0,dtmp1);

1461         faddd   %f54,KA0,%f56           ! (Y1_1) dtmp0 += KA0;

1463         fitod   %f2,%f54                ! (Y2_0) dtmp0 = (double)ind0;

1465         fmuld   %f62,%f52,%f62          ! (Y1_0) yy0 *= di0;
1466         faddd   %f60,%f48,%f12          ! (Y1_1) yy0 = dtmp0 + dtmp1;

1468         fcmped  %fcc1,LTHRESHOLD,%f58   ! (Y0_1) if (yy0 <= LTHRESH)

1470         fmuld   %f56,%f46,%f46          ! (Y1_1) dtmp0 *= y0;

1472         fsubd   %f18,%f54,%f26          ! (Y2_0) y0 = yy0 - dtmp0;

1474         faddd   %f62,%f52,%f54          ! (Y1_0) yy0 += di0;

1476         fmovdl  %fcc0,HTHRESHOLD,%f58   ! (Y0_1) yy0 = HTHRESH;


1479         fmuld   KB2,%f26,%f4            ! (Y2_0) dtmp0 = KB2 * y0;
1480         faddd   %f12,%f46,%f60          ! (Y1_1) yy0 += dtmp0;

1482         ld      [%fp+tmp1],%o0
1483         fdtos   %f54,%f15               ! (Y1_0) ftmp0 = (float)yy0;

1485         st      %f15,[%l7]              ! (Y1_0) *pz0 = ftmp0;
1486         add     %l7,stridez,%o4         ! pz += stridez
1487         fmovdg  %fcc1,LTHRESHOLD,%f58   ! (Y0_1) yy0 = LTHRESH;

1489         subcc   counter,1,counter
1490         bneg,pn %icc,.begin
1491         or      %g0,%o4,%i5

1493         and     %o0,255,%o0             ! (Y2_0) ind0 &= 255;

1495         fmuld   %f22,%f60,%f56          ! (Y1_1) yy0 *= dtmp0;
1496         sll     %o0,3,%l7               ! (Y2_0) ind0 <<= 3;
1497         faddd   %f4,KB1,%f60            ! (Y2_0) dtmp0 += KB1;

1499         fpackfix        %f2,%f2         ! (Y2_0) dtmp1 = vis_fpackfix(dtmp1);
1500         ldd     [%l0+%l7],%f4           ! (Y2_0) di0 = *(double*)((char*)__mt_co

1502         fdtoi   %f58,%f10               ! (Y0_1) ind0 = (int) yy0;

1504         st      %f10,[%fp+tmp0]         ! (Y0_1) STORE ind0

1506         fmuld   %f60,%f26,%f62          ! (Y2_0) yy0 = dtmp0 * y0;
1507         fcmped  %fcc0,HTHRESHOLD,%f56   ! (Y1_1) if (yy0 >= HTHRESH)

1509         fpadd32 %f2,%f4,%f46            ! (Y2_0) di0 = vis_fpadd32(di0,dtmp1);

1511         add     %i2,stridey,%i2         ! py += stridey

1513         fitod   %f10,%f52               ! (Y0_1) dtmp0 = (double)ind0;
```



```
1515         fmuld   %f62,%f46,%f62          ! (Y2_0) yy0 *= di0;

1517         fcmped  %fcc1,LTHRESHOLD,%f56   ! (Y1_1) if (yy0 <= LTHRESH)


1520         fsubd   %f58,%f52,%f60          ! (Y0_1) y0 = yy0 - dtmp0;

1522         faddd   %f62,%f46,%f22          ! (Y2_0) yy0 += di0;

1524         fmovdl  %fcc0,HTHRESHOLD,%f56   ! (Y1_1) yy0 = HTHRESH;

1526         fmuld   KB2,%f60,%f62           ! (Y0_1) dtmp0 = KB2 * y0;

1528         ld      [%fp+tmp0],%g1          ! (Y0_1) LAOD ind0
1529         fdtos   %f22,%f12               ! (Y2_0) ftmp0 = (float)yy0;

1531         st      %f12,[%o4]              ! (Y2_0) *pz0 = ftmp0;

1533         subcc   counter,1,counter
1534         bneg,pn %icc,.begin
1535         add     %o4,stridez,%i5

1537         and     %g1,255,%o2             ! (Y0_0) ind0 &= 255;
1538         fmovdg  %fcc1,LTHRESHOLD,%f56   ! (Y1_0) yy0 = LTHRESH;

1540         sll     %o2,3,%i1               ! (Y0_0) ind0 <<= 3;
1541         add     %o4,stridez,%l7         ! pz += stridez
1542         faddd   %f62,KB1,%f62           ! (Y0_0) dtmp0 += KB1;

1544         fpackfix        %f10,%f10       ! (Y0_0) dtmp1 = vis_fpackfix(dtmp1);
1545         ldd     [%l0+%i1],%f58          ! (Y0_0) di0 = *(double*)((char*)__mt_co

1547         fdtoi   %f56,%f20               ! (Y1_0) ind0 = (int) yy0;
1548         st      %f20,[%fp+tmp1]         ! (Y1_0) STORE ind0

1550         fmuld   %f62,%f60,%f62          ! (Y0_0) yy0 = dtmp0 * y0;

1552         fpadd32 %f10,%f58,%f22          ! (Y0_0) di0 = vis_fpadd32(di0,dtmp1);

1554         fitod   %f20,%f52               ! (Y1_0) dtmp0 = (double)ind0;

1556         fmuld   %f62,%f22,%f62          ! (Y0_0) yy0 *= di0;

1558         fsubd   %f56,%f52,%f52          ! (Y1_0) y0 = yy0 - dtmp0;

1560         faddd   %f62,%f22,%f62          ! (Y0_0) yy0 += di0;

1562         fmuld   KB2,%f52,%f56           ! (Y1_0) dtmp0 = KB2 * y0;

1564         ld      [%fp+tmp1],%g5          ! (Y1_0) ind0 = (int) yy0;
1565         fdtos   %f62,%f8                ! (Y0_0) ftmp0 = (float)yy0;
1566         st      %f8,[%l7]               ! (Y0_0) *pz0 = ftmp0;

1568         subcc   counter,1,counter
1569         bneg    .begin
1570         add     %l7,stridez,%i5

1572         add     %l7,stridez,%l7         ! pz += stridez
1573         and     %g5,255,%g5             ! (Y1_0) ind0 &= 255;

1575         sll     %g5,3,%i2               ! (Y1_0) ind0 <<= 3;
1576         faddd   %f56,KB1,%f60           ! (Y1_0) dtmp0 += KB1;

1578         fpackfix        %f20,%f20       ! (Y1_0) dtmp1 = vis_fpackfix(dtmp1);
1579         ldd     [%l0+%i2],%f56          ! (Y1_0) di0 = *(double*)((char*)__mt_co
```

```
1581         fmuld   %f60,%f52,%f62          ! (Y1_0) yy0 = dtmp0 * y0;

1583         fpadd32 %f20,%f56,%f52          ! (Y1_0) di0 = vis_fpadd32(di0,dtmp1);

1585         fmuld   %f62,%f52,%f62          ! (Y1_0) yy0 *= di0;

1587         faddd   %f62,%f52,%f54          ! (Y1_0) yy0 += di0;

1589         fdtos   %f54,%f15               ! (Y1_0) ftmp0 = (float)yy0;

1591         st      %f15,[%l7]              ! (Y1_0) *pz0 = ftmp0;
1592         ba      .begin
1593         add     %l7,stridez,%i5         ! pz += stridez

1595 .exit:
1596         ret
1597         restore

1599         .align  16
1600 .specs_exit:
1601         add     %i1,stridex,%o2
1602         add     %i3,stridey,%i2
1603         st      %f4,[%i5]

1605         sub     counter,1,counter
1606         ba      .begin1
1607         add     %i5,stridez,%i5

1609 .spec1:
1610         ld      [%l0+2048+64],%f0       ! LOAD 1.0f
1611         or      %g0,%i1,%o1
1612         or      %g0,%i3,%o3

1614         ld      [%o2],%f4               ! *px
1615         or      %g0,%o2,%i1
1616         or      %g0,%i2,%i3

1618         ld      [%i3],%f6               ! *py
1619         or      %g0,%l7,%o2
1620         fsubs   %f0,%f0,%f5             ! 0.0f

1622         sethi   %hi(0x7f800000),%l6
1623         cmp     %o4,0                   ! ay ? 0
1624         be,a,pn %icc,.specs_exit        ! if(ay == 0)
1625         fmovs   %f0,%f4                 ! return 1.0f

1627         cmp     %o3,%l6                 ! ax0 ? 0x7f800000
1628         bgu,a   %icc,.specs_exit        ! ax0 > 0x7f800000
1629         fmuls   %f4,%f6,%f4             ! return *px * *py; /* |X| or |Y| = Nan

1631         cmp     %o4,%l6                 ! ay ? 0x7f800000
1632         bgu,a   .specs_exit             ! ay > 0x7f800000
1633         fmuls   %f4,%f6,%f4             ! return *px * *py; /* |X| or |Y| = Nan

1635         sethi   %hi(0x3f800000),%o5
1636         bne,a   %icc,1f                 ! if (ay != 0x7f800000) { /* |Y| = Inf *
1637         srl     %o1,31,%o1              ! sx = ux >> 31

1639         cmp     %o3,%o5                 ! ax0 ? 0x3f800000
1640         be,a    .specs_exit             ! if (ax0 == 0x3f800000)
1641         fmuls   %f6,%f5,%f4             ! return *py * 0.0f; /* +-1 ** +-Inf = N

1643         sub     %o3,%o5,%o3             ! ax0 - 0x3f800000
1644         srl     %o2,31,%o2              ! uy >> 31
```



```
1646         srlx    %o3,63,%o3              ! (ax0 - 0x3f800000) << 63

1648         cmp     %o3,%o2                 ! ((ax0 - 0x3f800000) << 63) ? (uy >> 31
1649         bne,a   .specs_exit
1650         fzeros  %f4                     ! return 0.f;

1652         ba      .specs_exit
1653         fabss   %f6,%f4                 ! return fabss(*py)
1654 1:
1655         cmp     %o1,0                   ! sx ? 0
1656         be,pn   %icc,.spec1_exit        ! if (sx == 0)
1657         or      %g0,%g0,%o5             ! yisint0 = 0;

1659         srl     %o4,23,%l7              ! exp = ay >> 23;
1660         cmp     %l7,0x97                ! exp ? 0x97
1661         bge,a,pn %icc,.spec1_exit       ! if (exp >= 0x97) /* |Y| >= 2^24  */
1662         add     %g0,2,%o5               ! yisint = 2;

1664         cmp     %l7,0x7f                ! exp ? 0x7f
1665         bl,pn   %icc,.spec1_exit        ! if (exp < 0x7f)
1666         sub     %g0,%l7,%l7             ! exp = -exp;

1668         add     %l7,(0x7f + 23),%l7     ! exp += (0x07f + 23);
1669         srl     %o4,%l7,%l6             ! i0 = ay >> exp
1670         sll     %l6,%l7,%l7             ! i0 << exp

1672         cmp     %l7,%o4                 ! (i0 << exp) ? ay
1673         bne,pn  %icc,.spec1_exit        ! if((i0 << exp) != ay)
1674         and     %l6,1,%l6               ! i0 &= 1

1676         sub     %g0,%l6,%l6             ! i0 = -i0;
1677         add     %l6,2,%o5               ! yisint0 = 2 + i0;

1679 .spec1_exit:
1680         srl     %o2,31,%o2              ! uy >> 31
1681         cmp     %o2,0                   ! (uy >> 31) ? 0
1682         movne   %icc,%g0,%o3            ! if (uy >> 31) ax0 = 0;

1684         sll     %o5,31,%o5              ! yisint0 <<= 31;
1685         add     %o5,%o3,%o5             ! ax0 += yisint0;

1687         add     %i1,stridex,%o2         ! px += stridex;
1688         add     %i3,stridey,%i2         ! py += stridey;
1689         st      %o5,[%i5]               ! return *(float*)&ax0;

1691         sub     counter,1,counter       ! counter--;
1692         ba      .begin1
1693         add     %i5,stridez,%i5         ! pz += stridez;

1695 .spec2:
1696         or      %g0,%i1,%o1
1697         or      %g0,%i3,%o3
1698         ld      [%l0+2048+64],%f0       ! LOAD 1.0f
1699         or      %g0,%o2,%i1
1700         or      %g0,%i2,%i3

1702         or      %g0,%l7,%o2
1703         cmp     %o4,0                   ! ay ? 0
1704         be,a,pn %icc,.specs_exit        ! if(ay == 0)
1705         fmovs   %f0,%f4                 ! return 1.0f

1707         srl     %o3,23,%l7              ! exp0 = (ax0 >> 23);
1708         sub     %l7,127,%l7             ! exp = exp0 = exp0 - 127;

1710         or      %g0,%g0,%o5             ! yisint = 0;
1711         cmp     %o3,MASK_0x007fffff     ! (int)ax0 ? 0x00800000
```

```
1712         bg,pn   %icc,1f                 ! if ((int)ax0 >= 0x00800000)
1713         nop
1714
1715                                         ! X = denormal or negative
1716         st      %o3,[%fp+tmp0]          ! *((float*) &ax0) = (float) (int)ax0;
1717         ld      [%fp+tmp0],%f4
1718         fitos   %f4,%f4
1719         st      %f4,[%fp+tmp0]
1720         ld      [%fp+tmp0],%o3
1721
1722         srl     %o3,23,%l7              ! exp = (ax0 >> 23)
1723         sub     %l7,127+149,%l7         ! exp -= (127+149)
1724 1:
1725         cmp     %o1,0                   ! ux ? 0
1726         bg,a    %icc,.spec_proc         ! if((int)ux > 0)
1727         sethi   %hi(0xffff0000),%l6
1728
1729         srl     %o4,23,%o0              ! exp = ay >> 23;
1730         cmp     %o0,0x97                ! exp ? 0x97
1731         bge,a,pn %icc,2f                ! if (exp >= 0x97) /* |Y| >= 2^24  */
1732         add     %g0,2,%o5               ! yisint0 = 2;     /* Y - even */
1733
1734         cmp     %o0,0x7f                ! exp ? 0x7f
1735         bl,pn   %icc,2f                 ! if(exp < 0x7f)
1736         nop
1737
1738         sub     %g0,%o0,%o0             ! exp = -exp;
1739         add     %o0,(0x7f + 23),%o0     ! exp += (0x7f + 23)
1740         srl     %o4,%o0,%l6             ! i0 = ay >> ((0x7f + 23) - exp);
1741         sll     %l6,%o0,%o0             ! i0 << ((0x7f + 23) - exp
1742         cmp     %o0,%o4                 ! (i0 << ((0x7f + 23) - exp)) ? ay
1743         bne,pn  %icc,2f                 ! if(i0 << ((0x7f + 23) - exp)) != ay)
1744         nop
1745
1746         and     %l6,1,%l6               ! i0 &= 1;
1747         sub     %g0,%l6,%l6             ! i0 = -i0;
1748         add     %l6,2,%o5               ! yisint = i0 + 2;
1749 2:
1750         cmp     %o3,0                   ! ax0 ? 0
1751         bne,pn  %icc,4f                 ! if(ax0 != 0)
1752         nop
1753
1754         srl     %o1,31,%o1              ! sx = ux >> 31
1755         srl     %o2,31,%o2              ! uy >> 31
1756
1757         cmp     %o2,0                   ! (uy >> 31) ? 0
1758         be,a,pn %icc,3f                 ! if((uy >> 31) == 0)
1759         fzeros  %f4                     ! return ZERO
1760
1761         fdivs   %f0,%f3,%f4             ! fy = ONE/ZERO
1762 3:
1763         andcc   %o1,%o5,%g0             ! sx & yisint0
1764         be,pn   %icc,.specs_exit        ! if( (sx & yisint0) == 0 )
1765         nop
1766
1767         ba      .specs_exit
1768         fnegs   %f4,%f4                 ! fy = -fy;
1769 4:
1770         cmp     %o5,0                   ! ysisint0 ? 0
1771         be,a    %icc,.specs_exit        ! if(yisint0 == 0)
1772         fdivs   %f3,%f3,%f4             ! return ZERO/ZERO
1773
1774         sethi   %hi(0xffff0000),%l6
1775
1776 .spec_proc:
1777         sll     %l7,8,%l7               ! exp0 = exp0 << 8;
```



```
1778         st      %l7,[%fp+tmp1]          ! STORE exp0
1779         and     %o3,MASK_0x007fffff,%g5 ! ax0 &= 0x007fffff;
1780         ld      [%i3],%f14              ! ftmp0 = py[0]
1781         sllx    %o5,63,%o5              ! ysisint0 <<= 63;
1782         add     %g5,CONST_0x8000,%o3    ! i0 = ax0 + 0x8000;
1783         stx     %o5,[%fp+tmp5]          ! STORE yisint0
1784         and     %o3,%l6,%l7             ! i0 &= 0xffff0000;
1785         sub     %g5,%l7,%o1             ! i0 = ax0 - i0;
1786         sra     %l7,12,%g5              ! ind0 = i0 >> 12;
1787         st      %o1,[%fp+tmp2]          ! STORE i0
1788         fstod   %f14,%f54               ! dtmp1 = (double)ftmp0
1789         and     %g5,-8,%g5              ! ind0 &= -8;
1790         add     %l2,%g5,%l7             ! (char*)__mt_constlog4f + ind0
1791         ld      [%fp+tmp1],%f18         ! LOAD exp0
1792         ld      [%fp+tmp2],%f16         ! LOAD i0
1793         ldd     [%l7+8],%f62            ! dtmp2 = *(double *)((char*)__mt_constl
1794         ldd     [%l2+%g5],%f56          ! dtmp3 = *(double *)((char*)__mt_constl
1795         fitod   %f18,%f58               ! dtmp4 = (double)exp0
1796         fitod   %f16,%f60               ! dtmp5 = (double)i0
1797         fmuld   %f60,%f62,%f60          ! y0 =  dtmp5 * dtmp2;
1798         faddd   %f56,%f58,%f58          ! yy0 = dtmp3 + dtmp4;
1799         fmuld   KA3,%f60,%f52           ! dtmp0 = KA3 * y0;
1800         faddd   %f52,KA2,%f50           ! dtmp0 += KA2;
1801         fmuld   %f50,%f60,%f48          ! dtmp0 *= y0;
1802         faddd   %f48,KA1,%f46           ! dtmp0 += KA1;
1803         fmuld   %f46,%f60,%f62          ! dtmp0 *= y0;
1804         ldd     [%fp+tmp5],%f24         ! LOAD yisint0
1805         faddd   %f62,KA0,%f56           ! dtmp0 += KA0;
1806         fmuld   %f56,%f60,%f52          ! dtmp0 *= y0;
1807         faddd   %f58,%f52,%f50          ! yy0 += dtmp1;
1808         fmuld   %f54,%f50,%f52          ! yy0 *= dtmp1;
1809         fcmped  %fcc0,HTHRESHOLD,%f52   ! if (yy0 >= HTHRESH)
1810         fcmped  %fcc1,LTHRESHOLD,%f52   ! yy0 = HTHRESH;
1811         fmovdl  %fcc0,HTHRESHOLD,%f52   ! if (yy0 <= LTHRESH)
1812         fmovdg  %fcc1,LTHRESHOLD,%f52   ! yy0 = LTHRESH;
1813         fdtoi   %f52,%f20               ! ind0 = (int) yy0;
1814         st      %f20,[%fp+tmp3]         ! STORE ind0
1815         fitod   %f20,%f58               ! dtmp0 = (double) ind0;
1816         fpackfix        %f20,%f20       ! dtmp1 = vis_fpackfix(dtmp1)
1817         ld      [%fp+tmp3],%g1          ! LOAD ind0
1818         fsubd   %f52,%f58,%f46          ! y0 = yy0 - dtmp0;
1819         fpadd32 %f20,%f24,%f56          ! dtmp1 += yisint0
1820         and     %g1,255,%o4             ! ind0 &= 255;
1821         sll     %o4,3,%o3               ! ind0 <<= 3;
1822         ldd     [%l0+%o3],%f54          ! di0 = *(double*)((char*)__mt_constexp2
1823         fmuld   KB2,%f46,%f48           ! dtmp0 = KB2 * y0;
1824         fpadd32 %f56,%f54,%f56          ! di0 = vis_fpadd32(di0,dtmp1);
1825         faddd   %f48,KB1,%f62           ! dtmp0 += KB1;
1826         fmuld   %f62,%f46,%f60          ! yy0 = dtmp0 * y0;
1827         fmuld   %f60,%f56,%f52          ! yy0 *= di0;
1828         faddd   %f52,%f56,%f58          ! yy0 += di0;
1829         ba      .specs_exit
1830         fdtos   %f58,%f4                ! ftmp0 = (float)yy0;
1831
1832         .align  16
1833 .update0:
1834         cmp     counter,1
1835         ble     .cont0
1836         nop
1837
1838         add     %i2,stridey,%o1
1839         stx     %o2,[%fp+tmp_px]
1840
1841         stx     %o1,[%fp+tmp_py]
1842         sub     counter,1,counter
```

```
1844         st      counter,[%fp+tmp_counter]
1845         ba      .cont0
1846         or      %g0,1,counter

1848         .align  16
1849 .update1:
1850         cmp     counter,1
1851         ble     .cont1
1852         nop

1854         add     %i2,stridey,%o1
1855         stx     %o2,[%fp+tmp_px]

1857         stx     %o1,[%fp+tmp_py]
1858         sub     counter,1,counter

1860         st      counter,[%fp+tmp_counter]
1861         ba      .cont1
1862         or      %g0,1,counter

1864         .align  16
1865 .update2:
1866         cmp     counter,2
1867         ble     .cont2
1868         nop

1870         add     %i2,stridey,%o2
1871         stx     %i3,[%fp+tmp_px]

1873         add     %o2,stridey,%o2
1874         stx     %o2,[%fp+tmp_py]

1876         sub     counter,2,counter
1877         st      counter,[%fp+tmp_counter]
1878         ba      .cont2
1879         or      %g0,2,counter

1881         .align  16
1882 .update3:
1883         cmp     counter,2
1884         ble     .cont3
1885         nop

1887         add     %i2,stridey,%o2
1888         stx     %i3,[%fp+tmp_px]

1890         add     %o2,stridey,%o2
1891         stx     %o2,[%fp+tmp_py]

1893         sub     counter,2,counter
1894         st      counter,[%fp+tmp_counter]
1895         ba      .cont3
1896         or      %g0,2,counter

1898         .align  16
1899 .update4:
1900         cmp     counter,3
1901         ble     .cont4
1902         nop

1904         sll     stridey,1,%g5
1905         add     %i2,stridey,%o3
1906         stx     %o2,[%fp+tmp_px]

1908         add     %o3,%g5,%o3
1909         stx     %o3,[%fp+tmp_py]
```



```
1911         sub     counter,3,counter
1912         st      counter,[%fp+tmp_counter]
1913         ba      .cont4
1914         or      %g0,3,counter

1916         .align  16
1917 .update5:
1918         cmp     counter,3
1919         ble     .cont5
1920         nop

1922         sll     stridey,1,%g5
1923         add     %i2,stridey,%o3
1924         stx     %o2,[%fp+tmp_px]

1926         add     %o3,%g5,%o3
1927         stx     %o3,[%fp+tmp_py]

1929         sub     counter,3,counter
1930         st      counter,[%fp+tmp_counter]
1931         ba      .cont5
1932         or      %g0,3,counter

1934         .align  16
1935 .update6:
1936         fzeros  %f2
1937         cmp     counter,1
1938         ble     .cont6
1939         nop

1941         ld      [%fp+tmp_counter],%g1

1943         sub     %o2,stridex,%o3
1944         stx     %o4,[%fp+tmp_py]

1946         sub     %o3,stridex,%o3
1947         add     %g1,counter,counter
1948         stx     %o3,[%fp+tmp_px]

1950         sub     counter,1,counter
1951         st      counter,[%fp+tmp_counter]
1952         ba      .cont6
1953         or      %g0,1,counter

1955         .align  16
1956 .update7:
1957         cmp     counter,4
1958         ble     .cont7
1959         nop

1961         sll     stridey,1,%g1
1962         add     %o4,stridey,%o0
1963         stx     %o2,[%fp+tmp_px]

1965         add     %o0,%g1,%o0
1966         stx     %o0,[%fp+tmp_py]

1968         sub     counter,4,counter
1969         st      counter,[%fp+tmp_counter]
1970         ba      .cont7
1971         or      %g0,4,counter

1973         .align  16
1974 .update8:
1975         cmp     counter,4
```

```
1976         ble     .cont8
1977         nop

1979         sll     stridey,1,%g1
1980         add     %o4,stridey,%o0
1981         stx     %o2,[%fp+tmp_px]

1983         add     %o0,%g1,%o0
1984         stx     %o0,[%fp+tmp_py]

1986         sub     counter,4,counter
1987         st      counter,[%fp+tmp_counter]
1988         ba      .cont8
1989         or      %g0,4,counter

1991         .align  16
1992 .update9:
1993         cmp     counter,2
1994         ble     .cont9
1995         fzeros  %f16

1997         ld      [%fp+tmp_counter],%i3

1999         sub     %o2,stridex,%g1
2000         stx     %i2,[%fp+tmp_py]

2002         sub     %g1,stridex,%g1
2003         add     %i3,counter,counter
2004         stx     %g1,[%fp+tmp_px]

2006         sub     counter,2,counter
2007         st      counter,[%fp+tmp_counter]
2008         ba      .cont9
2009         or      %g0,2,counter

2011         .align  16
2012 .update10:
2013         cmp     counter,5
2014         ble     .cont10
2015         nop

2017         add     %i2,stridey,%i1
2018         stx     %i3,[%fp+tmp_px]

2020         add     %i1,stridey,%i1
2021         stx     %i1,[%fp+tmp_py]

2023         sub     counter,5,counter
2024         st      counter,[%fp+tmp_counter]
2025         ba      .cont10
2026         or      %g0,5,counter

2028         .align  16
2029 .update11:
2030         cmp     counter,5
2031         ble     .cont11
2032         nop

2034         add     %i2,stridey,%i1
2035         stx     %i3,[%fp+tmp_px]

2037         add     %i1,stridey,%i1
2038         stx     %i1,[%fp+tmp_py]

2040         sub     counter,5,counter
2041         st      counter,[%fp+tmp_counter]
```



```
2042         ba      .cont11
2043         or      %g0,5,counter

2045         .align  16
2046 .update12:
2047         fzeros  %f0
2048         cmp     counter,3
2049         ble     .cont12
2050         nop

2052         ld      [%fp+tmp_counter],%o2

2054         sub     %i3,stridex,%i1
2055         stx     %i2,[%fp+tmp_py]

2057         sub     %i1,stridex,%i1
2058         add     %o2,counter,counter
2059         stx     %i1,[%fp+tmp_px]

2061         sub     counter,3,counter
2062         st      counter,[%fp+tmp_counter]
2063         ba      .cont12
2064         or      %g0,3,counter

2066         .align  16
2067 .update13:
2068         cmp     counter,3
2069         ble     .cont13
2070         nop

2072         sll     stridey,1,%g5
2073         add     %i2,stridey,%o3
2074         stx     %o2,[%fp+tmp_px]

2076         add     %o3,%g5,%o3
2077         stx     %o3,[%fp+tmp_py]

2079         sub     counter,3,counter
2080         st      counter,[%fp+tmp_counter]
2081         ba      .cont13
2082         or      %g0,3,counter

2084         .align  16
2085 .update14:
2086         cmp     counter,3
2087         ble     .cont14
2088         nop

2090         sll     stridey,1,%g5
2091         add     %i2,stridey,%o3
2092         stx     %o2,[%fp+tmp_px]

2094         add     %o3,%g5,%o3
2095         stx     %o3,[%fp+tmp_py]

2097         sub     counter,3,counter
2098         st      counter,[%fp+tmp_counter]
2099         ba      .cont14
2100         or      %g0,3,counter

2102         .align  16
2103 .update15:
2104         cmp     counter,1
2105         ble     .cont15
2106         fzeros  %f2
```

```
2108         ld      [%fp+tmp_counter],%g1

2110         sub     %o2,stridex,%o3
2111         stx     %o4,[%fp+tmp_py]

2113         sub     %o3,stridex,%o3
2114         add     %g1,counter,counter
2115         stx     %o3,[%fp+tmp_px]

2117         sub     counter,1,counter
2118         st      counter,[%fp+tmp_counter]
2119         ba      .cont15
2120         or      %g0,1,counter

2122         .align  16
2123 .update16:
2124         cmp     counter,4
2125         ble     .cont16
2126         nop

2128         sll     stridey,1,%g1
2129         add     %o4,stridey,%o0
2130         stx     %o2,[%fp+tmp_px]

2132         add     %o0,%g1,%o0
2133         stx     %o0,[%fp+tmp_py]

2135         sub     counter,4,counter
2136         st      counter,[%fp+tmp_counter]
2137         ba      .cont16
2138         or      %g0,4,counter

2140         .align  16
2141 .update17:
2142         cmp     counter,4
2143         ble     .cont17
2144         nop

2146         sll     stridey,1,%g1
2147         add     %o4,stridey,%o0
2148         stx     %o2,[%fp+tmp_px]

2150         add     %o0,%g1,%o0
2151         stx     %o0,[%fp+tmp_py]

2153         sub     counter,4,counter
2154         st      counter,[%fp+tmp_counter]
2155         ba      .cont17
2156         or      %g0,4,counter

2158         .align  16
2159 .update18:
2160         fzeros  %f16
2161         cmp     counter,2
2162         ble     .cont18
2163         nop

2165         ld      [%fp+tmp_counter],%i3

2167         sub     %o2,stridex,%g1
2168         stx     %i2,[%fp+tmp_py]

2170         sub     %g1,stridex,%g1
2171         add     %i3,counter,counter
2172         stx     %g1,[%fp+tmp_px]
```



```
2174         sub     counter,2,counter
2175         st      counter,[%fp+tmp_counter]
2176         ba      .cont18
2177         or      %g0,2,counter

2179         .align  16
2180 .update19:
2181         cmp     counter,5
2182         ble     .cont19
2183         nop

2185         add     %i2,stridey,%i1
2186         stx     %i3,[%fp+tmp_px]

2188         add     %i1,stridey,%i1
2189         stx     %i1,[%fp+tmp_py]

2191         sub     counter,5,counter
2192         st      counter,[%fp+tmp_counter]
2193         ba      .cont19
2194         or      %g0,5,counter

2196         .align  16
2197 .update20:
2198         cmp     counter,5
2199         ble     .cont20
2200         nop

2202         add     %i2,stridey,%i1
2203         stx     %i3,[%fp+tmp_px]

2205         add     %i1,stridey,%i1
2206         stx     %i1,[%fp+tmp_py]

2208         sub     counter,5,counter
2209         st      counter,[%fp+tmp_counter]
2210         ba      .cont20
2211         or      %g0,5,counter

2213         .align  16
2214 .update21:
2215         cmp     counter,3
2216         ble     .cont21
2217         fzeros  %f0

2219         ld      [%fp+tmp_counter],%o2

2221         sub     %i3,stridex,%i1
2222         stx     %i2,[%fp+tmp_py]

2224         sub     %i1,stridex,%i1
2225         add     %o2,counter,counter
2226         stx     %i1,[%fp+tmp_px]


2229         sub     counter,3,counter
2230         st      counter,[%fp+tmp_counter]
2231         ba      .cont21
2232         or      %g0,3,counter

2234         .align  16
2235 .update22:
2236         cmp     counter,3
2237         ble     .cont22
2238         fzeros  %f2
```

```
2240         ld      [%fp+tmp_counter],%g1

2242         sub     %i3,stridex,%i2
2243         stx     %i2,[%fp+tmp_px]

2245         add     %g1,counter,counter
2246         stx     %o4,[%fp+tmp_py]

2248         sub     counter,3,counter
2249         st      counter,[%fp+tmp_counter]
2250         ba      .cont22
2251         or      %g0,3,counter

2253 .stridex_zero:
2254         ld      [%fp+tmp_counter],counter

2256         stx     %i3,[%fp+tmp_py]

2258         cmp     counter,0
2259         ble,pn  %icc,.exit
2260         lda     [%i1]0x82,%i1           ! (Y0_2) ax0 = *px;

2262         and     %i1,MASK_0x7fffffff,%i3 ! (Y0_2) exp0 = ax0 & 0x7fffffff;
2263         sub     %i3,%l6,%l6
2264         and     %i1,MASK_0x007fffff,%g5 ! (Y0_2) ax0 &= 0x007fffff;
2265         srl     %i3,23,%o3              ! (Y0_2) exp0 >>= 23;
2266         srl     %l6,31,%l6
2267         st      %l6,[%fp+tmp5]
2268         add     %g5,CONST_0x8000,%i3    ! (Y0_2) i0 = ax0 + 0x8000;
2269         sethi   %hi(0xffff0000),%l6
2270         sub     %o3,127,%o3             ! (Y0_2) exp0 -= 127;
2271         and     %i3,%l6,%i3             ! (Y0_2) i0 &= 0xffff0000;
2272         sll     %o3,8,%o4               ! (Y0_2) exp0 <<= 8;
2273         st      %o4,[%fp+tmp3]          ! (Y0_2) STORE exp0
2274         sra     %i3,12,%o0              ! (Y0_2) ind0 = i0 >> 12;
2275         sub     %g5,%i3,%o4             ! (Y0_2) i0 = ax0 - i0;
2276         st      %o4,[%fp+tmp2]          ! (Y0_2) STORE i0
2277         and     %o0,-8,%g5              ! (Y0_2) ind0 &= -8;
2278         ld      [%fp+tmp2],%f14         ! (Y0_2) dtmp0 = (double) i0;
2279         add     %l2,%g5,%g1             ! (Y0_2) (char*)__mt_constlog4f + ind0
2280         ldd     [%g1+8],%f48            ! (Y0_2) dtmp1 = *(double *)((char*)__mt
2281         fitod   %f14,%f60               ! (Y0_2) dtmp0 = (double) i0;
2282         fmuld   %f60,%f48,%f48          ! (Y0_2) y0 =  dtmp0 * dtmp1;
2283         fmuld   KA3,%f48,%f62           ! (Y0_2) dtmp0 = KA3 * y0;
2284         faddd   %f62,KA2,%f22           ! (Y0_2) dtmp0 += KA2;
2285         fmuld   %f22,%f48,%f26          ! (Y0_2) dtmp0 *= y0;
2286         faddd   %f26,KA1,%f50           ! (Y0_2) dtmp0 += KA1;
2287         ld      [%fp+tmp3],%f4          ! (Y0_2) dtmp1 = (double) exp0;
2288         fitod   %f4,%f26                ! (Y0_1) dtmp1 = (double) exp0;
2289         fmuld   %f50,%f48,%f50          ! (Y0_1) dtmp0 *= y0;
2290         ldd     [%l2+%g5],%f60          ! (Y0_1) dtmp0 = *(double *)((char*)__mt
2291         faddd   %f50,KA0,%f58           ! (Y0_1) dtmp0 += KA0;
2292         faddd   %f60,%f26,%f26          ! (Y0_1) yy0 = dtmp0 + dtmp1;
2293         fmuld   %f58,%f48,%f48          ! (Y0_1) dtmp0 *= y0;
2294         sub     %l2,3200,%o4
2295         sub     %l2,1152-600,%o3
2296         faddd   %f26,%f48,%f46          ! (Y0_1) yy0 += dtmp0;
2297         or      %g0,%i5,%g1
2298         sethi   %hi(0x7f800000),%o1

2300 .xbegin:
2301         ld      [%fp+tmp_counter],counter
2302         ldx     [%fp+tmp_py],%o5
2303         st      %g0,[%fp+tmp_counter]
2304 .xbegin1:
2305         subcc   counter,1,counter
```



```
2306         bneg,pn %icc,.exit
2307         nop

2309         lda     [%o5]0x82,%i5           ! (Y0_0) ay = py[0];

2311         lda     [%o5]0x82,%f5           ! (Y0_0) ftmp0 = py[0];

2313         and     %i5,MASK_0x7fffffff,%i3 ! (Y0_0) ay &= 0x7fffffff

2315         cmp     %i3,%o1
2316         bge,pn  %icc,.xspec
2317         nop

2319         fstod   %f5,%f52                ! (Y0_0) dtmp0 = (double)ftmp0;

2321         fmuld   %f52,%f46,%f26          ! (Y0_0) yy0 = dtmp0 * yy;
2322         add     %o5,stridey,%o5         ! py += stridey

2324         lda     [%o5]0x82,%i5           ! (Y1_0) ay = ((int*)py)[0];

2326         lda     [%o5]0x82,%f7           ! (Y1_0) ftmp0 = py[0];

2328         and     %i5,MASK_0x7fffffff,%i5 ! (Y1_0) ay &= 0x7fffffff
2329         fcmped  %fcc0,HTHRESHOLD,%f26   ! (Y0_0) if (yy0 >= HTHRESH)

2331         cmp     %i5,%o1
2332         bge,pn  %icc,.xupdate0
2333         nop

2335 .xcont0:
2336         fstod   %f7,%f48                ! (Y1_0) dtmp0 = (double)ftmp0;

2338         fcmped  %fcc1,LTHRESHOLD,%f26   ! (Y0_1) if (yy0 <= LTHRESH)

2340         add     %o5,stridey,%o5         ! py += stridey
2341         fmuld   %f48,%f46,%f28          ! (Y1_1) yy0 = dtmp0 * yy;

2343         lda     [%o5]0x82,%i3           ! (Y0_0) ay = py[0];

2345         lda     [%o5]0x82,%f5           ! (Y0_0) ftmp0 = py[0];

2347         and     %i3,MASK_0x7fffffff,%i3 ! (Y0_0) ay &= 0x7fffffff
2348         fmovdl  %fcc0,HTHRESHOLD,%f26   ! (Y0_1) yy0 = HTHRESH;

2350         cmp     %i3,%o1
2351         bge,pn  %icc,.xupdate1
2352         fcmped  %fcc2,HTHRESHOLD,%f28   ! (Y1_1) if (yy0 >= HTHRESH)
2353 .xcont1:
2354         fstod   %f5,%f52                ! (Y0_0) dtmp0 = (double)ftmp0;

2356         fmovdg  %fcc1,LTHRESHOLD,%f26   ! (Y0_1) yy0 = LTHRESH;

2358         fcmped  %fcc3,LTHRESHOLD,%f28   ! (Y1_1) if (yy0 <= LTHRESH)

2360         fmuld   %f52,%f46,%f22          ! (Y0_0) yy0 = dtmp0 * yy;

2362         fdtoi   %f26,%f0                ! (Y0_1) ii0 = (int) yy0;

2364         add     %o5,stridey,%o5         ! py += stridey
2365         st      %f0,[%fp+tmp1]          ! (Y0_1) STORE ii0

2367         lda     [%o5]0x82,%l7           ! (Y1_0) ay = ((int*)py)[0];

2369         lda     [%o5]0x82,%f7           ! (Y1_0) ftmp0 = py[0];
2370         fmovdl  %fcc2,HTHRESHOLD,%f28   ! (Y1_1) yy0 = HTHRESH;
```

```
2372         and     %l7,MASK_0x7fffffff,%l7 ! (Y1_0) ay &= 0x7fffffff
2373         fcmped  %fcc0,HTHRESHOLD,%f22   ! (Y0_0) if (yy0 >= HTHRESH)

2375         cmp     %l7,%o1
2376         bge,pn  %icc,.xupdate2
2377         nop
2378 .xcont2:
2379         fstod   %f7,%f48                ! (Y1_0) dtmp0 = (double)ftmp0;

2381         fmovdg  %fcc3,LTHRESHOLD,%f28   ! (Y1_2) yy0 = LTHRESH;

2383         fcmped  %fcc1,LTHRESHOLD,%f22   ! (Y0_1) if (yy0 <= LTHRESH)

2385         fitod   %f0,%f52                ! (Y0_2) dtmp0 = (double)ii0;

2387         add     %o5,stridey,%o5         ! py += stridey
2388         fmuld   %f48,%f46,%f24          ! (Y1_1) yy0 = dtmp0 * yy;

2390         fdtoi   %f28,%f3                ! (Y1_2) ii0 = (int) yy0;
2391         lda     [%o5]0x82,%i3           ! (Y0_0) ay = py[0];

2393         st      %f3,[%fp+tmp0]          ! (Y1_2) STORE ii0

2395         fsubd   %f26,%f52,%f40          ! (Y0_2) y0 = yy0 - dtmp0;
2396         lda     [%o5]0x82,%f5           ! (Y0_0) ftmp0 = py[0];

2398         and     %i3,MASK_0x7fffffff,%i3 ! (Y0_0) ay &= 0x7fffffff
2399         fmovdl  %fcc0,HTHRESHOLD,%f22   ! (Y0_1) yy0 = HTHRESH;

2401         cmp     %i3,%o1
2402         bge,pn  %icc,.xupdate3
2403         fcmped  %fcc2,HTHRESHOLD,%f24   ! (Y1_1) if (yy0 >= HTHRESH)
2404 .xcont3:
2405         ld      [%fp+tmp1],%i2          ! (Y0_2) LOAD ii0
2406         fmuld   KB2,%f40,%f36           ! (Y0_2) dtmp0 = KB2 * y0;
2407         fstod   %f5,%f52                ! (Y0_0) dtmp0 = (double)ftmp0;

2409         fmovdg  %fcc1,LTHRESHOLD,%f22   ! (Y0_1) yy0 = LTHRESH;

2411         sra     %i2,6,%l6               ! (Y0_2) i0 = ii0 >> 6;
2412         and     %i2,255,%l7             ! (Y0_2) ii0 &= 255;
2413         fcmped  %fcc3,LTHRESHOLD,%f24   ! (Y1_1) if (yy0 <= LTHRESH)

2415         fitod   %f3,%f56                ! (Y1_2) dtmp0 = (double)ii0;
2416         sll     %l7,3,%o0               ! (Y0_2) ii0 <<= 3;
2417         and     %l6,-4,%g5              ! (Y0_2) i0 &= -4;

2419         faddd   %f36,KB1,%f60           ! (Y0_2) dtmp0 += KB1;
2420         fmuld   %f52,%f46,%f26          ! (Y0_0) yy0 = dtmp0 * yy;
2421         ld      [%g5+%o3],%f10          ! (Y0_2) di0 = ((double*)((char*)(__mt_c

2423         fdtoi   %f22,%f0                ! (Y0_1) ii0 = (int) yy0;
2424         ldd     [%o4+%o0],%f62          ! (Y0_2) dtmp0 = ((double*)((char*)__mt_

2426         add     %o5,stridey,%o5         ! py += stridey
2427         st      %f0,[%fp+tmp1]          ! (Y0_1) STORE ii0

2429         fsubd   %f28,%f56,%f56          ! (Y1_2) y0 = yy0 - dtmp0;
2430         lda     [%o5]0x82,%i5           ! (Y1_0) ay = ((int*)py)[0];

2432         fmuld   %f60,%f40,%f60          ! (Y0_2) yy0 = dtmp0 * y0;
2433         fmovdl  %fcc2,HTHRESHOLD,%f24   ! (Y1_1) yy0 = HTHRESH;
2434         lda     [%o5]0x82,%f7           ! (Y1_0) ftmp0 = py[0];

2436         fmuld   %f10,%f62,%f62          ! (Y0_2) di0 *= dtmp0;
2437         ld      [%fp+tmp0],%g5          ! (Y1_2) LOAD ii0
```



```
2438         and     %i5,MASK_0x7fffffff,%i5 ! (Y1_0) ay &= 0x7fffffff
2439         fcmped  %fcc0,HTHRESHOLD,%f26   ! (Y0_0) if (yy0 >= HTHRESH)

2441         cmp     %i5,%o1
2442         bge,pn  %icc,.xupdate4
2443 .xcont4:
2444         fmuld   KB2,%f56,%f58           ! (Y1_2) dtmp0 = KB2 * y0;
2445         fstod   %f7,%f48                ! (Y1_0) dtmp0 = (double)ftmp0;

2447         fmovdg  %fcc3,LTHRESHOLD,%f24   ! (Y1_2) yy0 = LTHRESH;
2448         sra     %g5,6,%i0               ! (Y1_3) i0 = ii0 >> 6;
2449         and     %g5,255,%i1             ! (Y1_3) ii0 &= 255;
2450         fmuld   %f60,%f62,%f40          ! (Y0_3) dtmp0 = yy0 * di0;

2452         fcmped  %fcc1,LTHRESHOLD,%f26   ! (Y0_1) if (yy0 <= LTHRESH)
2453         sll     %i1,3,%i3               ! (Y1_3) ii0 <<= 3;
2454         and     %i0,-4,%i0              ! (Y1_3) i0 &= -4;

2456         fitod   %f0,%f52                ! (Y0_2) dtmp0 = (double)ii0;
2457         ld      [%i0+%o3],%f10          ! (Y1_3) di0 = ((double*)((char*)(__mt_c

2459         faddd   %f58,KB1,%f58           ! (Y1_3) dtmp0 += KB1;
2460         add     %o5,stridey,%o5         ! py += stridey
2461         ldd     [%o4+%i3],%f18          ! (Y1_3) dtmp0 = ((double*)((char*)__mt_
2462         fmuld   %f48,%f46,%f28          ! (Y1_1) yy0 = dtmp0 * yy;

2464         fdtoi   %f24,%f3                ! (Y1_2) ii0 = (int) yy0;
2465         lda     [%o5]0x82,%i3           ! (Y0_0) ay = py[0];

2467         faddd   %f40,%f62,%f60          ! (Y0_3) dtmp0 += di0;
2468         st      %f3,[%fp+tmp0]          ! (Y1_2) STORE ii0

2470         fsubd   %f22,%f52,%f40          ! (Y0_2) y0 = yy0 - dtmp0;
2471         lda     [%o5]0x82,%f5           ! (Y0_0) ftmp0 = py[0];

2473         fmuld   %f58,%f56,%f56          ! (Y1_3) yy0 = dtmp0 * y0;
2474         and     %i3,MASK_0x7fffffff,%i3 ! (Y0_0) ay &= 0x7fffffff
2475         fmovdl  %fcc0,HTHRESHOLD,%f26   ! (Y0_1) yy0 = HTHRESH;

2477         fmuld   %f10,%f18,%f50          ! (Y1_3) di0 *= dtmp0;
2478         cmp     %i3,%o1
2479         bge,pn  %icc,.xupdate5
2480         fcmped  %fcc2,HTHRESHOLD,%f28   ! (Y1_1) if (yy0 >= HTHRESH)
2481 .xcont5:
2482         fdtos   %f60,%f1                ! (Y0_3) ftmp0 = (float)dtmp0;
2483         add     %g1,stridez,%i3         ! pz += stridez
2484         st      %f1,[%g1]               ! (Y0_3) pz[0] = ftmp0;

2486         subcc   counter,1,counter
2487         bneg,pn %icc,.xbegin
2488         or      %g0,%i3,%g1

2490         ld      [%fp+tmp1],%i2          ! (Y0_2) LOAD ii0
2491         fmuld   KB2,%f40,%f36           ! (Y0_2) dtmp0 = KB2 * y0;
2492         fstod   %f5,%f52                ! (Y0_0) dtmp0 = (double)ftmp0;

2494         fmovdg  %fcc1,LTHRESHOLD,%f26   ! (Y0_1) yy0 = LTHRESH;

2496         fmuld   %f56,%f50,%f58          ! (Y1_3) dtmp0 = yy0 * di0;
2497         sra     %i2,6,%l6               ! (Y0_2) i0 = ii0 >> 6;
2498         and     %i2,255,%l7             ! (Y0_2) ii0 &= 255;
2499         fcmped  %fcc3,LTHRESHOLD,%f28   ! (Y1_1) if (yy0 <= LTHRESH)

2501         fitod   %f3,%f56                ! (Y1_2) dtmp0 = (double)ii0;
2502         sll     %l7,3,%o0               ! (Y0_2) ii0 <<= 3;
2503         and     %l6,-4,%g5              ! (Y0_2) i0 &= -4;
```

```
2505         faddd   %f36,KB1,%f60           ! (Y0_2) dtmp0 += KB1;
2506         fmuld   %f52,%f46,%f22          ! (Y0_0) yy0 = dtmp0 * yy;
2507         ld      [%g5+%o3],%f10          ! (Y0_2) di0 = ((double*)((char*)(__mt_c

2509         fdtoi   %f26,%f0                ! (Y0_1) ii0 = (int) yy0;
2510         ldd     [%o4+%o0],%f62          ! (Y0_2) dtmp0 = ((double*)((char*)__mt_

2512         faddd   %f58,%f50,%f58          ! (Y1_3) dtmp0 += di0;
2513         add     %o5,stridey,%o5         ! py += stridey
2514         st      %f0,[%fp+tmp1]          ! (Y0_1) STORE ii0

2516         fsubd   %f24,%f56,%f56          ! (Y1_2) y0 = yy0 - dtmp0;
2517         lda     [%o5]0x82,%l7           ! (Y1_0) ay = ((int*)py)[0];

2519         fmuld   %f60,%f40,%f60          ! (Y0_2) yy0 = dtmp0 * y0;
2520         add     %i3,stridez,%i5         ! pz += stridez
2521         lda     [%o5]0x82,%f7           ! (Y1_0) ftmp0 = py[0];
2522         fmovdl  %fcc2,HTHRESHOLD,%f28   ! (Y1_1) yy0 = HTHRESH;

2524         fmuld   %f10,%f62,%f62          ! (Y0_2) di0 *= dtmp0;
2525         and     %l7,MASK_0x7fffffff,%l7 ! (Y1_0) ay &= 0x7fffffff
2526         ld      [%fp+tmp0],%g5          ! (Y1_2) LOAD ii0
2527         fcmped  %fcc0,HTHRESHOLD,%f22   ! (Y0_0) if (yy0 >= HTHRESH)

2529         fdtos   %f58,%f9                ! (Y1_3) ftmp0 = (float)dtmp0;
2530         st      %f9,[%i3]               ! (Y1_3) pz[0] = ftmp0;
2531         cmp     %l7,%o1
2532         bge,pn  %icc,.xupdate6

2534 .xcont6:
2535         fmuld   KB2,%f56,%f58           ! (Y1_2) dtmp0 = KB2 * y0;
2536         fstod   %f7,%f48                ! (Y1_0) dtmp0 = (double)ftmp0;

2538         cmp     counter,8
2539         bl,pn   %icc,.xtail
2540         nop

2542         ba      .xmain_loop
2543         nop

2545         .align  16
2546 .xmain_loop:
2547         fmovdg  %fcc3,LTHRESHOLD,%f28   ! (Y1_2) yy0 = LTHRESH;
2548         sra     %g5,6,%i0               ! (Y1_3) i0 = ii0 >> 6;
2549         and     %g5,255,%i1             ! (Y1_3) ii0 &= 255;
2550         fmuld   %f60,%f62,%f40          ! (Y0_3) dtmp0 = yy0 * di0;

2552         fcmped  %fcc1,LTHRESHOLD,%f22   ! (Y0_1) if (yy0 <= LTHRESH)
2553         sll     %i1,3,%i3               ! (Y1_3) ii0 <<= 3;
2554         and     %i0,-4,%i0              ! (Y1_3) i0 &= -4;

2556         fitod   %f0,%f52                ! (Y0_2) dtmp0 = (double)ii0;
2557         sub     counter,4,counter
2558         ld      [%i0+%o3],%f10          ! (Y1_3) di0 = ((double*)((char*)(__mt_c

2560         faddd   %f58,KB1,%f58           ! (Y1_3) dtmp0 += KB1;
2561         add     %o5,stridey,%o5         ! py += stridey
2562         ldd     [%o4+%i3],%f18          ! (Y1_3) dtmp0 = ((double*)((char*)__mt_
2563         fmuld   %f48,%f46,%f24          ! (Y1_1) yy0 = dtmp0 * yy;

2565         fdtoi   %f28,%f3                ! (Y1_2) ii0 = (int) yy0;
2566         lda     [%o5]0x82,%i3           ! (Y0_0) ay = py[0];

2568         faddd   %f40,%f62,%f60          ! (Y0_3) dtmp0 += di0;
2569         st      %f3,[%fp+tmp0]          ! (Y1_2) STORE ii0
```



```
2571         fsubd   %f26,%f52,%f40          ! (Y0_2) y0 = yy0 - dtmp0;
2572         lda     [%o5]0x82,%f5           ! (Y0_0) ftmp0 = py[0];

2574         fmuld   %f58,%f56,%f56          ! (Y1_3) yy0 = dtmp0 * y0;
2575         and     %i3,MASK_0x7fffffff,%i3 ! (Y0_0) ay &= 0x7fffffff
2576         fmovdl  %fcc0,HTHRESHOLD,%f22   ! (Y0_1) yy0 = HTHRESH;

2578         fmuld   %f10,%f18,%f50          ! (Y1_3) di0 *= dtmp0;
2579         cmp     %i3,%o1
2580         bge,pn  %icc,.xupdate7
2581         fcmped  %fcc2,HTHRESHOLD,%f24   ! (Y1_1) if (yy0 >= HTHRESH)
2582 .xcont7:
2583         fdtos   %f60,%f1                ! (Y0_3) ftmp0 = (float)dtmp0;
2584         add     %i5,stridez,%i3         ! pz += stridez
2585         st      %f1,[%i5]               ! (Y0_3) pz[0] = ftmp0;

2587         ld      [%fp+tmp1],%i2          ! (Y0_2) LOAD ii0
2588         fmuld   KB2,%f40,%f36           ! (Y0_2) dtmp0 = KB2 * y0;
2589         fstod   %f5,%f52                ! (Y0_0) dtmp0 = (double)ftmp0;

2591         fmovdg  %fcc1,LTHRESHOLD,%f22   ! (Y0_1) yy0 = LTHRESH;

2593         fmuld   %f56,%f50,%f58          ! (Y1_3) dtmp0 = yy0 * di0;
2594         sra     %i2,6,%l6               ! (Y0_2) i0 = ii0 >> 6;
2595         and     %i2,255,%l7             ! (Y0_2) ii0 &= 255;
2596         fcmped  %fcc3,LTHRESHOLD,%f24   ! (Y1_1) if (yy0 <= LTHRESH)

2598         fitod   %f3,%f56                ! (Y1_2) dtmp0 = (double)ii0;
2599         sll     %l7,3,%o0               ! (Y0_2) ii0 <<= 3;
2600         and     %l6,-4,%g5              ! (Y0_2) i0 &= -4;

2602         faddd   %f36,KB1,%f60           ! (Y0_2) dtmp0 += KB1;
2603         fmuld   %f52,%f46,%f26          ! (Y0_0) yy0 = dtmp0 * yy;
2604         ld      [%g5+%o3],%f10          ! (Y0_2) di0 = ((double*)((char*)(__mt_c

2606         fdtoi   %f22,%f0                ! (Y0_1) ii0 = (int) yy0;
2607         ldd     [%o4+%o0],%f62          ! (Y0_2) dtmp0 = ((double*)((char*)__mt_

2609         faddd   %f58,%f50,%f58          ! (Y1_3) dtmp0 += di0;
2610         add     %o5,stridey,%o5         ! py += stridey
2611         st      %f0,[%fp+tmp1]          ! (Y0_1) STORE ii0

2613         fsubd   %f28,%f56,%f56          ! (Y1_2) y0 = yy0 - dtmp0;
2614         lda     [%o5]0x82,%i5           ! (Y1_0) ay = ((int*)py)[0];

2616         fmuld   %f60,%f40,%f60          ! (Y0_2) yy0 = dtmp0 * y0;
2617         fmovdl  %fcc2,HTHRESHOLD,%f24   ! (Y1_1) yy0 = HTHRESH;
2618         lda     [%o5]0x82,%f7           ! (Y1_0) ftmp0 = py[0];

2620         fmuld   %f10,%f62,%f62          ! (Y0_2) di0 *= dtmp0;
2621         ld      [%fp+tmp0],%g5          ! (Y1_2) LOAD ii0
2622         and     %i5,MASK_0x7fffffff,%i5 ! (Y1_0) ay &= 0x7fffffff
2623         fcmped  %fcc0,HTHRESHOLD,%f26   ! (Y0_0) if (yy0 >= HTHRESH)

2625         fdtos   %f58,%f9                ! (Y1_3) ftmp0 = (float)dtmp0;
2626         cmp     %i5,%o1
2627         bge,pn  %icc,.xupdate8

2629 .xcont8:
2630         fmuld   KB2,%f56,%f58           ! (Y1_2) dtmp0 = KB2 * y0;
2631         add     %i3,stridez,%i5         ! pz += stridez
2632         st      %f9,[%i3]               ! (Y1_3) pz[0] = ftmp0;
2633         fstod   %f7,%f48                ! (Y1_0) dtmp0 = (double)ftmp0;

2635         fmovdg  %fcc3,LTHRESHOLD,%f24   ! (Y1_2) yy0 = LTHRESH;
```

```
2636         sra     %g5,6,%i0               ! (Y1_3) i0 = ii0 >> 6;
2637         and     %g5,255,%i1             ! (Y1_3) ii0 &= 255;
2638         fmuld   %f60,%f62,%f40          ! (Y0_3) dtmp0 = yy0 * di0;

2640         fcmped  %fcc1,LTHRESHOLD,%f26   ! (Y0_1) if (yy0 <= LTHRESH)
2641         sll     %i1,3,%i3               ! (Y1_3) ii0 <<= 3;
2642         and     %i0,-4,%i0              ! (Y1_3) i0 &= -4;

2644         fitod   %f0,%f52                ! (Y0_2) dtmp0 = (double)ii0;
2645         ld      [%i0+%o3],%f10          ! (Y1_3) di0 = ((double*)((char*)(__mt_c

2647         faddd   %f58,KB1,%f58           ! (Y1_3) dtmp0 += KB1;
2648         add     %o5,stridey,%o5         ! py += stridey
2649         ldd     [%o4+%i3],%f18          ! (Y1_3) dtmp0 = ((double*)((char*)__mt_
2650         fmuld   %f48,%f46,%f28          ! (Y1_1) yy0 = dtmp0 * yy;

2652         fdtoi   %f24,%f3                ! (Y1_2) ii0 = (int) yy0;
2653         lda     [%o5]0x82,%i3           ! (Y0_0) ay = py[0];

2655         faddd   %f40,%f62,%f60          ! (Y0_3) dtmp0 += di0;
2656         st      %f3,[%fp+tmp0]          ! (Y1_2) STORE ii0

2658         fsubd   %f22,%f52,%f40          ! (Y0_2) y0 = yy0 - dtmp0;
2659         lda     [%o5]0x82,%f5           ! (Y0_0) ftmp0 = py[0];

2661         fmuld   %f58,%f56,%f56          ! (Y1_3) yy0 = dtmp0 * y0;
2662         and     %i3,MASK_0x7fffffff,%i3 ! (Y0_0) ay &= 0x7fffffff
2663         fmovdl  %fcc0,HTHRESHOLD,%f26   ! (Y0_1) yy0 = HTHRESH;

2665         fmuld   %f10,%f18,%f50          ! (Y1_3) di0 *= dtmp0;
2666         cmp     %i3,%o1
2667         bge,pn  %icc,.xupdate9
2668         fcmped  %fcc2,HTHRESHOLD,%f28   ! (Y1_1) if (yy0 >= HTHRESH)
2669 .xcont9:
2670         fdtos   %f60,%f1                ! (Y0_3) ftmp0 = (float)dtmp0;
2671         add     %i5,stridez,%i3         ! pz += stridez
2672         st      %f1,[%i5]               ! (Y0_3) pz[0] = ftmp0;

2674         ld      [%fp+tmp1],%i2          ! (Y0_2) LOAD ii0
2675         fmuld   KB2,%f40,%f36           ! (Y0_2) dtmp0 = KB2 * y0;
2676         fstod   %f5,%f52                ! (Y0_0) dtmp0 = (double)ftmp0;

2678         fmovdg  %fcc1,LTHRESHOLD,%f26   ! (Y0_1) yy0 = LTHRESH;

2680         fmuld   %f56,%f50,%f58          ! (Y1_3) dtmp0 = yy0 * di0;
2681         sra     %i2,6,%l6               ! (Y0_2) i0 = ii0 >> 6;
2682         and     %i2,255,%l7             ! (Y0_2) ii0 &= 255;
2683         fcmped  %fcc3,LTHRESHOLD,%f28   ! (Y1_1) if (yy0 <= LTHRESH)

2685         fitod   %f3,%f56                ! (Y1_2) dtmp0 = (double)ii0;
2686         sll     %l7,3,%o0               ! (Y0_2) ii0 <<= 3;
2687         and     %l6,-4,%g5              ! (Y0_2) i0 &= -4;

2689         faddd   %f36,KB1,%f60           ! (Y0_2) dtmp0 += KB1;
2690         fmuld   %f52,%f46,%f22          ! (Y0_0) yy0 = dtmp0 * yy;
2691         ld      [%g5+%o3],%f10          ! (Y0_2) di0 = ((double*)((char*)(__mt_c

2693         fdtoi   %f26,%f0                ! (Y0_1) ii0 = (int) yy0;
2694         ldd     [%o4+%o0],%f62          ! (Y0_2) dtmp0 = ((double*)((char*)__mt_

2696         faddd   %f58,%f50,%f58          ! (Y1_3) dtmp0 += di0;
2697         add     %o5,stridey,%o5         ! py += stridey
2698         st      %f0,[%fp+tmp1]          ! (Y0_1) STORE ii0

2700         fsubd   %f24,%f56,%f56          ! (Y1_2) y0 = yy0 - dtmp0;
2701         lda     [%o5]0x82,%l7           ! (Y1_0) ay = ((int*)py)[0];
```



```
2703         fmuld   %f60,%f40,%f60          ! (Y0_2) yy0 = dtmp0 * y0;
2704         add     %i3,stridez,%i5         ! pz += stridez
2705         lda     [%o5]0x82,%f7           ! (Y1_0) ftmp0 = py[0];
2706         fmovdl  %fcc2,HTHRESHOLD,%f28   ! (Y1_1) yy0 = HTHRESH;

2708         fmuld   %f10,%f62,%f62          ! (Y0_2) di0 *= dtmp0;
2709         and     %l7,MASK_0x7fffffff,%l7 ! (Y1_0) ay &= 0x7fffffff
2710         ld      [%fp+tmp0],%g5          ! (Y1_2) LOAD ii0
2711         fcmped  %fcc0,HTHRESHOLD,%f22   ! (Y0_0) if (yy0 >= HTHRESH)

2713         fdtos   %f58,%f9                ! (Y1_3) ftmp0 = (float)dtmp0;
2714         st      %f9,[%i3]               ! (Y1_3) pz[0] = ftmp0;
2715         cmp     %l7,%o1
2716         bge,pn  %icc,.xupdate10
2717 .xcont10:
2718         fmuld   KB2,%f56,%f58           ! (Y1_2) dtmp0 = KB2 * y0;
2719         cmp     counter,4
2720         bge,pt  %icc,.xmain_loop
2721         fstod   %f7,%f48                ! (Y1_0) dtmp0 = (double)ftmp0;

2723 .xtail:
2724         subcc   counter,1,counter
2725         bneg,pn %icc,.xbegin
2726         or      %g0,%i5,%g1

2728         fmovdg  %fcc3,LTHRESHOLD,%f28   ! (Y1_2) yy0 = LTHRESH;
2729         sra     %g5,6,%i0               ! (Y1_3) i0 = ii0 >> 6;
2730         and     %g5,255,%i1             ! (Y1_3) ii0 &= 255;
2731         fmuld   %f60,%f62,%f40          ! (Y0_3) dtmp0 = yy0 * di0;

2733         fcmped  %fcc1,LTHRESHOLD,%f22   ! (Y0_1) if (yy0 <= LTHRESH)
2734         sll     %i1,3,%i3               ! (Y1_3) ii0 <<= 3;
2735         and     %i0,-4,%i0              ! (Y1_3) i0 &= -4;

2737         fitod   %f0,%f52                ! (Y0_2) dtmp0 = (double)ii0;
2738         ld      [%i0+%o3],%f10          ! (Y1_3) di0 = ((double*)((char*)(__mt_c

2740         faddd   %f58,KB1,%f58           ! (Y1_3) dtmp0 += KB1;
2741         add     %o5,stridey,%o5         ! py += stridey
2742         ldd     [%o4+%i3],%f18          ! (Y1_3) dtmp0 = ((double*)((char*)__mt_
2743         fmuld   %f48,%f46,%f24          ! (Y1_1) yy0 = dtmp0 * yy;

2745         fdtoi   %f28,%f3                ! (Y1_2) ii0 = (int) yy0;
2746         lda     [%o5]0x82,%i3           ! (Y0_0) ay = py[0];

2748         faddd   %f40,%f62,%f60          ! (Y0_3) dtmp0 += di0;
2749         st      %f3,[%fp+tmp0]          ! (Y1_2) STORE ii0

2751         fsubd   %f26,%f52,%f40          ! (Y0_2) y0 = yy0 - dtmp0;
2752         lda     [%o5]0x82,%f5           ! (Y0_0) ftmp0 = py[0];

2754         fmuld   %f58,%f56,%f56          ! (Y1_3) yy0 = dtmp0 * y0;
2755         and     %i3,MASK_0x7fffffff,%i3 ! (Y0_0) ay &= 0x7fffffff
2756         fmovdl  %fcc0,HTHRESHOLD,%f22   ! (Y0_1) yy0 = HTHRESH;

2758         fmuld   %f10,%f18,%f50          ! (Y1_3) di0 *= dtmp0;
2759         cmp     %i3,%o1
2760         bge,pn  %icc,.xupdate11
2761         fcmped  %fcc2,HTHRESHOLD,%f24   ! (Y1_1) if (yy0 >= HTHRESH)
2762 .xcont11:
2763         fdtos   %f60,%f1                ! (Y0_3) ftmp0 = (float)dtmp0;
2764         add     %i5,stridez,%i3         ! pz += stridez
2765         st      %f1,[%i5]               ! (Y0_3) pz[0] = ftmp0;

2767         subcc   counter,1,counter
```

```
2768        bneg,pn %icc,.xbegin
2769        or      %g0,%i3,%g1

2771        ld      [%fp+tmp1],%i2          ! (Y0_2) LOAD ii0
2772        fmuld   KB2,%f40,%f36           ! (Y0_2) dtmp0 = KB2 * y0;
2773        fstod   %f5,%f52                ! (Y0_0) dtmp0 = (double)ftmp0;

2775        fmovdg  %fcc1,LTHRESHOLD,%f22   ! (Y0_1) yy0 = LTHRESH;

2777        fmuld   %f56,%f50,%f58          ! (Y1_3) dtmp0 = yy0 * di0;
2778        sra     %i2,6,%l6               ! (Y0_2) i0 = ii0 >> 6;
2779        and     %i2,255,%l7             ! (Y0_2) ii0 &= 255;
2780        fcmped  %fcc3,LTHRESHOLD,%f24   ! (Y1_1) if (yy0 <= LTHRESH)

2782        fitod   %f3,%f56                ! (Y1_2) dtmp0 = (double)ii0;
2783        sll     %l7,3,%o0               ! (Y0_2) ii0 <<= 3;
2784        and     %l6,-4,%g5              ! (Y0_2) i0 &= -4;

2786        faddd   %f36,KB1,%f60           ! (Y0_2) dtmp0 += KB1;
2787        fmuld   %f52,%f46,%f26          ! (Y0_0) yy0 = dtmp0 * yy;
2788        ld      [%g5+%o3],%f10          ! (Y0_2) di0 = ((double*)((char*)(__mt_c

2790        fdtoi   %f22,%f0                ! (Y0_1) ii0 = (int) yy0;
2791        ldd     [%o4+%o0],%f62          ! (Y0_2) dtmp0 = ((double*)((char*)__mt_

2793        faddd   %f58,%f50,%f58          ! (Y1_3) dtmp0 += di0;
2794        st      %f0,[%fp+tmp1]          ! (Y0_1) STORE ii0

2796        fsubd   %f28,%f56,%f56          ! (Y1_2) y0 = yy0 - dtmp0;

2798        fmuld   %f60,%f40,%f60          ! (Y0_2) yy0 = dtmp0 * y0;
2799        fmovdl  %fcc2,HTHRESHOLD,%f24   ! (Y1_1) yy0 = HTHRESH;

2801        fmuld   %f10,%f62,%f62          ! (Y0_2) di0 *= dtmp0;
2802        ld      [%fp+tmp0],%g5          ! (Y1_2) LOAD ii0
2803        fcmped  %fcc0,HTHRESHOLD,%f26   ! (Y0_0) if (yy0 >= HTHRESH)

2805        fdtos   %f58,%f9                ! (Y1_3) ftmp0 = (float)dtmp0;

2807        fmuld   KB2,%f56,%f58           ! (Y1_2) dtmp0 = KB2 * y0;
2808        add     %i3,stridez,%i5         ! pz += stridez
2809        st      %f9,[%i3]               ! (Y1_3) pz[0] = ftmp0;

2811        subcc   counter,1,counter
2812        bneg,pn %icc,.xbegin
2813        or      %g0,%i5,%g1

2815        fmovdg  %fcc3,LTHRESHOLD,%f24   ! (Y1_2) yy0 = LTHRESH;
2816        sra     %g5,6,%i0               ! (Y1_3) i0 = ii0 >> 6;
2817        and     %g5,255,%i1             ! (Y1_3) ii0 &= 255;
2818        fmuld   %f60,%f62,%f40          ! (Y0_3) dtmp0 = yy0 * di0;

2820        fcmped  %fcc1,LTHRESHOLD,%f26   ! (Y0_1) if (yy0 <= LTHRESH)
2821        sll     %i1,3,%i3               ! (Y1_3) ii0 <<= 3;
2822        and     %i0,-4,%i0              ! (Y1_3) i0 &= -4;

2824        fitod   %f0,%f52                ! (Y0_2) dtmp0 = (double)ii0;
2825        ld      [%i0+%o3],%f10          ! (Y1_3) di0 = ((double*)((char*)(__mt_c

2827        faddd   %f58,KB1,%f58           ! (Y1_3) dtmp0 += KB1;
2828        ldd     [%o4+%i3],%f18          ! (Y1_3) dtmp0 = ((double*)((char*)__mt_

2830        fdtoi   %f24,%f3                ! (Y1_2) ii0 = (int) yy0;

2832        faddd   %f40,%f62,%f60          ! (Y0_3) dtmp0 += di0;
2833        st      %f3,[%fp+tmp0]          ! (Y1_2) STORE ii0
```



```
2835        fsubd   %f22,%f52,%f40          ! (Y0_2) y0 = yy0 - dtmp0;

2837        fmuld   %f58,%f56,%f56          ! (Y1_3) yy0 = dtmp0 * y0;
2838        fmovdl  %fcc0,HTHRESHOLD,%f26   ! (Y0_1) yy0 = HTHRESH;

2840        fmuld   %f10,%f18,%f50          ! (Y1_3) di0 *= dtmp0;

2842        fdtos   %f60,%f1                ! (Y0_3) ftmp0 = (float)dtmp0;
2843        add     %i5,stridez,%i3         ! pz += stridez
2844        st      %f1,[%i5]               ! (Y0_3) pz[0] = ftmp0;

2846        subcc   counter,1,counter
2847        bneg,pn %icc,.xbegin
2848        or      %g0,%i3,%g1

2850        ld      [%fp+tmp1],%i2          ! (Y0_2) LOAD ii0
2851        fmuld   KB2,%f40,%f36           ! (Y0_2) dtmp0 = KB2 * y0;

2853        fmovdg  %fcc1,LTHRESHOLD,%f26   ! (Y0_1) yy0 = LTHRESH;

2855        fmuld   %f56,%f50,%f58          ! (Y1_3) dtmp0 = yy0 * di0;
2856        sra     %i2,6,%l6               ! (Y0_2) i0 = ii0 >> 6;
2857        and     %i2,255,%l7             ! (Y0_2) ii0 &= 255;

2859        fitod   %f3,%f56                ! (Y1_2) dtmp0 = (double)ii0;
2860        sll     %l7,3,%o0               ! (Y0_2) ii0 <<= 3;
2861        and     %l6,-4,%g5              ! (Y0_2) i0 &= -4;

2863        faddd   %f36,KB1,%f60           ! (Y0_2) dtmp0 += KB1;
2864        ld      [%g5+%o3],%f10          ! (Y0_2) di0 = ((double*)((char*)(__mt_c

2866        fdtoi   %f26,%f0                ! (Y0_1) ii0 = (int) yy0;
2867        ldd     [%o4+%o0],%f62          ! (Y0_2) dtmp0 = ((double*)((char*)__mt_

2869        faddd   %f58,%f50,%f58          ! (Y1_3) dtmp0 += di0;
2870        st      %f0,[%fp+tmp1]          ! (Y0_1) STORE ii0

2872        fsubd   %f24,%f56,%f56          ! (Y1_2) y0 = yy0 - dtmp0;

2874        fmuld   %f60,%f40,%f60          ! (Y0_2) yy0 = dtmp0 * y0;
2875        add     %i3,stridez,%i5         ! pz += stridez

2877        fmuld   %f10,%f62,%f62          ! (Y0_2) di0 *= dtmp0;
2878        ld      [%fp+tmp0],%g5          ! (Y1_2) LOAD ii0

2880        fdtos   %f58,%f9                ! (Y1_3) ftmp0 = (float)dtmp0;
2881        st      %f9,[%i3]               ! (Y1_3) pz[0] = ftmp0;

2883        subcc   counter,1,counter
2884        bneg,pn %icc,.xbegin
2885        or      %g0,%i5,%g1

2887        fmuld   KB2,%f56,%f58           ! (Y1_2) dtmp0 = KB2 * y0;

2889        sra     %g5,6,%i0               ! (Y1_3) i0 = ii0 >> 6;
2890        and     %g5,255,%i1             ! (Y1_3) ii0 &= 255;
2891        fmuld   %f60,%f62,%f40          ! (Y0_3) dtmp0 = yy0 * di0;

2893        sll     %i1,3,%i3               ! (Y1_3) ii0 <<= 3;
2894        and     %i0,-4,%i0              ! (Y1_3) i0 &= -4;

2896        fitod   %f0,%f52                ! (Y0_2) dtmp0 = (double)ii0;
2897        ld      [%i0+%o3],%f10          ! (Y1_3) di0 = ((double*)((char*)(__mt_c

2899        faddd   %f58,KB1,%f58           ! (Y1_3) dtmp0 += KB1;
```

```
2900         ldd     [%o4+%i3],%f18          ! (Y1_3) dtmp0 = ((double*)((char*)__mt_

2902         faddd   %f40,%f62,%f60          ! (Y0_3) dtmp0 += di0;

2904         fsubd   %f26,%f52,%f40          ! (Y0_2) y0 = yy0 - dtmp0;

2906         fmuld   %f58,%f56,%f56          ! (Y1_3) yy0 = dtmp0 * y0;

2908         fmuld   %f10,%f18,%f50          ! (Y1_3) di0 *= dtmp0;

2910         fdtos   %f60,%f1                ! (Y0_3) ftmp0 = (float)dtmp0;
2911         add     %i5,stridez,%i3         ! pz += stridez
2912         st      %f1,[%i5]               ! (Y0_3) pz[0] = ftmp0;

2914         subcc   counter,1,counter
2915         bneg,pn %icc,.xbegin
2916         or      %g0,%i3,%g1

2918         ld      [%fp+tmp1],%i2          ! (Y0_2) LOAD ii0
2919         fmuld   KB2,%f40,%f36           ! (Y0_2) dtmp0 = KB2 * y0;

2921         fmuld   %f56,%f50,%f58          ! (Y1_3) dtmp0 = yy0 * di0;
2922         sra     %i2,6,%l6               ! (Y0_2) i0 = ii0 >> 6;
2923         and     %i2,255,%l7             ! (Y0_2) ii0 &= 255;

2925         sll     %l7,3,%o0               ! (Y0_2) ii0 <<= 3;
2926         and     %l6,-4,%g5              ! (Y0_2) i0 &= -4;

2928         faddd   %f36,KB1,%f60           ! (Y0_2) dtmp0 += KB1;
2929         ld      [%g5+%o3],%f10          ! (Y0_2) di0 = ((double*)((char*)(__mt_c

2931         ldd     [%o4+%o0],%f62          ! (Y0_2) dtmp0 = ((double*)((char*)__mt_

2933         faddd   %f58,%f50,%f58          ! (Y1_3) dtmp0 += di0;

2935         fmuld   %f60,%f40,%f60          ! (Y0_2) yy0 = dtmp0 * y0;

2937         fmuld   %f10,%f62,%f62          ! (Y0_2) di0 *= dtmp0;

2939         fdtos   %f58,%f9                ! (Y1_3) ftmp0 = (float)dtmp0;
2940         add     %i3,stridez,%i5         ! pz += stridez
2941         st      %f9,[%i3]               ! (Y1_3) pz[0] = ftmp0;

2943         subcc   counter,1,counter
2944         bneg,pn %icc,.xbegin
2945         or      %g0,%i5,%g1

2947         fmuld   %f60,%f62,%f40          ! (Y0_3) dtmp0 = yy0 * di0;

2949         faddd   %f40,%f62,%f60          ! (Y0_3) dtmp0 += di0;

2951         fdtos   %f60,%f1                ! (Y0_3) ftmp0 = (float)dtmp0;
2952         add     %i5,stridez,%i3         ! pz += stridez
2953         st      %f1,[%i5]               ! (Y0_3) pz[0] = ftmp0;

2955         ba      .xbegin
2956         or      %g0,%i3,%g1

2958 .xspec:
2959         bg,a,pn %icc,.yisnan            ! if (ay > 0x7f800000) /* |Y| = Nan */
2960         ld      [%o5],%f8               ! fy = *py;

2962         ld      [%fp+tmp5],%l6          ! LOAD (ax-0x3f800000)<<63
2963         srl     %i5,31,%i5              ! uy >> 31

2965         cmp     %l6,%i5                 ! if((ax < 0x3f800000) != (uy >> 31))
```



```
2966         be,a,pn %icc,.xspec_exit        ! if((ax < 0x3f800000) != (uy >> 31))
2967         st      %i3,[%g1]               ! fy = *(float*)&ay;

2969         st      %g0,[%g1]               ! fy = ZERO
2970         add     %g1,stridez,%g1
2971         ba      .xbegin1
2972         add     %o5,stridey,%o5

2974 .yisnan:
2975         fmuls   %f8,%f8,%f8             ! fy = *py * *py;  /* |Y| = Nan */
2976         st      %f8,[%g1]

2978 .xspec_exit:
2979         add     %g1,stridez,%g1
2980         ba      .xbegin1
2981         add     %o5,stridey,%o5

2983         .align  16
2984 .xupdate0:
2985         cmp     counter,0
2986         ble     .xcont0
2987         fzeros  %f7

2989         stx     %o5,[%fp+tmp_py]

2991         st      counter,[%fp+tmp_counter]
2992         ba      .xcont0
2993         or      %g0,0,counter

2995         .align  16
2996 .xupdate1:
2997         cmp     counter,1
2998         ble     .xcont1
2999         fzeros  %f5

3001         sub     counter,1,counter
3002         stx     %o5,[%fp+tmp_py]

3004         st      counter,[%fp+tmp_counter]
3005         ba      .xcont1
3006         or      %g0,1,counter

3008         .align  16
3009 .xupdate2:
3010         cmp     counter,2
3011         ble     .xcont2
3012         fzeros  %f7

3014         sub     counter,2,counter
3015         stx     %o5,[%fp+tmp_py]

3017         st      counter,[%fp+tmp_counter]
3018         ba      .xcont2
3019         or      %g0,2,counter

3021         .align  16
3022 .xupdate3:
3023         cmp     counter,3
3024         ble     .xcont3
3025         fzeros  %f5

3027         sub     counter,3,counter
3028         stx     %o5,[%fp+tmp_py]

3030         st      counter,[%fp+tmp_counter]
3031         ba      .xcont3
```

```
3032         or      %g0,3,counter

3034         .align  16
3035 .xupdate4:
3036         cmp     counter,4
3037         ble     .xcont4
3038         fzeros  %f7

3040         sub     counter,4,counter
3041         stx     %o5,[%fp+tmp_py]

3043         st      counter,[%fp+tmp_counter]
3044         ba      .xcont4
3045         or      %g0,4,counter

3047         .align  16
3048 .xupdate5:
3049         cmp     counter,5
3050         ble     .xcont5
3051         fzeros  %f5

3053         sub     counter,5,counter
3054         stx     %o5,[%fp+tmp_py]

3056         st      counter,[%fp+tmp_counter]
3057         ba      .xcont5
3058         or      %g0,5,counter

3060         .align  16
3061 .xupdate6:
3062         cmp     counter,5
3063         ble     .xcont6
3064         fzeros  %f7

3066         sub     counter,5,counter
3067         stx     %o5,[%fp+tmp_py]

3069         st      counter,[%fp+tmp_counter]
3070         ba      .xcont6
3071         or      %g0,5,counter

3073         .align  16
3074 .xupdate7:
3075         cmp     counter,2
3076         ble     .xcont7
3077         fzeros  %f5

3079         sub     counter,2,counter
3080         stx     %o5,[%fp+tmp_py]

3082         st      counter,[%fp+tmp_counter]
3083         ba      .xcont7
3084         or      %g0,2,counter

3086         .align  16
3087 .xupdate8:
3088         cmp     counter,3
3089         ble     .xcont8
3090         fzeros  %f7

3092         sub     counter,3,counter
3093         stx     %o5,[%fp+tmp_py]

3095         st      counter,[%fp+tmp_counter]
3096         ba      .xcont8
3097         or      %g0,3,counter
```



```
3099         .align  16
3100 .xupdate9:
3101         cmp     counter,4
3102         ble     .xcont9
3103         fzeros  %f5

3105         sub     counter,4,counter
3106         stx     %o5,[%fp+tmp_py]

3108         st      counter,[%fp+tmp_counter]
3109         ba      .xcont9
3110         or      %g0,4,counter

3112         .align  16
3113 .xupdate10:
3114         cmp     counter,5
3115         ble     .xcont10
3116         fzeros  %f7

3118         sub     counter,5,counter
3119         stx     %o5,[%fp+tmp_py]

3121         st      counter,[%fp+tmp_counter]
3122         ba      .xcont10
3123         or      %g0,5,counter

3125         .align  16
3126 .xupdate11:
3127         cmp     counter,5
3128         ble     .xcont11
3129         fzeros  %f5

3131         sub     counter,5,counter
3132         stx     %o5,[%fp+tmp_py]

3134         st      counter,[%fp+tmp_counter]
3135         ba      .xcont11
3136         or      %g0,5,counter

3138         SET_SIZE(__vpowf)
```

```
**********************************************************
  110173 Sat May 10 12:09:59 2014
new/usr/src/lib/libmvec/common/vis/__vrhypot.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vrhypot.S"

#include "libm.h"

        RO_DATA
        .align  64

.CONST_TBL:
        .word   0x7fe00000, 0x7fdfc07f, 0x7fdf81f8, 0x7fdf4465,
        .word   0x7fdf07c1, 0x7fdecc07, 0x7fde9131, 0x7fde573a,
        .word   0x7fde1e1e, 0x7fdde5d6, 0x7fddae60, 0x7fdd77b6,
        .word   0x7fdd41d4, 0x7fdd0cb5, 0x7fdcd856, 0x7fdca4b3,
        .word   0x7fdc71c7, 0x7fdc3f8f, 0x7fdc0e07, 0x7fdbdd2b,
        .word   0x7fdbacf9, 0x7fdb7d6c, 0x7fdb4e81, 0x7fdb2036,
        .word   0x7fdaf286, 0x7fdac570, 0x7fda98ef, 0x7fda6d01,
        .word   0x7fda41a4, 0x7fda16d3, 0x7fd9ec8e, 0x7fd9c2d1,
        .word   0x7fd99999, 0x7fd970e4, 0x7fd948b0, 0x7fd920fb,
        .word   0x7fd8f9c1, 0x7fd8d301, 0x7fd8acb9, 0x7fd886e5,
        .word   0x7fd86186, 0x7fd83c97, 0x7fd81818, 0x7fd7f405,
        .word   0x7fd7d05f, 0x7fd7ad22, 0x7fd78a4c, 0x7fd767dc,
        .word   0x7fd745d1, 0x7fd72428, 0x7fd702e0, 0x7fd6e1f7,
        .word   0x7fd6c16c, 0x7fd6a13c, 0x7fd68168, 0x7fd661ec,
        .word   0x7fd642c8, 0x7fd623fa, 0x7fd60581, 0x7fd5e75b,
        .word   0x7fd5c988, 0x7fd5ac05, 0x7fd58ed2, 0x7fd571ed,
        .word   0x7fd55555, 0x7fd53909, 0x7fd51d07, 0x7fd50150,
        .word   0x7fd4e5e0, 0x7fd4cab8, 0x7fd4afd6, 0x7fd49539,
        .word   0x7fd47ae1, 0x7fd460cb, 0x7fd446f8, 0x7fd42d66,
        .word   0x7fd41414, 0x7fd3fb01, 0x7fd3e22c, 0x7fd3c995,
        .word   0x7fd3b13b, 0x7fd3991c, 0x7fd38138, 0x7fd3698d,
        .word   0x7fd3521c, 0x7fd33ae4, 0x7fd323e3, 0x7fd30d19,
        .word   0x7fd2f684, 0x7fd2e025, 0x7fd2c9fb, 0x7fd2b404,
        .word   0x7fd29e41, 0x7fd288b0, 0x7fd27350, 0x7fd25e22,
        .word   0x7fd24924, 0x7fd23456, 0x7fd21fb7, 0x7fd20b47,
```



```
        .word   0x7fd1f704, 0x7fd1e2ef, 0x7fd1cf06, 0x7fd1bb4a,
        .word   0x7fd1a7b9, 0x7fd19453, 0x7fd18118, 0x7fd16e06,
        .word   0x7fd15b1e, 0x7fd1485f, 0x7fd135c8, 0x7fd12358,
        .word   0x7fd11111, 0x7fd0fef0, 0x7fd0ecf5, 0x7fd0db20,
        .word   0x7fd0c971, 0x7fd0b7e6, 0x7fd0a681, 0x7fd0953f,
        .word   0x7fd08421, 0x7fd07326, 0x7fd0624d, 0x7fd05197,
        .word   0x7fd04104, 0x7fd03091, 0x7fd02040, 0x7fd01010,

        .word   0x42300000, 0           ! D2ON36 = 2**36
        .word   0xffffff00, 0           ! DA0
        .word   0xfff00000, 0           ! DA1
        .word   0x3ff00000, 0           ! DONE = 1.0
        .word   0x40000000, 0           ! DTWO = 2.0
        .word   0x7fd00000, 0           ! D2ON1022
        .word   0x3cb00000, 0           ! D2ONM52
        .word   0x43200000, 0           ! D2ON51
        .word   0x0007ffff, 0xffffffff  ! 0x0007ffffffffffff

#define stridex         %l2
#define stridey         %l3
#define stridez         %l5

#define TBL_SHIFT       512

#define TBL             %l1
#define counter         %l4

#define _0x7ff00000     %l0
#define _0x00100000     %o5
#define _0x7fffffff     %l6

#define D2ON36          %f4
#define DTWO            %f6
#define DONE            %f8
#define DA0             %f58
#define DA1             %f56

#define dtmp0           STACK_BIAS-0x80
#define dtmp1           STACK_BIAS-0x78
#define dtmp2           STACK_BIAS-0x70
#define dtmp3           STACK_BIAS-0x68
#define dtmp4           STACK_BIAS-0x60
#define dtmp5           STACK_BIAS-0x58
#define dtmp6           STACK_BIAS-0x50
#define dtmp7           STACK_BIAS-0x48
#define dtmp8           STACK_BIAS-0x40
#define dtmp9           STACK_BIAS-0x38
#define dtmp10          STACK_BIAS-0x30
#define dtmp11          STACK_BIAS-0x28
#define dtmp12          STACK_BIAS-0x20
#define dtmp13          STACK_BIAS-0x18
#define dtmp14          STACK_BIAS-0x10
#define dtmp15          STACK_BIAS-0x08

#define ftmp0           STACK_BIAS-0x100
#define tmp_px          STACK_BIAS-0x98
#define tmp_py          STACK_BIAS-0x90
#define tmp_counter     STACK_BIAS-0x88

! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x100

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!      !!!!!   algorithm   !!!!!
!  hx0 = *(int*)px;
!  hy0 = *(int*)py;
```

```
!
!  ((float*)&x0)[0] = ((float*)px)[0];
!  ((float*)&x0)[1] = ((float*)px)[1];
!  ((float*)&y0)[0] = ((float*)py)[0];
!  ((float*)&y0)[1] = ((float*)py)[1];
!
!  hx0 &= 0x7fffffff;
!  hy0 &= 0x7fffffff;
!
!  diff0 = hy0 - hx0;
!  j0 = diff0 >> 31;
!  j0 &= diff0;
!  j0 = hy0 - j0;
!  j0 &= 0x7ff00000;
!
!  j0 = 0x7ff00000 - j0;
!  ll = (long long)j0 << 32;
!  *(long long*)&scl0 = ll;
!
!  if ( hx0 >= 0x7ff00000 || hy0 >= 0x7ff00000 )
!  {
!    lx = ((int*)px)[1];
!    ly = ((int*)py)[1];
!
!    if ( hx0 == 0x7ff00000 && lx == 0 ) res0 = 0.0;
!    else if ( hy0 == 0x7ff00000 && ly == 0 ) res0 = 0.0;
!    else res0 = fabs(x0) * fabs(y0);
!
!    ((float*)pz)[0] = ((float*)&res0)[0];
!    ((float*)pz)[1] = ((float*)&res0)[1];
!
!    px += stridex;
!    py += stridey;
!    pz += stridez;
!    continue;
!  }
!  if ( hx0 <  0x00100000 && hy0 <  0x00100000 )
!  {
!    lx = ((int*)px)[1];
!    ly = ((int*)py)[1];
!    ii = hx0 | hy0;
!    ii |= lx;
!    ii |= ly;
!    if ( ii == 0 )
!    {
!      res0 = 1.0 / 0.0;
!      ((float*)pz)[0] = ((float*)&res0)[0];
!      ((float*)pz)[1] = ((float*)&res0)[1];
!
!      px += stridex;
!      py += stridey;
!      pz += stridez;
!      continue;
!    }
!    x0 = fabs(x0);
!    y0 = fabs(y0);
!    if ( hx0 < 0x00080000 )
!    {
!      x0 = *(long long*)&x0;
!    }
!    else
!    {
!      ((long long*)&dtmp0)[0] = 0x0007ffffffffffffULL;
!      x0 = vis_fand(x0, dtmp0);
!      x0 = *(long long*)&x0;
!      x0 += D2ON51;
```



```
!    }
!    x0 *= D2ONM52;
!    if ( hy0 < 0x00080000 )
!    {
!      y0 = *(long long*)&y0;
!    }
!    else
!    {
!      ((long long*)&dtmp0)[0] = 0x0007ffffffffffffULL;
!      y0 = vis_fand(y0, dtmp0);
!      y0 = *(long long*)&y0;
!      y0 += D2ON51;
!    }
!    y0 *= D2ONM52;
!    *(long long*)&scl0 = 0x7fd0000000000000ULL;
!  }
!  else
!  {
!    x0 *= scl0;
!    y0 *= scl0;
!  }
!
!  x_hi0 = x0 + D2ON36;
!  y_hi0 = y0 + D2ON36;
!  x_hi0 -= D2ON36;
!  y_hi0 -= D2ON36;
!  x_lo0 = x0 - x_hi0;
!  y_lo0 = y0 - y_hi0;
!  res0_hi = x_hi0 * x_hi0;
!  dtmp0 = y_hi0 * y_hi0;
!  res0_hi += dtmp0;
!  res0_lo = x0 + x_hi0;
!  res0_lo *= x_lo0;
!  dtmp1 = y0 + y_hi0;
!  dtmp1 *= y_lo0;
!  res0_lo += dtmp1;
!
!  dres = res0_hi + res0_lo;
!  dexp0 = vis_fand(dres,DA1);
!  iarr = ((int*)&dres)[0];
!
!  iarr >>= 11;
!  iarr &= 0x1fc;
!  dtmp0 = ((double*)((char*)dll1 + iarr))[0];
!  dd = vis_fpsub32(dtmp0, dexp0);
!
!  dtmp0 = dd * dres;
!  dtmp0 = DTWO - dtmp0;
!  dd *= dtmp0;
!  dtmp1 = dd * dres;
!  dtmp1 = DTWO - dtmp1;
!  dd *= dtmp1;
!  dtmp2 = dd * dres;
!  dtmp2 = DTWO - dtmp2;
!  dres = dd * dtmp2;
!
!  res0 = vis_fand(dres,DA0);
!
!  dtmp0 = res0_hi * res0;
!  dtmp0 = DONE - dtmp0;
!  dtmp1 = res0_lo * res0;
!  dtmp0 -= dtmp1;
!  dtmp0 *= dres;
!  res0 += dtmp0;
!
!  res0 = sqrt ( res0 );
```

```
!
!  res0 = scl0 * res0;
!
!  ((float*)pz)[0] = ((float*)&res0)[0];
!  ((float*)pz)[1] = ((float*)&res0)[1];
!
!  px += stridex;
!  py += stridey;
!  pz += stridez;
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

        ENTRY(__vrhypot)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,l1)
        wr      %g0,0x82,%asi

#ifdef __sparcv9
        ldx     [%fp+STACK_BIAS+176],stridez
#else
        ld      [%fp+STACK_BIAS+92],stridez
#endif

        sll     %i2,3,stridex
        sethi   %hi(0x7ff00000),_0x7ff00000
        st      %i0,[%fp+tmp_counter]

        sll     %i4,3,stridey
        sethi   %hi(0x00100000),_0x00100000
        stx     %i1,[%fp+tmp_px]

        sll     stridez,3,stridez
        sethi   %hi(0x7ffffc00),_0x7fffffff
        stx     %i3,[%fp+tmp_py]

        ldd     [TBL+TBL_SHIFT],D2ON36
        add     _0x7fffffff,1023,_0x7fffffff

        ldd     [TBL+TBL_SHIFT+8],DA0

        ldd     [TBL+TBL_SHIFT+16],DA1

        ldd     [TBL+TBL_SHIFT+24],DONE

        ldd     [TBL+TBL_SHIFT+32],DTWO

.begin:
        ld      [%fp+tmp_counter],counter
        ldx     [%fp+tmp_px],%i4
        ldx     [%fp+tmp_py],%i3
        st      %g0,[%fp+tmp_counter]
.begin1:
        cmp     counter,0
        ble,pn  %icc,.exit

        lda     [%i4]0x82,%o1           ! (7_0) hx0 = *(int*)px;
        add     %i4,stridex,%i1

        lda     [%i3]0x82,%o4           ! (7_0) hy0 = *(int*)py;
        add     %i3,stridey,%i0         ! py += stridey

        and     %o1,_0x7fffffff,%o7     ! (7_0) hx0 &= 0x7fffffff;

        cmp     %o7,_0x7ff00000         ! (7_0) hx0 ? 0x7ff00000
        bge,pn  %icc,.spec0             ! (7_0) if ( hx0 >= 0x7ff00000 )
        and     %o4,_0x7fffffff,%l7     ! (7_0) hy0 &= 0x7fffffff;
```



```
        cmp     %l7,_0x7ff00000         ! (7_0) hy0 ? 0x7ff00000
        bge,pn  %icc,.spec0             ! (7_0) if ( hy0 >= 0x7ff00000 )
        sub     %l7,%o7,%o1             ! (7_0) diff0 = hy0 - hx0;

        sra     %o1,31,%o3              ! (7_0) j0 = diff0 >> 31;
        cmp     %o7,_0x00100000         ! (7_0) hx0 ? 0x00100000
        bl,pn   %icc,.spec1             ! (7_0) if ( hx0 < 0x00100000 )

        and     %o1,%o3,%o1             ! (7_0) j0 &= diff0;
.cont_spec0:
        sub     %l7,%o1,%o4             ! (7_0) j0 = hy0 - j0;

        and     %o4,%l0,%o4             ! (7_0) j0 &= 0x7ff00000;

        sub     %l0,%o4,%g1             ! (7_0) j0 = 0x7ff00000 - j0;

        sllx    %g1,32,%g1              ! (7_0) ll = (long long)j0 << 32;

        stx     %g1,[%fp+dtmp15]        ! (7_0) *(long long*)&scl0 = ll;

        stx     %g1,[%fp+dtmp0]         ! (7_1) *(long long*)&scl0 = ll;
.cont_spec1:
        lda     [%i1]0x82,%o1           ! (0_0) hx0 = *(int*)px;
        mov     %i1,%i2

        lda     [%i0]0x82,%o4           ! (0_0) hy0 = *(int*)py;

        and     %o1,_0x7fffffff,%o7     ! (0_0) hx0 &= 0x7fffffff;
        mov     %i0,%o0

        cmp     %o7,_0x7ff00000         ! (0_0) hx0 ? 0x7ff00000
        bge,pn  %icc,.update0           ! (0_0) if ( hx0 >= 0x7ff00000 )
        and     %o4,_0x7fffffff,%l7     ! (0_0) hy0 &= 0x7fffffff;

        cmp     %l7,_0x7ff00000         ! (0_0) hy0 ? 0x7ff00000
        sub     %l7,%o7,%o1             ! (0_0) diff0 = hy0 - hx0;
        bge,pn  %icc,.update0           ! (0_0) if ( hy0 >= 0x7ff00000 )
        sra     %o1,31,%o3              ! (0_0) j0 = diff0 >> 31;

        cmp     %o7,_0x00100000         ! (0_0) hx0 ? 0x00100000

        and     %o1,%o3,%o1             ! (0_0) j0 &= diff0;
        bl,pn   %icc,.update1           ! (0_0) if ( hx0 < 0x00100000 )
        sub     %l7,%o1,%o4             ! (0_0) j0 = hy0 - j0;
.cont0:
        and     %o4,%l0,%o4             ! (0_0) j0 &= 0x7ff00000;

        sub     %l0,%o4,%o4             ! (0_0) j0 = 0x7ff00000 - j0;
.cont1:
        sllx    %o4,32,%o4              ! (0_0) ll = (long long)j0 << 32;
        stx     %o4,[%fp+dtmp1]         ! (0_0) *(long long*)&scl0 = ll;

        ldd     [%fp+dtmp15],%f62       ! (7_1) *(long long*)&scl0 = ll;

        lda     [%i4]%asi,%f10          ! (7_1) ((float*)&x0)[0] = ((float*)px)[

        lda     [%i4+4]%asi,%f11        ! (7_1) ((float*)&x0)[1] = ((float*)px)[

        lda     [%i3]%asi,%f12          ! (7_1) ((float*)&y0)[0] = ((float*)py)[

        add     %i1,stridex,%i4         ! px += stridex
        lda     [%i3+4]%asi,%f13        ! (7_1) ((float*)&y0)[1] = ((float*)py)[

        fmuld   %f10,%f62,%f10          ! (7_1) x0 *= scl0;
        add     %i4,stridex,%i1         ! px += stridex
```

```
393         fmuld   %f12,%f62,%f60          ! (7_1) y0 *= scl0;

395         lda     [%i4]0x82,%o1           ! (1_0) hx0 = *(int*)px;

397         add     %i0,stridey,%i3         ! py += stridey
398         faddd   %f10,D2ON36,%f46        ! (7_1) x_hi0 = x0 + D2ON36;

400         lda     [%i3]0x82,%g1           ! (1_0) hy0 = *(int*)py;
401         add     %i3,stridey,%i0         ! py += stridey
402         faddd   %f60,D2ON36,%f50        ! (7_1) y_hi0 = y0 + D2ON36;

404         and     %o1,_0x7fffffff,%o7     ! (1_0) hx0 &= 0x7fffffff;

406         cmp     %o7,_0x7ff00000         ! (1_0) hx0 ? 0x7ff00000
407         stx     %o4,[%fp+dtmp2]         ! (0_0) *(long long*)&scl0 = ll;

409         and     %g1,_0x7fffffff,%l7     ! (1_0) hy0 &= 0x7fffffff;
410         bge,pn  %icc,.update2           ! (1_0) if ( hx0 >= 0x7ff00000 )
411         fsubd   %f46,D2ON36,%f20        ! (7_1) x_hi0 -= D2ON36;

413         cmp     %l7,_0x7ff00000         ! (1_0) hy0 ? 0x7ff00000
414         sub     %l7,%o7,%o1             ! (1_0) diff0 = hy0 - hx0;
415         bge,pn  %icc,.update3           ! (1_0) if ( hy0 >= 0x7ff00000 )
416         fsubd   %f50,D2ON36,%f54        ! (7_1) y_hi0 -= D2ON36;

418         sra     %o1,31,%o3              ! (1_0) j0 = diff0 >> 31;

420         and     %o1,%o3,%o1             ! (1_0) j0 &= diff0;

422         fmuld   %f20,%f20,%f2           ! (7_1) res0_hi = x_hi0 * x_hi0;
423         sub     %l7,%o1,%o4             ! (1_0) j0 = hy0 - j0;
424         cmp     %o7,_0x00100000         ! (1_0) hx0 ? 0x00100000
425         fsubd   %f10,%f20,%f0           ! (7_1) x_lo0 = x0 - x_hi0;

427         fmuld   %f54,%f54,%f46          ! (7_1) dtmp0 = y_hi0 * y_hi0;
428         and     %o4,%l0,%o4             ! (1_0) j0 &= 0x7ff00000;
429         bl,pn   %icc,.update4           ! (1_0) if ( hx0 < 0x00100000 )
430         faddd   %f10,%f20,%f62          ! (7_1) res0_lo = x0 + x_hi0;

432         sub     %l0,%o4,%o4             ! (1_0) j0 = 0x7ff00000 - j0;
433 .cont4:
434         sllx    %o4,32,%o4              ! (1_0) ll = (long long)j0 << 32;
435         stx     %o4,[%fp+dtmp3]         ! (1_0) *(long long*)&scl0 = ll;
436         faddd   %f60,%f54,%f50          ! (7_1) dtmp1 = y0 + y_hi0;

438         fsubd   %f60,%f54,%f12          ! (7_1) y_lo0 = y0 - y_hi0;

440         fmuld   %f62,%f0,%f0            ! (7_1) res0_lo *= x_lo0;
441         ldd     [%fp+dtmp1],%f62        ! (0_0) *(long long*)&scl0 = ll;
442         faddd   %f2,%f46,%f44           ! (7_1) res0_hi += dtmp0;

444         lda     [%i2]%asi,%f10          ! (0_0) ((float*)&x0)[0] = ((float*)px)[

446         lda     [%i2+4]%asi,%f11        ! (0_0) ((float*)&x0)[1] = ((float*)px)[

448         fmuld   %f50,%f12,%f26          ! (7_1) dtmp1 *= y_lo0;
449         lda     [%o0]%asi,%f12          ! (0_0) ((float*)&y0)[0] = ((float*)py)[

451         lda     [%o0+4]%asi,%f13        ! (0_0) ((float*)&y0)[1] = ((float*)py)[

453         fmuld   %f10,%f62,%f10          ! (0_0) x0 *= scl0;

455         fmuld   %f12,%f62,%f60          ! (0_0) y0 *= scl0;
456         faddd   %f0,%f26,%f38           ! (7_1) res0_lo += dtmp1;
```



```
458         lda     [%i1]0x82,%o1           ! (2_0) hx0 = *(int*)px;
459         mov     %i1,%i2

461         faddd   %f10,D2ON36,%f46        ! (0_0) x_hi0 = x0 + D2ON36;

463         lda     [%i0]0x82,%g1           ! (2_0) hy0 = *(int*)py;
464         mov     %i0,%o0
465         faddd   %f60,D2ON36,%f12        ! (0_0) y_hi0 = y0 + D2ON36;

467         faddd   %f44,%f38,%f14          ! (7_1) dres = res0_hi + res0_lo;
468         and     %o1,_0x7fffffff,%o7     ! (2_0) hx0 &= 0x7fffffff;

470         cmp     %o7,_0x7ff00000         ! (2_0) hx0 ? 0x7ff00000
471         bge,pn  %icc,.update5           ! (2_0) if ( hx0 >= 0x7ff00000 )
472         stx     %o4,[%fp+dtmp4]         ! (1_0) *(long long*)&scl0 = ll;

474         and     %g1,_0x7fffffff,%l7     ! (2_0) hx0 &= 0x7fffffff;
475         st      %f14,[%fp+ftmp0]        ! (7_1) iarr = ((int*)&dres)[0];
476         fsubd   %f46,D2ON36,%f20        ! (0_0) x_hi0 -= D2ON36;

478         sub     %l7,%o7,%o1             ! (2_0) diff0 = hy0 - hx0;
479         cmp     %l7,_0x7ff00000         ! (2_0) hy0 ? 0x7ff00000
480         bge,pn  %icc,.update6           ! (2_0) if ( hy0 >= 0x7ff00000 )
481         fsubd   %f12,D2ON36,%f54        ! (0_0) y_hi0 -= D2ON36;

483         sra     %o1,31,%o3              ! (2_0) j0 = diff0 >> 31;

485         and     %o1,%o3,%o1             ! (2_0) j0 &= diff0;

487         fmuld   %f20,%f20,%f2           ! (0_0) res0_hi = x_hi0 * x_hi0;
488         cmp     %o7,_0x00100000         ! (2_0) hx0 ? 0x00100000
489         sub     %l7,%o1,%o4             ! (2_0) j0 = hy0 - j0;
490         fsubd   %f10,%f20,%f0           ! (0_0) x_lo0 = x0 - x_hi0;

492         fmuld   %f54,%f54,%f46          ! (0_0) dtmp0 = y_hi0 * y_hi0;
493         and     %o4,%l0,%o4             ! (2_0) j0 &= 0x7ff00000;
494         bl,pn   %icc,.update7           ! (2_0) if ( hx0 < 0x00100000 )
495         faddd   %f10,%f20,%f62          ! (0_0) res0_lo = x0 + x_hi0;
496 .cont7:
497         sub     %l0,%o4,%g1             ! (2_0) j0 = 0x7ff00000 - j0;

499         sllx    %g1,32,%g1              ! (2_0) ll = (long long)j0 << 32;
500 .cont8:
501         stx     %g1,[%fp+dtmp5]         ! (2_0) *(long long*)&scl0 = ll;
502         faddd   %f60,%f54,%f50          ! (0_0) dtmp1 = y0 + y_hi0;

504         fsubd   %f60,%f54,%f12          ! (0_0) y_lo0 = y0 - y_hi0;

506         fmuld   %f62,%f0,%f0            ! (0_0) res0_lo *= x_lo0;
507         ldd     [%fp+dtmp3],%f62        ! (1_0) *(long long*)&scl0 = ll;
508         faddd   %f2,%f46,%f32           ! (0_0) res0_hi += dtmp0;

510         lda     [%i4]%asi,%f10          ! (1_0) ((float*)&x0)[0] = ((float*)px)[

512         lda     [%i4+4]%asi,%f11        ! (1_0) ((float*)&x0)[1] = ((float*)px)[

514         fmuld   %f50,%f12,%f28          ! (0_0) dtmp1 *= y_lo0;
515         lda     [%i3]%asi,%f12          ! (1_0) ((float*)&y0)[0] = ((float*)py)[

517         add     %i1,stridex,%i4         ! px += stridex
518         lda     [%i3+4]%asi,%f13        ! (1_0) ((float*)&y0)[1] = ((float*)py)[

520         ld      [%fp+ftmp0],%o2         ! (7_1) iarr = ((int*)&dres)[0];
521         add     %i4,stridex,%i1         ! px += stridex
522         fand    %f14,DA1,%f2            ! (7_1) dexp0 = vis_fand(dres,DA1);
```

```
524         fmuld   %f10,%f62,%f10          ! (1_0) x0 *= scl0;

526         fmuld   %f12,%f62,%f60          ! (1_0) y0 *= scl0;
527         sra     %o2,11,%i3              ! (7_1) iarr >>= 11;
528         faddd   %f0,%f28,%f36           ! (0_0) res0_lo += dtmp1;

530         and     %i3,0x1fc,%i3           ! (7_1) iarr &= 0x1fc;

532         add     %i3,TBL,%o4             ! (7_1) (char*)dll1 + iarr
533         lda     [%i4]0x82,%o1           ! (3_0) hx0 = *(int*)px;

535         add     %i0,stridey,%i3         ! py += stridey
536         ld      [%o4],%f26              ! (7_1) dtmp0 = ((double*)((char*)dll1 +
537         faddd   %f10,D2ON36,%f46        ! (1_0) x_hi0 = x0 + D2ON36;

539         lda     [%i3]0x82,%o4           ! (3_0) hy0 = *(int*)py;
540         add     %i3,stridey,%i0         ! py += stridey
541         faddd   %f60,D2ON36,%f12        ! (1_0) y_hi0 = y0 + D2ON36;

543         faddd   %f32,%f36,%f22          ! (0_0) dres = res0_hi + res0_lo;
544         and     %o1,_0x7fffffff,%o7     ! (3_0) hx0 &= 0x7fffffff;

546         cmp     %o7,_0x7ff00000         ! (3_0) hx0 ? 0x7ff00000
547         stx     %g1,[%fp+dtmp6]         ! (2_0) *(long long*)&scl0 = ll;
548         bge,pn  %icc,.update9           ! (3_0) if ( hx0 >= 0x7ff00000 )
549         fpsub32 %f26,%f2,%f26           ! (7_1) dd = vis_fpsub32(dtmp0, dexp0);

551         and     %o4,_0x7fffffff,%l7     ! (3_0) hy0 &= 0x7fffffff;
552         st      %f22,[%fp+ftmp0]        ! (0_0) iarr = ((int*)&dres)[0];
553         fsubd   %f46,D2ON36,%f20        ! (1_0) x_hi0 -= D2ON36;

555         sub     %l7,%o7,%o1             ! (3_0) diff0 = hy0 - hx0;
556         cmp     %l7,_0x7ff00000         ! (3_0) hy0 ? 0x7ff00000
557         bge,pn  %icc,.update10          ! (3_0) if ( hy0 >= 0x7ff00000 )
558         fsubd   %f12,D2ON36,%f54        ! (1_0) y_hi0 -= D2ON36;

560         fmuld   %f26,%f14,%f50          ! (7_1) dtmp0 = dd * dres;
561         sra     %o1,31,%o3              ! (3_0) j0 = diff0 >> 31;

563         and     %o1,%o3,%o1             ! (3_0) j0 &= diff0;

565         fmuld   %f20,%f20,%f2           ! (1_0) res0_hi = x_hi0 * x_hi0;
566         cmp     %o7,_0x00100000         ! (3_0) hx0 ? 0x00100000
567         sub     %l7,%o1,%o4             ! (3_0) j0 = hy0 - j0;
568         fsubd   %f10,%f20,%f0           ! (1_0) x_lo0 = x0 - x_hi0;

570         fmuld   %f54,%f54,%f46          ! (1_0) dtmp0 = y_hi0 * y_hi0;
571         and     %o4,%l0,%o4             ! (3_0) j0 &= 0x7ff00000;
572         bl,pn   %icc,.update11          ! (3_0) if ( hx0 < 0x00100000 )
573         faddd   %f10,%f20,%f62          ! (1_0) res0_lo = x0 + x_hi0;
574 .cont11:
575         sub     %l0,%o4,%g1             ! (3_0) j0 = 0x7ff00000 - j0;
576         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp0 = DTWO - dtmp0;
577 .cont12:
578         sllx    %g1,32,%g1              ! (3_0) ll = (long long)j0 << 32;
579         stx     %g1,[%fp+dtmp7]         ! (3_0) *(long long*)&scl0 = ll;
580         faddd   %f60,%f54,%f50          ! (1_0) dtmp1 = y0 + y_hi0;

582         fsubd   %f60,%f54,%f12          ! (1_0) y_lo0 = y0 - y_hi0

584         fmuld   %f62,%f0,%f0            ! (1_0) res0_lo *= x_lo0;
585         ldd     [%fp+dtmp5],%f62        ! (2_0) *(long long*)&scl0 = ll;
586         faddd   %f2,%f46,%f42           ! (1_0) res0_hi += dtmp0;

588         lda     [%i2]%asi,%f10          ! (2_0) ((float*)&x0)[0] = ((float*)px)[
589         fmuld   %f26,%f20,%f54          ! (7_1) dd *= dtmp0;
```



```
591         lda     [%i2+4]%asi,%f11        ! (2_0) ((float*)&x0)[1] = ((float*)px)[

593         fmuld   %f50,%f12,%f26          ! (1_0) dtmp1 *= y_lo0;
594         lda     [%o0]%asi,%f12          ! (2_0) ((float*)&y0)[0] = ((float*)py)[

596         lda     [%o0+4]%asi,%f13        ! (2_0) ((float*)&y0)[1] = ((float*)py)[

598         fmuld   %f54,%f14,%f50          ! (7_1) dtmp1 = dd * dres;
599         ld      [%fp+ftmp0],%o2         ! (0_0) iarr = ((int*)&dres)[0];
600         fand    %f22,DA1,%f2            ! (0_0) dexp0 = vis_fand(dres,DA1);

602         fmuld   %f10,%f62,%f10          ! (2_0) x0 *= scl0;

604         fmuld   %f12,%f62,%f60          ! (2_0) y0 *= scl0;
605         sra     %o2,11,%o4              ! (0_0) iarr >>= 11;
606         faddd   %f0,%f26,%f34           ! (1_0) res0_lo += dtmp1;

608         and     %o4,0x1fc,%o4           ! (0_0) iarr &= 0x1fc;

610         add     %o4,TBL,%o4             ! (0_0) (char*)dll1 + iarr
611         mov     %i1,%i2
612         lda     [%i1]0x82,%o1           ! (4_0) hx0 = *(int*)px;
613         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp1 = DTWO - dtmp1;

615         ld      [%o4],%f28              ! (0_0) dtmp0 = ((double*)((char*)dll1 +
616         faddd   %f10,D2ON36,%f46        ! (2_0) x_hi0 = x0 + D2ON36;

618         lda     [%i0]0x82,%o4           ! (4_0) hy0 = *(int*)py;
619         mov     %i0,%o0
620         faddd   %f60,D2ON36,%f50        ! (2_0) y_hi0 = y0 + D2ON36;

622         and     %o1,_0x7fffffff,%o7     ! (4_0) hx0 &= 0x7fffffff;
623         faddd   %f42,%f34,%f18          ! (1_0) dres = res0_hi + res0_lo;

625         fmuld   %f54,%f20,%f16          ! (7_1) dd *= dtmp1;
626         cmp     %o7,_0x7ff00000         ! (4_0) hx0 ? 0x7ff00000
627         stx     %g1,[%fp+dtmp8]         ! (3_0) *(long long*)&scl0 = ll;
628         fpsub32 %f28,%f2,%f28           ! (0_0) dd = vis_fpsub32(dtmp0, dexp0);

630         and     %o4,_0x7fffffff,%l7     ! (4_0) hy0 &= 0x7fffffff;
631         bge,pn  %icc,.update13          ! (4_0) if ( hx0 >= 0x7ff00000 )
632         st      %f18,[%fp+ftmp0]        ! (1_0) iarr = ((int*)&dres)[0];
633         fsubd   %f46,D2ON36,%f20        ! (2_0) x_hi0 -= D2ON36;

635         sub     %l7,%o7,%o1             ! (4_0) diff0 = hy0 - hx0;
636         cmp     %l7,_0x7ff00000         ! (4_0) hy0 ? 0x7ff00000
637         bge,pn  %icc,.update14          ! (4_0) if ( hy0 >= 0x7ff00000 )
638         fsubd   %f50,D2ON36,%f54        ! (2_0) y_hi0 -= D2ON36;

640         fmuld   %f28,%f22,%f50          ! (0_0) dtmp0 = dd * dres;
641         sra     %o1,31,%o3              ! (4_0) j0 = diff0 >> 31;

643         and     %o1,%o3,%o1             ! (4_0) j0 &= diff0;

645         fmuld   %f20,%f20,%f2           ! (2_0) res0_hi = x_hi0 * x_hi0;
646         sub     %l7,%o1,%o4             ! (4_0) j0 = hy0 - j0;
647         cmp     %o7,_0x00100000         ! (4_0) hx0 ? 0x00100000
648         fsubd   %f10,%f20,%f0           ! (2_0) x_lo0 = x0 - x_hi0;

650         fmuld   %f54,%f54,%f46          ! (2_0) dtmp0 = y_hi0 * y_hi0;
651         and     %o4,%l0,%o4             ! (4_0) j0 &= 0x7ff00000;
652         bl,pn   %icc,.update15          ! (4_0) if ( hx0 < 0x00100000 )
653         faddd   %f10,%f20,%f62          ! (2_0) res0_lo = x0 + x_hi0;
654 .cont15:
655         sub     %l0,%o4,%g1             ! (4_0) j0 = 0x7ff00000 - j0;
```

```
656         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp0 = DTWO - dtmp0;
657 .cont16:
658         fmuld   %f16,%f14,%f14          ! (7_1) dtmp2 = dd * dres;
659         sllx    %g1,32,%g1              ! (4_0) ll = (long long)j0 << 32;
660         stx     %g1,[%fp+dtmp9]         ! (4_0) *(long long*)&scl0 = ll;
661         faddd   %f60,%f54,%f50          ! (2_0) dtmp1 = y0 + y_hi0;

663         fsubd   %f60,%f54,%f12          ! (2_0) y_lo0 = y0 - y_hi0;

665         fmuld   %f62,%f0,%f0            ! (2_0) res0_lo *= x_lo0;
666         ldd     [%fp+dtmp7],%f62        ! (3_0) *(long long*)&scl0 = ll;
667         faddd   %f2,%f46,%f30           ! (2_0) res0_hi += dtmp0;

669         lda     [%i4]%asi,%f10          ! (3_0) ((float*)&x0)[0] = ((float*)px)[
670         fmuld   %f28,%f20,%f54          ! (0_0) dd *= dtmp0;

672         lda     [%i4+4]%asi,%f11        ! (3_0) ((float*)&x0)[1] = ((float*)px)[

674         fmuld   %f50,%f12,%f28          ! (2_0) dtmp1 *= y_lo0;
675         lda     [%i3]%asi,%f12          ! (3_0) ((float*)&y0)[0] = ((float*)py)[
676         fsubd   DTWO,%f14,%f20          ! (7_1) dtmp2 = DTWO - dtmp2;

678         lda     [%i3+4]%asi,%f13        ! (3_0) ((float*)&y0)[1] = ((float*)py)[
679         add     %i1,stridex,%i4         ! px += stridex

681         fmuld   %f54,%f22,%f50          ! (0_0) dtmp1 = dd * dres;
682         ld      [%fp+ftmp0],%o2         ! (1_0) iarr = ((int*)&dres)[0];
683         add     %i4,stridex,%i1         ! px += stridex
684         fand    %f18,DA1,%f2            ! (1_0) dexp0 = vis_fand(dres,DA1);

686         fmuld   %f10,%f62,%f10          ! (3_0) x0 *= scl0;

688         fmuld   %f12,%f62,%f60          ! (3_0) y0 *= scl0;
689         sra     %o2,11,%i3              ! (1_0) iarr >>= 11;
690         faddd   %f0,%f28,%f40           ! (2_0) res0_lo += dtmp1;

692         and     %i3,0x1fc,%i3           ! (1_0) iarr &= 0x1fc;
693         fmuld   %f16,%f20,%f28          ! (7_1) dres = dd * dtmp2;

695         add     %i3,TBL,%o4             ! (1_0) (char*)dll1 + iarr
696         lda     [%i4]0x82,%o1           ! (5_0) hx0 = *(int*)px;
697         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp1 = DTWO - dtmp1;

699         add     %i0,stridey,%i3         ! py += stridey
700         ld      [%o4],%f26              ! (1_0) dtmp0 = ((double*)((char*)dll1 +
701         faddd   %f10,D2ON36,%f46        ! (3_0) x_hi0 = x0 + D2ON36;

703         lda     [%i3]0x82,%o4           ! (5_0) hy0 = *(int*)py;
704         add     %i3,stridey,%i0         ! py += stridey
705         faddd   %f60,D2ON36,%f50        ! (3_0) y_hi0 = y0 + D2ON36;

707         and     %o1,_0x7fffffff,%o7     ! (5_0) hx0 &= 0x7fffffff;
708         faddd   %f30,%f40,%f14          ! (2_0) dres = res0_hi + res0_lo;

710         fmuld   %f54,%f20,%f24          ! (0_0) dd *= dtmp1;
711         cmp     %o7,_0x7ff00000         ! (5_0) hx0 ? 0x7ff00000
712         stx     %g1,[%fp+dtmp10]        ! (4_0) *(long long*)&scl0 = ll;
713         fpsub32 %f26,%f2,%f26           ! (1_0) dd = vis_fpsub32(dtmp0, dexp0);

715         and     %o4,_0x7fffffff,%l7     ! (5_0) hy0 &= 0x7fffffff;
716         st      %f14,[%fp+ftmp0]        ! (2_0) iarr = ((int*)&dres)[0];
717         bge,pn  %icc,.update17          ! (5_0) if ( hx0 >= 0x7ff00000 )
718         fsubd   %f46,D2ON36,%f20        ! (3_0) x_hi0 -= D2ON36;

720         sub     %l7,%o7,%o1             ! (5_0) diff0 = hy0 - hx0;
721         cmp     %l7,_0x7ff00000         ! (5_0) hy0 ? 0x7ff00000
```



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722         bge,pn  %icc,.update18          ! (5_0) if ( hy0 >= 0x7ff00000 )
723         fsubd   %f50,D2ON36,%f54        ! (3_0) y_hi0 -= D2ON36;

725         fmuld   %f26,%f18,%f50          ! (1_0) dtmp0 = dd * dres;
726         sra     %o1,31,%o3              ! (5_0) j0 = diff0 >> 31;

728         and     %o1,%o3,%o1             ! (5_0) j0 &= diff0;
729         fand    %f28,DA0,%f48           ! (7_1) res0 = vis_fand(dres,DA0);

731         fmuld   %f20,%f20,%f2           ! (3_0) res0_hi = x_hi0 * x_hi0;
732         sub     %l7,%o1,%o4             ! (5_0) j0 = hy0 - j0;
733         cmp     %o7,_0x00100000         ! (5_0) hx0 ? 0x00100000
734         fsubd   %f10,%f20,%f0           ! (3_0) x_lo0 = x0 - x_hi0;

736         fmuld   %f54,%f54,%f46          ! (3_0) dtmp0 = y_hi0 * y_hi0;
737         and     %o4,%l0,%o4             ! (5_0) j0 &= 0x7ff00000;
738         bl,pn   %icc,.update19          ! (5_0) if ( hx0 < 0x00100000 )
739         faddd   %f10,%f20,%f62          ! (3_0) res0_lo = x0 + x_hi0;
740 .cont19a:
741         fmuld   %f44,%f48,%f10          ! (7_1) dtmp0 = res0_hi * res0;
742         sub     %l0,%o4,%g1             ! (5_0) j0 = 0x7ff00000 - j0;
743         fsubd   DTWO,%f50,%f20          ! (1_0) dtmp0 = DTWO - dtmp0;
744 .cont19b:
745         fmuld   %f24,%f22,%f22          ! (0_0) dtmp2 = dd * dres;
746         sllx    %g1,32,%g1              ! (5_0) ll = (long long)j0 << 32;
747         stx     %g1,[%fp+dtmp11]        ! (5_0) *(long long*)&scl0 = ll;
748         faddd   %f60,%f54,%f50          ! (3_0) dtmp1 = y0 + y_hi0;

750         fmuld   %f38,%f48,%f38          ! (7_1) dtmp1 = res0_lo * res0;
751         fsubd   %f60,%f54,%f12          ! (3_0) y_lo0 = y0 - y_hi0;
752 .cont20:
753         fmuld   %f62,%f0,%f0            ! (3_0) res0_lo *= x_lo0;
754         ldd     [%fp+dtmp9],%f62        ! (4_0) *(long long*)&scl0 = ll;
755         faddd   %f2,%f46,%f44           ! (3_0) res0_hi += dtmp0;

757         fsubd   DONE,%f10,%f60          ! (7_1) dtmp0 = DONE - dtmp0;
758         lda     [%i2]%asi,%f10          ! (4_0) ((float*)&x0)[0] = ((float*)px)[
759         fmuld   %f26,%f20,%f54          ! (1_0) dd *= dtmp0;

761         lda     [%i2+4]%asi,%f11        ! (4_0) ((float*)&x0)[1] = ((float*)px)[

763         fmuld   %f50,%f12,%f26          ! (3_0) dtmp1 *= y_lo0;
764         lda     [%o0]%asi,%f12          ! (4_0) ((float*)&y0)[0] = ((float*)py)[
765         fsubd   DTWO,%f22,%f20          ! (0_0) dtmp2 = DTWO - dtmp2;

767         lda     [%o0+4]%asi,%f13        ! (4_0) ((float*)&y0)[1] = ((float*)py)[

769         fmuld   %f54,%f18,%f50          ! (1_0) dtmp1 = dd * dres;
770         ld      [%fp+ftmp0],%o2         ! (2_0) iarr = ((int*)&dres)[0];
771         fand    %f14,DA1,%f2            ! (2_0) dexp0 = vis_fand(dres,DA1);

773         fmuld   %f10,%f62,%f10          ! (4_0) x0 *= scl0;
774         fsubd   %f60,%f38,%f46          ! (7_1) dtmp0 -= dtmp1;

776         fmuld   %f12,%f62,%f60          ! (4_0) y0 *= scl0;
777         sra     %o2,11,%o4              ! (2_0) iarr >>= 11;
778         faddd   %f0,%f26,%f38           ! (3_0) res0_lo += dtmp1;

780         and     %o4,0x1fc,%o4           ! (2_0) iarr &= 0x1fc;
781         fmuld   %f24,%f20,%f26          ! (0_0) dres = dd * dtmp2;

783         add     %o4,TBL,%o4             ! (2_0) (char*)dll1 + iarr
784         mov     %i1,%i2
785         lda     [%i1]0x82,%o1           ! (6_0) hx0 = *(int*)px;
786         fsubd   DTWO,%f50,%f52          ! (1_0) dtmp1 = DTWO - dtmp1;
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788         fmuld   %f46,%f28,%f28          ! (7_1) dtmp0 *= dres;
789         ld      [%o4],%f20              ! (2_0) dtmp0 = ((double*)((char*)dll1 +
790         faddd   %f10,D2ON36,%f46        ! (4_0) x_hi0 = x0 + D2ON36;

792         lda     [%i0]0x82,%o4           ! (6_0) hy0 = *(int*)py;
793         mov     %i0,%o0
794         faddd   %f60,D2ON36,%f50        ! (4_0) y_hi0 = y0 + D2ON36;

796         and     %o1,_0x7fffffff,%o7     ! (6_0) hx0 &= 0x7fffffff;
797         faddd   %f44,%f38,%f22          ! (3_0) dres = res0_hi + res0_lo;

799         fmuld   %f54,%f52,%f16          ! (1_0) dd *= dtmp1;
800         cmp     %o7,_0x7ff00000         ! (6_0) hx0 ? 0x7ff00000
801         stx     %g1,[%fp+dtmp12]        ! (5_0) *(long long*)&scl0 = ll;
802         fpsub32 %f20,%f2,%f52           ! (2_0) dd = vis_fpsub32(dtmp0, dexp0);

804         and     %o4,_0x7fffffff,%l7     ! (6_0) hy0 &= 0x7fffffff;
805         st      %f22,[%fp+ftmp0]        ! (3_0) iarr = ((int*)&dres)[0];
806         bge,pn  %icc,.update21          ! (6_0) if ( hx0 >= 0x7ff00000 )
807         fsubd   %f46,D2ON36,%f46        ! (4_0) x_hi0 -= D2ON36;

809         sub     %l7,%o7,%o1             ! (6_0) diff0 = hy0 - hx0;
810         cmp     %l7,_0x7ff00000         ! (6_0) hy0 ? 0x7ff00000
811         bge,pn  %icc,.update22          ! (6_0) if ( hy0 >= 0x7ff00000 )
812         fsubd   %f50,D2ON36,%f54        ! (4_0) y_hi0 -= D2ON36;

814         fmuld   %f52,%f14,%f50          ! (2_0) dtmp0 = dd * dres;
815         sra     %o1,31,%o3              ! (6_0) j0 = diff0 >> 31;
816         faddd   %f48,%f28,%f48          ! (7_1) res0 += dtmp0;

818         and     %o1,%o3,%o1             ! (6_0) j0 &= diff0;
819         fand    %f26,DA0,%f28           ! (0_0) res0 = vis_fand(dres,DA0);

821         fmuld   %f46,%f46,%f0           ! (4_0) res0_hi = x_hi0 * x_hi0;
822         sub     %l7,%o1,%o4             ! (6_0) j0 = hy0 - j0;
823         cmp     %o7,_0x00100000         ! (6_0) hx0 ? 0x00100000
824         fsubd   %f10,%f46,%f2           ! (4_0) x_lo0 = x0 - x_hi0;

826         fmuld   %f54,%f54,%f20          ! (4_0) dtmp0 = y_hi0 * y_hi0;
827         and     %o4,%l0,%o4             ! (6_0) j0 &= 0x7ff00000;
828         bl,pn   %icc,.update23          ! (6_0) if ( hx0 < 0x00100000 )
829         faddd   %f10,%f46,%f62          ! (4_0) res0_lo = x0 + x_hi0;
830 .cont23a:
831         fmuld   %f16,%f18,%f18          ! (1_0) dtmp2 = dd * dres;
832         sub     %l0,%o4,%g1             ! (6_0) j0 = 0x7ff00000 - j0;
833         fsubd   DTWO,%f50,%f10          ! (2_0) dtmp0 = DTWO - dtmp0;
834 .cont23b:
835         fmuld   %f32,%f28,%f50          ! (0_0) dtmp0 = res0_hi * res0;
836         sllx    %g1,32,%g1              ! (6_0) ll = (long long)j0 << 32;
837         stx     %g1,[%fp+dtmp13]        ! (6_0) *(long long*)&scl0 = ll;
838         faddd   %f60,%f54,%f46          ! (4_0) dtmp1 = y0 + y_hi0;

840         fmuld   %f36,%f28,%f36          ! (0_0) dtmp1 = res0_lo * res0;
841         fsubd   %f60,%f54,%f60          ! (4_0) y_lo0 = y0 - y_hi0;
842 .cont24:
843         fmuld   %f62,%f2,%f2            ! (4_0) res0_lo *= x_lo0;
844         ldd     [%fp+dtmp11],%f62       ! (5_0) *(long long*)&scl0 = ll;
845         faddd   %f0,%f20,%f32           ! (4_0) res0_hi += dtmp0;

847         lda     [%i4]%asi,%f0           ! (5_0) ((float*)&x0)[0] = ((float*)px)[
848         fmuld   %f52,%f10,%f10          ! (2_0) dd *= dtmp0;

850         lda     [%i4+4]%asi,%f1         ! (5_0) ((float*)&x0)[1] = ((float*)px)[
851         fsubd   DONE,%f50,%f52          ! (0_0) dtmp0 = DONE - dtmp0;

853         fmuld   %f46,%f60,%f46          ! (4_0) dtmp1 *= y_lo0;
```



```
854         lda     [%i3]%asi,%f12          ! (5_0) ((float*)&y0)[0] = ((float*)py)[
855         fsubd   DTWO,%f18,%f18          ! (1_0) dtmp2 = DTWO - dtmp2;

857         add     %i1,stridex,%i4         ! px += stridex
858         lda     [%i3+4]%asi,%f13        ! (5_0) ((float*)&y0)[1] = ((float*)py)[

860         fmuld   %f10,%f14,%f50          ! (2_0) dtmp1 = dd * dres;
861         add     %i4,stridex,%i1         ! px += stridex
862         ld      [%fp+ftmp0],%o2         ! (3_0) iarr = ((int*)&dres)[0];
863         fand    %f22,DA1,%f54           ! (3_0) dexp0 = vis_fand(dres,DA1);

865         fmuld   %f0,%f62,%f60           ! (5_0) x0 *= scl0;
866         fsubd   %f52,%f36,%f20          ! (0_0) dtmp0 -= dtmp1;

868         fmuld   %f12,%f62,%f52          ! (5_0) y0 *= scl0;
869         sra     %o2,11,%i3              ! (3_0) iarr >>= 11;
870         faddd   %f2,%f46,%f36           ! (4_0) res0_lo += dtmp1;

872         and     %i3,0x1fc,%i3           ! (3_0) iarr &= 0x1fc;
873         fmuld   %f16,%f18,%f16          ! (1_0) dres = dd * dtmp2;

875         fsqrtd  %f48,%f18               ! (7_1) res0 = sqrt ( res0 );
876         add     %i3,TBL,%o4             ! (3_0) (char*)dll1 + iarr
877         lda     [%i4]0x82,%o1           ! (7_0) hx0 = *(int*)px;
878         fsubd   DTWO,%f50,%f46          ! (2_0) dtmp1 = DTWO - dtmp1;

880         fmuld   %f20,%f26,%f48          ! (0_0) dtmp0 *= dres;
881         add     %i0,stridey,%i3         ! py += stridey
882         ld      [%o4],%f20              ! (3_0) dtmp0 = ((double*)((char*)dll1 +
883         faddd   %f60,D2ON36,%f50        ! (5_0) x_hi0 = x0 + D2ON36;

885         lda     [%i3]0x82,%o4           ! (7_0) hy0 = *(int*)py;
886         add     %i3,stridey,%i0         ! py += stridey
887         faddd   %f52,D2ON36,%f12        ! (5_0) y_hi0 = y0 + D2ON36;

889         and     %o1,_0x7fffffff,%o7     ! (7_0) hx0 &= 0x7fffffff;
890         faddd   %f32,%f36,%f24          ! (4_0) dres = res0_hi + res0_lo;

892         fmuld   %f10,%f46,%f26          ! (2_0) dd *= dtmp1;
893         cmp     %o7,_0x7ff00000         ! (7_0) hx0 ? 0x7ff00000
894         stx     %g1,[%fp+dtmp14]        ! (6_0) *(long long*)&scl0 = ll;
895         fpsub32 %f20,%f54,%f10          ! (3_0) dd = vis_fpsub32(dtmp0, dexp0);

897         and     %o4,_0x7fffffff,%l7     ! (7_0) hy0 &= 0x7fffffff;
898         st      %f24,[%fp+ftmp0]        ! (4_0) iarr = ((int*)&dres)[0];
899         bge,pn  %icc,.update25          ! (7_0) if ( hx0 >= 0x7ff00000 )
900         fsubd   %f50,D2ON36,%f20        ! (5_0) x_hi0 -= D2ON36;

902         sub     %l7,%o7,%o1             ! (7_0) diff0 = hy0 - hx0;
903         cmp     %l7,_0x7ff00000         ! (7_0) hy0 ? 0x7ff00000
904         bge,pn  %icc,.update26          ! (7_0) if ( hy0 >= 0x7ff00000 )
905         fsubd   %f12,D2ON36,%f54        ! (5_0) y_hi0 -= D2ON36;

907         fmuld   %f10,%f22,%f50          ! (3_0) dtmp0 = dd * dres;
908         sra     %o1,31,%o3              ! (7_0) j0 = diff0 >> 31;
909         faddd   %f28,%f48,%f48          ! (0_0) res0 += dtmp0;

911         and     %o1,%o3,%o1             ! (7_0) j0 &= diff0;
912         fand    %f16,DA0,%f28           ! (1_0) res0 = vis_fand(dres,DA0);

914         fmuld   %f20,%f20,%f0           ! (5_0) res0_hi = x_hi0 * x_hi0;
915         sub     %l7,%o1,%o4             ! (7_0) j0 = hy0 - j0;
916         cmp     %o7,_0x00100000         ! (7_0) hx0 ? 0x00100000
917         fsubd   %f60,%f20,%f2           ! (5_0) x_lo0 = x0 - x_hi0;

919         fmuld   %f54,%f54,%f46          ! (5_0) dtmp0 = y_hi0 * y_hi0;
```

```
920         and     %o4,%l0,%o4             ! (7_0) j0 &= 0x7ff00000;
921         bl,pn   %icc,.update27          ! (7_0) if ( hx0 < 0x00100000 )
922         faddd   %f60,%f20,%f62          ! (5_0) res0_lo = x0 + x_hi0;
923 .cont27a:
924         fmuld   %f26,%f14,%f14          ! (2_0) dtmp2 = dd * dres;
925         sub     %l0,%o4,%g1             ! (7_0) j0 = 0x7ff00000 - j0;
926         fsubd   DTWO,%f50,%f20          ! (3_0) dtmp0 = DTWO - dtmp0;
927 .cont27b:
928         fmuld   %f42,%f28,%f60          ! (1_0) dtmp0 = res0_hi * res0;
929         sllx    %g1,32,%g1              ! (7_0) ll = (long long)j0 << 32;
930         stx     %g1,[%fp+dtmp15]        ! (7_0) *(long long*)&scl0 = ll;
931         faddd   %f52,%f54,%f50          ! (5_0) dtmp1 = y0 + y_hi0;

933         fmuld   %f34,%f28,%f34          ! (1_0) dtmp1 = res0_lo * res0;
934         fsubd   %f52,%f54,%f54          ! (5_0) y_lo0 = y0 - y_hi0;
935 .cont28:
936         fmuld   %f62,%f2,%f2            ! (5_0) res0_lo *= x_lo0;
937         ldd     [%fp+dtmp13],%f62       ! (6_0) *(long long*)&scl0 = ll;
938         faddd   %f0,%f46,%f42           ! (5_0) res0_hi += dtmp0;

940         fmuld   %f10,%f20,%f52          ! (3_0) dd *= dtmp0;
941         lda     [%i2]%asi,%f10          ! (6_0) ((float*)&x0)[0] = ((float*)px)[

943         lda     [%i2+4]%asi,%f11        ! (6_0) ((float*)&x0)[1] = ((float*)px)[
944         fsubd   DONE,%f60,%f60          ! (1_0) dtmp0 = DONE - dtmp0;

946         fmuld   %f50,%f54,%f46          ! (5_0) dtmp1 *= y_lo0;
947         lda     [%o0]%asi,%f12          ! (6_0) ((float*)&y0)[0] = ((float*)py)[
948         fsubd   DTWO,%f14,%f14          ! (2_0) dtmp2 = DTWO - dtmp2;

950         lda     [%o0+4]%asi,%f13        ! (6_0) ((float*)&y0)[1] = ((float*)py)[

952         fmuld   %f52,%f22,%f50          ! (3_0) dtmp1 = dd * dres;
953         ld      [%fp+ftmp0],%o2         ! (4_0) iarr = ((int*)&dres)[0];
954         fand    %f24,DA1,%f54           ! (4_0) dexp0 = vis_fand(dres,DA1);

956         fmuld   %f10,%f62,%f10          ! (6_0) x0 *= scl0;
957         ldd     [%fp+dtmp0],%f0         ! (7_1) *(long long*)&scl0 = ll;
958         fsubd   %f60,%f34,%f20          ! (1_0) dtmp0 -= dtmp1;

960         fmuld   %f12,%f62,%f60          ! (6_0) y0 *= scl0;
961         sra     %o2,11,%o4              ! (4_0) iarr >>= 11;
962         faddd   %f2,%f46,%f34           ! (5_0) res0_lo += dtmp1;

964         and     %o4,0x1fc,%o4           ! (4_0) iarr &= 0x1fc;
965         fmuld   %f26,%f14,%f26          ! (2_0) dres = dd * dtmp2;

967         cmp     counter,8
968         bl,pn   %icc,.tail
969         nop

971         ba      .main_loop
972         sub     counter,8,counter

974         .align  16
975 .main_loop:
976         fsqrtd  %f48,%f14               ! (0_1) res0 = sqrt ( res0 );
977         add     %o4,TBL,%o4             ! (4_1) (char*)dll1 + iarr
978         lda     [%i1]0x82,%o1           ! (0_0) hx0 = *(int*)px;
979         fsubd   DTWO,%f50,%f46          ! (3_1) dtmp1 = DTWO - dtmp1;

981         fmuld   %f20,%f16,%f48          ! (1_1) dtmp0 *= dres;
982         mov     %i1,%i2
983         ld      [%o4],%f20              ! (4_1) dtmp0 = ((double*)((char*)dll1 +
984         faddd   %f10,D2ON36,%f50        ! (6_1) x_hi0 = x0 + D2ON36;
```



```
986         nop
987         mov     %i0,%o0
988         lda     [%i0]0x82,%o4           ! (0_0) hy0 = *(int*)py;
989         faddd   %f60,D2ON36,%f2         ! (6_1) y_hi0 = y0 + D2ON36;

991         faddd   %f42,%f34,%f16          ! (5_1) dres = res0_hi + res0_lo;
992         and     %o1,_0x7fffffff,%o7     ! (0_0) hx0 &= 0x7fffffff;
993         st      %f16,[%fp+ftmp0]        ! (5_1) iarr = ((int*)&dres)[0];
994         fmuld   %f0,%f18,%f0            ! (7_2) res0 = scl0 * res0;

996         fmuld   %f52,%f46,%f18          ! (3_1) dd *= dtmp1;
997         cmp     %o7,_0x7ff00000         ! (0_0) hx0 ? 0x7ff00000
998         st      %f0,[%i5]               ! (7_2) ((float*)pz)[0] = ((float*)&res0
999         fpsub32 %f20,%f54,%f54          ! (4_1) dd = vis_fpsub32(dtmp0, dexp0);

1001        and     %o4,_0x7fffffff,%l7     ! (0_0) hy0 &= 0x7fffffff;
1002        st      %f1,[%i5+4]             ! (7_2) ((float*)pz)[1] = ((float*)&res0
1003        bge,pn  %icc,.update29          ! (0_0) if ( hx0 >= 0x7ff00000 )
1004        fsubd   %f50,D2ON36,%f20        ! (6_1) x_hi0 -= D2ON36;

1006        cmp     %l7,_0x7ff00000         ! (0_0) hy0 ? 0x7ff00000
1007        sub     %l7,%o7,%o1             ! (0_0) diff0 = hy0 - hx0;
1008        bge,pn  %icc,.update30          ! (0_0) if ( hy0 >= 0x7ff00000 )
1009        fsubd   %f2,D2ON36,%f2          ! (6_1) y_hi0 -= D2ON36;

1011        fmuld   %f54,%f24,%f50          ! (4_1) dtmp0 = dd * dres;
1012        sra     %o1,31,%o3              ! (0_0) j0 = diff0 >> 31;
1013        stx     %g1,[%fp+dtmp0]         ! (7_1) *(long long*)&scl0 = ll;
1014        faddd   %f28,%f48,%f52          ! (1_1) res0 += dtmp0;

1016        and     %o1,%o3,%o1             ! (0_0) j0 &= diff0;
1017        cmp     %o7,_0x00100000         ! (0_0) hx0 ? 0x00100000
1018        bl,pn   %icc,.update31          ! (0_0) if ( hx0 < 0x00100000 )
1019        fand    %f26,DA0,%f48           ! (2_1) res0 = vis_fand(dres,DA0);
1020 .cont31:
1021        fmuld   %f20,%f20,%f0           ! (6_1) res0_hi = x_hi0 * x_hi0;
1022        sub     %l7,%o1,%o4             ! (0_0) j0 = hy0 - j0;
1023        nop
1024        fsubd   %f10,%f20,%f28          ! (6_1) x_lo0 = x0 - x_hi0;

1026        fmuld   %f2,%f2,%f46            ! (6_1) dtmp0 = y_hi0 * y_hi0;
1027        add     %i5,stridez,%i5         ! pz += stridez
1028        and     %o4,%l0,%o4             ! (0_0) j0 &= 0x7ff00000;
1029        faddd   %f10,%f20,%f62          ! (6_1) res0_lo = x0 + x_hi0;

1031        fmuld   %f18,%f22,%f22          ! (3_1) dtmp2 = dd * dres;
1032        sub     %l0,%o4,%o4             ! (0_0) j0 = 0x7ff00000 - j0;
1033        nop
1034        fsubd   DTWO,%f50,%f20          ! (4_1) dtmp0 = DTWO - dtmp0;
1035 .cont32:
1036        fmuld   %f30,%f48,%f12          ! (2_1) dtmp0 = res0_hi * res0;
1037        sllx    %o4,32,%o4              ! (0_0) ll = (long long)j0 << 32;
1038        stx     %o4,[%fp+dtmp1]         ! (0_0) *(long long*)&scl0 = ll;
1039        faddd   %f60,%f2,%f50           ! (6_1) dtmp1 = y0 + y_hi0;

1041        fmuld   %f40,%f48,%f40          ! (2_1) dtmp1 = res0_lo * res0;
1042        nop
1043        bn,pn   %icc,.exit
1044        fsubd   %f60,%f2,%f2            ! (6_1) y_lo0 = y0 - y_hi0;

1046        fmuld   %f62,%f28,%f28          ! (6_1) res0_lo *= x_lo0;
1047        nop
1048        ldd     [%fp+dtmp15],%f62       ! (7_1) *(long long*)&scl0 = ll;
1049        faddd   %f0,%f46,%f30           ! (6_1) res0_hi += dtmp0;

1051        nop
```

```
1052         nop
1053         lda     [%i4]%asi,%f10          ! (7_1) ((float*)&x0)[0] = ((float*)px)[
1054         fmuld   %f54,%f20,%f54          ! (4_1) dd *= dtmp0;

1056         nop
1057         nop
1058         lda     [%i4+4]%asi,%f11        ! (7_1) ((float*)&x0)[1] = ((float*)px)[
1059         fsubd   DONE,%f12,%f60          ! (2_1) dtmp0 = DONE - dtmp0;

1061         fmuld   %f50,%f2,%f46           ! (6_1) dtmp1 *= y_lo0;
1062         nop
1063         lda     [%i3]%asi,%f12          ! (7_1) ((float*)&y0)[0] = ((float*)py)[
1064         fsubd   DTWO,%f22,%f22          ! (3_1) dtmp2 = DTWO - dtmp2;

1066         add     %i1,stridex,%i4         ! px += stridex
1067         nop
1068         lda     [%i3+4]%asi,%f13        ! (7_1) ((float*)&y0)[1] = ((float*)py)[
1069         bn,pn   %icc,.exit

1071         fmuld   %f54,%f24,%f50          ! (4_1) dtmp1 = dd * dres;
1072         add     %i4,stridex,%i1         ! px += stridex
1073         ld      [%fp+ftmp0],%o2         ! (5_1) iarr = ((int*)&dres)[0];
1074         fand    %f16,DA1,%f2            ! (5_1) dexp0 = vis_fand(dres,DA1);

1076         fmuld   %f10,%f62,%f10          ! (7_1) x0 *= scl0;
1077         nop
1078         ldd     [%fp+dtmp2],%f0         ! (0_1) *(long long*)&scl0 = ll;
1079         fsubd   %f60,%f40,%f20          ! (2_1) dtmp0 -= dtmp1;

1081         fmuld   %f12,%f62,%f60          ! (7_1) y0 *= scl0;
1082         sra     %o2,11,%i3              ! (5_1) iarr >>= 11;
1083         nop
1084         faddd   %f28,%f46,%f40          ! (6_1) res0_lo += dtmp1;

1086         and     %i3,0x1fc,%i3           ! (5_1) iarr &= 0x1fc;
1087         nop
1088         bn,pn   %icc,.exit
1089         fmuld   %f18,%f22,%f28          ! (3_1) dres = dd * dtmp2;

1091         fsqrtd  %f52,%f22               ! (1_1) res0 = sqrt ( res0 );
1092         lda     [%i4]0x82,%o1           ! (1_0) hx0 = *(int*)px;
1093         add     %i3,TBL,%g1             ! (5_1) (char*)dll1 + iarr
1094         fsubd   DTWO,%f50,%f62          ! (4_1) dtmp1 = DTWO - dtmp1;

1096         fmuld   %f20,%f26,%f52          ! (2_1) dtmp0 *= dres;
1097         add     %i0,stridey,%i3         ! py += stridey
1098         ld      [%g1],%f26              ! (5_1) dtmp0 = ((double*)((char*)dll1 +
1099         faddd   %f10,D2ON36,%f46        ! (7_1) x_hi0 = x0 + D2ON36;

1101         nop
1102         add     %i3,stridey,%i0         ! py += stridey
1103         lda     [%i3]0x82,%g1           ! (1_0) hy0 = *(int*)py;
1104         faddd   %f60,D2ON36,%f50        ! (7_1) y_hi0 = y0 + D2ON36;

1106         faddd   %f30,%f40,%f18          ! (6_1) dres = res0_hi + res0_lo;
1107         and     %o1,_0x7fffffff,%o7     ! (1_0) hx0 &= 0x7fffffff;
1108         st      %f18,[%fp+ftmp0]        ! (6_1) iarr = ((int*)&dres)[0];
1109         fmuld   %f0,%f14,%f0            ! (0_1) res0 = scl0 * res0;

1111         fmuld   %f54,%f62,%f14          ! (4_1) dd *= dtmp1;
1112         cmp     %o7,_0x7ff00000         ! (1_0) hx0 ? 0x7ff00000
1113         st      %f0,[%i5]               ! (0_1) ((float*)pz)[0] = ((float*)&res0
1114         fpsub32 %f26,%f2,%f26           ! (5_1) dd = vis_fpsub32(dtmp0, dexp0);

1116         and     %g1,_0x7fffffff,%l7     ! (1_0) hy0 &= 0x7fffffff;
1117         nop
```



```
1118         bge,pn  %icc,.update33          ! (1_0) if ( hx0 >= 0x7ff00000 )
1119         fsubd   %f46,D2ON36,%f20        ! (7_1) x_hi0 -= D2ON36;

1121         cmp     %l7,_0x7ff00000         ! (1_0) hy0 ? 0x7ff00000
1122         sub     %l7,%o7,%o1             ! (1_0) diff0 = hy0 - hx0;
1123         st      %f1,[%i5+4]             ! (0_1) ((float*)pz)[1] = ((float*)&res0
1124         fsubd   %f50,D2ON36,%f54        ! (7_1) y_hi0 -= D2ON36;

1126         fmuld   %f26,%f16,%f50          ! (5_1) dtmp0 = dd * dres;
1127         sra     %o1,31,%o3              ! (1_0) j0 = diff0 >> 31;
1128         bge,pn  %icc,.update34          ! (1_0) if ( hy0 >= 0x7ff00000 )
1129         faddd   %f48,%f52,%f52          ! (2_1) res0 += dtmp0;

1131         and     %o1,%o3,%o1             ! (1_0) j0 &= diff0;
1132         add     %i5,stridez,%i5         ! pz += stridez
1133         stx     %o4,[%fp+dtmp2]         ! (0_0) *(long long*)&scl0 = ll;
1134         fand    %f28,DA0,%f48           ! (3_1) res0 = vis_fand(dres,DA0);

1136         fmuld   %f20,%f20,%f2           ! (7_1) res0_hi = x_hi0 * x_hi0;
1137         sub     %l7,%o1,%o4             ! (1_0) j0 = hy0 - j0;
1138         cmp     %o7,_0x00100000         ! (1_0) hx0 ? 0x00100000
1139         fsubd   %f10,%f20,%f0           ! (7_1) x_lo0 = x0 - x_hi0;

1141         fmuld   %f54,%f54,%f46          ! (7_1) dtmp0 = y_hi0 * y_hi0;
1142         and     %o4,%l0,%o4             ! (1_0) j0 &= 0x7ff00000;
1143         bl,pn   %icc,.update35          ! (1_0) if ( hx0 < 0x00100000 )
1144         faddd   %f10,%f20,%f62          ! (7_1) res0_lo = x0 + x_hi0;
1145 .cont35a:
1146         fmuld   %f44,%f48,%f10          ! (3_1) dtmp0 = res0_hi * res0;
1147         nop
1148         sub     %l0,%o4,%o4             ! (1_0) j0 = 0x7ff00000 - j0;
1149         fsubd   DTWO,%f50,%f20          ! (5_1) dtmp0 = DTWO - dtmp0;
1150 .cont35b:
1151         fmuld   %f14,%f24,%f24          ! (4_1) dtmp2 = dd * dres;
1152         sllx    %o4,32,%o4              ! (1_0) ll = (long long)j0 << 32;
1153         stx     %o4,[%fp+dtmp3]         ! (1_0) *(long long*)&scl0 = ll;
1154         faddd   %f60,%f54,%f50          ! (7_1) dtmp1 = y0 + y_hi0;

1156         fmuld   %f38,%f48,%f38          ! (3_1) dtmp1 = res0_lo * res0;
1157         nop
1158         nop
1159         fsubd   %f60,%f54,%f12          ! (7_1) y_lo0 = y0 - y_hi0;
1160 .cont36:
1161         fmuld   %f62,%f0,%f0            ! (7_1) res0_lo *= x_lo0;
1162         nop
1163         ldd     [%fp+dtmp1],%f62        ! (0_0) *(long long*)&scl0 = ll;
1164         faddd   %f2,%f46,%f44           ! (7_1) res0_hi += dtmp0;

1166         fsubd   DONE,%f10,%f60          ! (3_1) dtmp0 = DONE - dtmp0;
1167         nop
1168         lda     [%i2]%asi,%f10          ! (0_0) ((float*)&x0)[0] = ((float*)px)[
1169         fmuld   %f26,%f20,%f54          ! (5_1) dd *= dtmp0;

1171         nop
1172         nop
1173         lda     [%i2+4]%asi,%f11        ! (0_0) ((float*)&x0)[1] = ((float*)px)[
1174         bn,pn   %icc,.exit

1176         fmuld   %f50,%f12,%f26          ! (7_1) dtmp1 *= y_lo0;
1177         nop
1178         lda     [%o0]%asi,%f12          ! (0_0) ((float*)&y0)[0] = ((float*)py)[
1179         fsubd   DTWO,%f24,%f24          ! (4_1) dtmp2 = DTWO - dtmp2;

1181         nop
1182         nop
1183         lda     [%o0+4]%asi,%f13        ! (0_0) ((float*)&y0)[1] = ((float*)py)[
```

```
1184         bn,pn   %icc,.exit

1186         fmuld   %f54,%f16,%f46          ! (5_1) dtmp1 = dd * dres;
1187         nop
1188         ld      [%fp+ftmp0],%o2         ! (6_1) iarr = ((int*)&dres)[0];
1189         fand    %f18,DA1,%f2            ! (6_1) dexp0 = vis_fand(dres,DA1);

1191         fmuld   %f10,%f62,%f10          ! (0_0) x0 *= scl0;
1192         nop
1193         ldd     [%fp+dtmp4],%f50        ! (1_1) *(long long*)&scl0 = ll;
1194         fsubd   %f60,%f38,%f20          ! (3_1) dtmp0 -= dtmp1;

1196         fmuld   %f12,%f62,%f60          ! (0_0) y0 *= scl0;
1197         sra     %o2,11,%g1              ! (6_1) iarr >>= 11;
1198         nop
1199         faddd   %f0,%f26,%f38           ! (7_1) res0_lo += dtmp1;

1201         nop
1202         and     %g1,0x1fc,%g1           ! (6_1) iarr &= 0x1fc;
1203         bn,pn   %icc,.exit
1204         fmuld   %f14,%f24,%f26          ! (4_1) dres = dd * dtmp2;

1206         fsqrtd  %f52,%f24               ! (2_1) res0 = sqrt ( res0 );
1207         lda     [%i1]0x82,%o1           ! (2_0) hx0 = *(int*)px;
1208         add     %g1,TBL,%g1             ! (6_1) (char*)dll1 + iarr
1209         fsubd   DTWO,%f46,%f62          ! (5_1) dtmp1 = DTWO - dtmp1;

1211         fmuld   %f20,%f28,%f52          ! (3_1) dtmp0 *= dres;
1212         mov     %i1,%i2
1213         ld      [%g1],%f28              ! (6_1) dtmp0 = ((double*)((char*)dll1 +
1214         faddd   %f10,D2ON36,%f46        ! (0_0) x_hi0 = x0 + D2ON36;

1216         nop
1217         mov     %i0,%o0
1218         lda     [%i0]0x82,%g1           ! (2_0) hy0 = *(int*)py;
1219         faddd   %f60,D2ON36,%f12        ! (0_0) y_hi0 = y0 + D2ON36;

1221         faddd   %f44,%f38,%f14          ! (7_1) dres = res0_hi + res0_lo;
1222         and     %o1,_0x7fffffff,%o7     ! (2_0) hx0 &= 0x7fffffff;
1223         st      %f14,[%fp+ftmp0]        ! (7_1) iarr = ((int*)&dres)[0];
1224         fmuld   %f50,%f22,%f0           ! (1_1) res0 = scl0 * res0;

1226         fmuld   %f54,%f62,%f22          ! (5_1) dd *= dtmp1;
1227         cmp     %o7,_0x7ff00000         ! (2_0) hx0 ? 0x7ff00000
1228         st      %f0,[%i5]               ! (1_1) ((float*)pz)[0] = ((float*)&res0
1229         fpsub32 %f28,%f2,%f28           ! (6_1) dd = vis_fpsub32(dtmp0, dexp0);

1231         and     %g1,_0x7fffffff,%l7     ! (2_0) hx0 &= 0x7fffffff;
1232         nop
1233         bge,pn  %icc,.update37          ! (2_0) if ( hx0 >= 0x7ff00000 )
1234         fsubd   %f46,D2ON36,%f20        ! (0_0) x_hi0 -= D2ON36;

1236         sub     %l7,%o7,%o1             ! (2_0) diff0 = hy0 - hx0;
1237         cmp     %l7,_0x7ff00000         ! (2_0) hy0 ? 0x7ff00000
1238         st      %f1,[%i5+4]             ! (1_1) ((float*)pz)[1] = ((float*)&res0
1239         fsubd   %f12,D2ON36,%f54        ! (0_0) y_hi0 -= D2ON36;

1241         fmuld   %f28,%f18,%f50          ! (6_1) dtmp0 = dd * dres;
1242         sra     %o1,31,%o3              ! (2_0) j0 = diff0 >> 31;
1243         bge,pn  %icc,.update38          ! (2_0) if ( hy0 >= 0x7ff00000 )
1244         faddd   %f48,%f52,%f52          ! (3_1) res0 += dtmp0;

1246         and     %o1,%o3,%o1             ! (2_0) j0 &= diff0;
1247         add     %i5,stridez,%i5         ! pz += stridez
1248         stx     %o4,[%fp+dtmp4]         ! (1_0) *(long long*)&scl0 = ll;
1249         fand    %f26,DA0,%f48           ! (4_1) res0 = vis_fand(dres,DA0);
```



```
1251         fmuld   %f20,%f20,%f2           ! (0_0) res0_hi = x_hi0 * x_hi0;
1252         cmp     %o7,_0x00100000         ! (2_0) hx0 ? 0x00100000
1253         sub     %l7,%o1,%o4             ! (2_0) j0 = hy0 - j0;
1254         fsubd   %f10,%f20,%f0           ! (0_0) x_lo0 = x0 - x_hi0;

1256         fmuld   %f54,%f54,%f46          ! (0_0) dtmp0 = y_hi0 * y_hi0;
1257         and     %o4,%l0,%o4             ! (2_0) j0 &= 0x7ff00000;
1258         bl,pn   %icc,.update39          ! (2_0) if ( hx0 < 0x00100000 )
1259         faddd   %f10,%f20,%f62          ! (0_0) res0_lo = x0 + x_hi0;
1260 .cont39a:
1261         fmuld   %f32,%f48,%f10          ! (4_1) dtmp0 = res0_hi * res0;
1262         sub     %l0,%o4,%g1             ! (2_0) j0 = 0x7ff00000 - j0;
1263         nop
1264         fsubd   DTWO,%f50,%f20          ! (6_1) dtmp0 = DTWO - dtmp0;
1265 .cont39b:
1266         fmuld   %f22,%f16,%f16          ! (5_1) dtmp2 = dd * dres;
1267         sllx    %g1,32,%g1              ! (2_0) ll = (long long)j0 << 32;
1268         stx     %g1,[%fp+dtmp5]         ! (2_0) *(long long*)&scl0 = ll;
1269         faddd   %f60,%f54,%f50          ! (0_0) dtmp1 = y0 + y_hi0;

1271         fmuld   %f36,%f48,%f36          ! (4_1) dtmp1 = res0_lo * res0;
1272         nop
1273         nop
1274         fsubd   %f60,%f54,%f12          ! (0_0) y_lo0 = y0 - y_hi0;
1275 .cont40:
1276         fmuld   %f62,%f0,%f0            ! (0_0) res0_lo *= x_lo0;
1277         nop
1278         ldd     [%fp+dtmp3],%f62        ! (1_0) *(long long*)&scl0 = ll;
1279         faddd   %f2,%f46,%f32           ! (0_0) res0_hi += dtmp0;

1281         fsubd   DONE,%f10,%f60          ! (4_1) dtmp0 = DONE - dtmp0;
1282         nop
1283         lda     [%i4]%asi,%f10          ! (1_0) ((float*)&x0)[0] = ((float*)px)[
1284         fmuld   %f28,%f20,%f54          ! (6_1) dd *= dtmp0;

1286         nop
1287         nop
1288         lda     [%i4+4]%asi,%f11        ! (1_0) ((float*)&x0)[1] = ((float*)px)[
1289         bn,pn   %icc,.exit

1291         fmuld   %f50,%f12,%f28          ! (0_0) dtmp1 *= y_lo0;
1292         nop
1293         lda     [%i3]%asi,%f12          ! (1_0) ((float*)&y0)[0] = ((float*)py)[
1294         fsubd   DTWO,%f16,%f16          ! (5_1) dtmp2 = DTWO - dtmp2;

1296         add     %i1,stridex,%i4         ! px += stridex
1297         nop
1298         lda     [%i3+4]%asi,%f13        ! (1_0) ((float*)&y0)[1] = ((float*)py)[
1299         bn,pn   %icc,.exit

1301         fmuld   %f54,%f18,%f46          ! (6_1) dtmp1 = dd * dres;
1302         add     %i4,stridex,%i1         ! px += stridex
1303         ld      [%fp+ftmp0],%o2         ! (7_1) iarr = ((int*)&dres)[0];
1304         fand    %f14,DA1,%f2            ! (7_1) dexp0 = vis_fand(dres,DA1);

1306         fmuld   %f10,%f62,%f10          ! (1_0) x0 *= scl0;
1307         nop
1308         ldd     [%fp+dtmp6],%f50        ! (2_1) *(long long*)&scl0 = ll;
1309         fsubd   %f60,%f36,%f20          ! (4_1) dtmp0 -= dtmp1;

1311         fmuld   %f12,%f62,%f60          ! (1_0) y0 *= scl0;
1312         sra     %o2,11,%i3              ! (7_1) iarr >>= 11;
1313         nop
1314         faddd   %f0,%f28,%f36           ! (0_0) res0_lo += dtmp1;
```

```
1316         and     %i3,0x1fc,%i3           ! (7_1) iarr &= 0x1fc;
1317         nop
1318         bn,pn   %icc,.exit
1319         fmuld   %f22,%f16,%f28          ! (5_1) dres = dd * dtmp2;

1321         fsqrtd  %f52,%f16               ! (3_1) res0 = sqrt ( res0 );
1322         add     %i3,TBL,%o4             ! (7_1) (char*)dll1 + iarr
1323         lda     [%i4]0x82,%o1           ! (3_0) hx0 = *(int*)px;
1324         fsubd   DTWO,%f46,%f62          ! (6_1) dtmp1 = DTWO - dtmp1;

1326         fmuld   %f20,%f26,%f52          ! (4_1) dtmp0 *= dres;
1327         add     %i0,stridey,%i3         ! py += stridey
1328         ld      [%o4],%f26              ! (7_1) dtmp0 = ((double*)((char*)dll1 +
1329         faddd   %f10,D2ON36,%f46        ! (1_0) x_hi0 = x0 + D2ON36;

1331         nop
1332         add     %i3,stridey,%i0         ! py += stridey
1333         lda     [%i3]0x82,%o4           ! (3_0) hy0 = *(int*)py;
1334         faddd   %f60,D2ON36,%f12        ! (1_0) y_hi0 = y0 + D2ON36;

1336         faddd   %f32,%f36,%f22          ! (0_0) dres = res0_hi + res0_lo;
1337         and     %o1,_0x7fffffff,%o7     ! (3_0) hx0 &= 0x7fffffff;
1338         st      %f22,[%fp+ftmp0]        ! (0_0) iarr = ((int*)&dres)[0];
1339         fmuld   %f50,%f24,%f0           ! (2_1) res0 = scl0 * res0;

1341         fmuld   %f54,%f62,%f24          ! (6_1) dd *= dtmp1;
1342         cmp     %o7,_0x7ff00000         ! (3_0) hx0 ? 0x7ff00000
1343         st      %f0,[%i5]               ! (2_1) ((float*)pz)[0] = ((float*)&res0
1344         fpsub32 %f26,%f2,%f26           ! (7_1) dd = vis_fpsub32(dtmp0, dexp0);

1346         and     %o4,_0x7fffffff,%l7     ! (3_0) hy0 &= 0x7fffffff;
1347         nop
1348         bge,pn  %icc,.update41          ! (3_0) if ( hx0 >= 0x7ff00000 )
1349         fsubd   %f46,D2ON36,%f20        ! (1_0) x_hi0 -= D2ON36;

1351         sub     %l7,%o7,%o1             ! (3_0) diff0 = hy0 - hx0;
1352         cmp     %l7,_0x7ff00000         ! (3_0) hy0 ? 0x7ff00000
1353         st      %f1,[%i5+4]             ! (2_1) ((float*)pz)[1] = ((float*)&res0
1354         fsubd   %f12,D2ON36,%f54        ! (1_0) y_hi0 -= D2ON36;

1356         fmuld   %f26,%f14,%f50          ! (7_1) dtmp0 = dd * dres;
1357         sra     %o1,31,%o3              ! (3_0) j0 = diff0 >> 31;
1358         bge,pn  %icc,.update42          ! (3_0) if ( hy0 >= 0x7ff00000 )
1359         faddd   %f48,%f52,%f52          ! (4_1) res0 += dtmp0;

1361         and     %o1,%o3,%o1             ! (3_0) j0 &= diff0;
1362         add     %i5,stridez,%i5         ! pz += stridez
1363         stx     %g1,[%fp+dtmp6]         ! (2_0) *(long long*)&scl0 = ll;
1364         fand    %f28,DA0,%f48           ! (5_1) res0 = vis_fand(dres,DA0);

1366         fmuld   %f20,%f20,%f2           ! (1_0) res0_hi = x_hi0 * x_hi0;
1367         cmp     %o7,_0x00100000         ! (3_0) hx0 ? 0x00100000
1368         sub     %l7,%o1,%o4             ! (3_0) j0 = hy0 - j0;
1369         fsubd   %f10,%f20,%f0           ! (1_0) x_lo0 = x0 - x_hi0;

1371         fmuld   %f54,%f54,%f46          ! (1_0) dtmp0 = y_hi0 * y_hi0;
1372         and     %o4,%l0,%o4             ! (3_0) j0 &= 0x7ff00000;
1373         bl,pn   %icc,.update43          ! (3_0) if ( hx0 < 0x00100000 )
1374         faddd   %f10,%f20,%f62          ! (1_0) res0_lo = x0 + x_hi0;
1375 .cont43a:
1376         fmuld   %f42,%f48,%f10          ! (5_1) dtmp0 = res0_hi * res0;
1377         nop
1378         sub     %l0,%o4,%g1             ! (3_0) j0 = 0x7ff00000 - j0;
1379         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp0 = DTWO - dtmp0;
1380 .cont43b:
1381         fmuld   %f24,%f18,%f18          ! (6_1) dtmp2 = dd * dres;
```



```
1382         sllx    %g1,32,%g1              ! (3_0) ll = (long long)j0 << 32;
1383         stx     %g1,[%fp+dtmp7]         ! (3_0) *(long long*)&scl0 = ll;
1384         faddd   %f60,%f54,%f50          ! (1_0) dtmp1 = y0 + y_hi0;

1386         fmuld   %f34,%f48,%f34          ! (5_1) dtmp1 = res0_lo * res0;
1387         nop
1388         nop
1389         fsubd   %f60,%f54,%f12          ! (1_0) y_lo0 = y0 - y_hi0
1390 .cont44:
1391         fmuld   %f62,%f0,%f0            ! (1_0) res0_lo *= x_lo0;
1392         nop
1393         ldd     [%fp+dtmp5],%f62        ! (2_0) *(long long*)&scl0 = ll;
1394         faddd   %f2,%f46,%f42           ! (1_0) res0_hi += dtmp0;

1396         fsubd   DONE,%f10,%f60          ! (5_1) dtmp0 = DONE - dtmp0;
1397         nop
1398         lda     [%i2]%asi,%f10          ! (2_0) ((float*)&x0)[0] = ((float*)px)[
1399         fmuld   %f26,%f20,%f54          ! (7_1) dd *= dtmp0;

1401         nop
1402         nop
1403         lda     [%i2+4]%asi,%f11        ! (2_0) ((float*)&x0)[1] = ((float*)px)[
1404         bn,pn   %icc,.exit

1406         fmuld   %f50,%f12,%f26          ! (1_0) dtmp1 *= y_lo0;
1407         nop
1408         lda     [%o0]%asi,%f12          ! (2_0) ((float*)&y0)[0] = ((float*)py)[
1409         fsubd   DTWO,%f18,%f20          ! (6_1) dtmp2 = DTWO - dtmp2;

1411         nop
1412         nop
1413         lda     [%o0+4]%asi,%f13        ! (2_0) ((float*)&y0)[1] = ((float*)py)[
1414         bn,pn   %icc,.exit

1416         fmuld   %f54,%f14,%f50          ! (7_1) dtmp1 = dd * dres;
1417         nop
1418         ld      [%fp+ftmp0],%o2         ! (0_0) iarr = ((int*)&dres)[0];
1419         fand    %f22,DA1,%f2            ! (0_0) dexp0 = vis_fand(dres,DA1);

1421         fmuld   %f10,%f62,%f10          ! (2_0) x0 *= scl0;
1422         nop
1423         ldd     [%fp+dtmp8],%f18        ! (3_1) *(long long*)&scl0 = ll;
1424         fsubd   %f60,%f34,%f46          ! (5_1) dtmp0 -= dtmp1;

1426         fmuld   %f12,%f62,%f60          ! (2_0) y0 *= scl0;
1427         sra     %o2,11,%o4              ! (0_0) iarr >>= 11;
1428         nop
1429         faddd   %f0,%f26,%f34           ! (1_0) res0_lo += dtmp1;

1431         and     %o4,0x1fc,%o4           ! (0_0) iarr &= 0x1fc;
1432         nop
1433         bn,pn   %icc,.exit
1434         fmuld   %f24,%f20,%f26          ! (6_1) dres = dd * dtmp2;

1436         fsqrtd  %f52,%f24               ! (4_1) res0 = sqrt ( res0 );
1437         add     %o4,TBL,%o4             ! (0_0) (char*)dll1 + iarr
1438         lda     [%i1]0x82,%o1           ! (4_0) hx0 = *(int*)px;
1439         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp1 = DTWO - dtmp1;

1441         fmuld   %f46,%f28,%f52          ! (5_1) dtmp0 -= dtmp1;
1442         mov     %i1,%i2
1443         ld      [%o4],%f28              ! (0_0) dtmp0 = ((double*)((char*)dll1 +
1444         faddd   %f10,D2ON36,%f46        ! (2_0) x_hi0 = x0 + D2ON36;

1446         nop
1447         mov     %i0,%o0
```

```
1448         lda     [%i0]0x82,%o4           ! (4_0) hy0 = *(int*)py;
1449         faddd   %f60,D2ON36,%f50        ! (2_0) y_hi0 = y0 + D2ON36;

1451         fmuld   %f18,%f16,%f0           ! (3_1) res0 = scl0 * res0;
1452         nop
1453         and     %o1,_0x7fffffff,%o7     ! (4_0) hx0 &= 0x7fffffff;
1454         faddd   %f42,%f34,%f18          ! (1_0) dres = res0_hi + res0_lo;

1456         fmuld   %f54,%f20,%f16          ! (7_1) dd *= dtmp1;
1457         cmp     %o7,_0x7ff00000         ! (4_0) hx0 ? 0x7ff00000
1458         st      %f18,[%fp+ftmp0]        ! (1_0) iarr = ((int*)&dres)[0];
1459         fpsub32 %f28,%f2,%f28           ! (0_0) dd = vis_fpsub32(dtmp0, dexp0);

1461         and     %o4,_0x7fffffff,%l7     ! (4_0) hy0 &= 0x7fffffff;
1462         st      %f0,[%i5]               ! (3_1) ((float*)pz)[0] = ((float*)&res0
1463         bge,pn  %icc,.update45          ! (4_0) if ( hx0 >= 0x7ff00000 )
1464         fsubd   %f46,D2ON36,%f20        ! (2_0) x_hi0 -= D2ON36;

1466         sub     %l7,%o7,%o1             ! (4_0) diff0 = hy0 - hx0;
1467         cmp     %l7,_0x7ff00000         ! (4_0) hy0 ? 0x7ff00000
1468         bge,pn  %icc,.update46          ! (4_0) if ( hy0 >= 0x7ff00000 )
1469         fsubd   %f50,D2ON36,%f54        ! (2_0) y_hi0 -= D2ON36;

1471         fmuld   %f28,%f22,%f50          ! (0_0) dtmp0 = dd * dres;
1472         sra     %o1,31,%o3              ! (4_0) j0 = diff0 >> 31;
1473         st      %f1,[%i5+4]             ! (3_1) ((float*)pz)[1] = ((float*)&res0
1474         faddd   %f48,%f52,%f52          ! (5_1) res0 += dtmp0;

1476         and     %o1,%o3,%o1             ! (4_0) j0 &= diff0;
1477         cmp     %o7,_0x00100000         ! (4_0) hx0 ? 0x00100000
1478         bl,pn   %icc,.update47          ! (4_0) if ( hx0 < 0x00100000 )
1479         fand    %f26,DA0,%f48           ! (6_1) res0 = vis_fand(dres,DA0);
1480 .cont47a:
1481         fmuld   %f20,%f20,%f2           ! (2_0) res0_hi = x_hi0 * x_hi0;
1482         sub     %l7,%o1,%o4             ! (4_0) j0 = hy0 - j0;
1483         stx     %g1,[%fp+dtmp8]         ! (3_0) *(long long*)&scl0 = ll;
1484         fsubd   %f10,%f20,%f0           ! (2_0) x_lo0 = x0 - x_hi0;

1486         fmuld   %f54,%f54,%f46          ! (2_0) dtmp0 = y_hi0 * y_hi0;
1487         and     %o4,%l0,%o4             ! (4_0) j0 &= 0x7ff00000;
1488         add     %i5,stridez,%i5         ! pz += stridez
1489         faddd   %f10,%f20,%f62          ! (2_0) res0_lo = x0 + x_hi0;

1491         fmuld   %f30,%f48,%f10          ! (6_1) dtmp0 = res0_hi * res0;
1492         nop
1493         sub     %l0,%o4,%g1             ! (4_0) j0 = 0x7ff00000 - j0;
1494         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp0 = DTWO - dtmp0;
1495 .cont47b:
1496         fmuld   %f16,%f14,%f14          ! (7_1) dtmp2 = dd * dres;
1497         sllx    %g1,32,%g1              ! (4_0) ll = (long long)j0 << 32;
1498         stx     %g1,[%fp+dtmp9]         ! (4_0) *(long long*)&scl0 = ll;
1499         faddd   %f60,%f54,%f50          ! (2_0) dtmp1 = y0 + y_hi0;

1501         fmuld   %f40,%f48,%f40          ! (6_1) dtmp1 = res0_lo * res0;
1502         nop
1503         nop
1504         fsubd   %f60,%f54,%f12          ! (2_0) y_lo0 = y0 - y_hi0;
1505 .cont48:
1506         fmuld   %f62,%f0,%f0            ! (2_0) res0_lo *= x_lo0;
1507         nop
1508         ldd     [%fp+dtmp7],%f62        ! (3_0) *(long long*)&scl0 = ll;
1509         faddd   %f2,%f46,%f30           ! (2_0) res0_hi += dtmp0;

1511         fsubd   DONE,%f10,%f60          ! (6_1) dtmp0 = DONE - dtmp0;
1512         nop
1513         lda     [%i4]%asi,%f10          ! (3_0) ((float*)&x0)[0] = ((float*)px)[
```



```
1514         fmuld   %f28,%f20,%f54          ! (0_0) dd *= dtmp0;

1516         nop
1517         nop
1518         lda     [%i4+4]%asi,%f11        ! (3_0) ((float*)&x0)[1] = ((float*)px)[
1519         bn,pn   %icc,.exit

1521         fmuld   %f50,%f12,%f28          ! (2_0) dtmp1 *= y_lo0;
1522         nop
1523         lda     [%i3]%asi,%f12          ! (3_0) ((float*)&y0)[0] = ((float*)py)[
1524         fsubd   DTWO,%f14,%f20          ! (7_1) dtmp2 = DTWO - dtmp2;

1526         lda     [%i3+4]%asi,%f13        ! (3_0) ((float*)&y0)[1] = ((float*)py)[
1527         add     %i1,stridex,%i4         ! px += stridex
1528         nop
1529         bn,pn   %icc,.exit

1531         fmuld   %f54,%f22,%f50          ! (0_0) dtmp1 = dd * dres;
1532         add     %i4,stridex,%i1         ! px += stridex
1533         ld      [%fp+ftmp0],%o2         ! (1_0) iarr = ((int*)&dres)[0];
1534         fand    %f18,DA1,%f2            ! (1_0) dexp0 = vis_fand(dres,DA1);

1536         fmuld   %f10,%f62,%f10          ! (3_0) x0 *= scl0;
1537         nop
1538         ldd     [%fp+dtmp10],%f14       ! (4_1) *(long long*)&scl0 = ll;
1539         fsubd   %f60,%f40,%f46          ! (6_1) dtmp0 -= dtmp1;

1541         fmuld   %f12,%f62,%f60          ! (3_0) y0 *= scl0;
1542         sra     %o2,11,%i3              ! (1_0) iarr >>= 11;
1543         nop
1544         faddd   %f0,%f28,%f40           ! (2_0) res0_lo += dtmp1;

1546         and     %i3,0x1fc,%i3           ! (1_0) iarr &= 0x1fc;
1547         nop
1548         bn,pn   %icc,.exit
1549         fmuld   %f16,%f20,%f28          ! (7_1) dres = dd * dtmp2;

1551         fsqrtd  %f52,%f16               ! (5_1) res0 = sqrt ( res0 );
1552         add     %i3,TBL,%o4             ! (1_0) (char*)dll1 + iarr
1553         lda     [%i4]0x82,%o1           ! (5_0) hx0 = *(int*)px;
1554         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp1 = DTWO - dtmp1;

1556         fmuld   %f46,%f26,%f52          ! (6_1) dtmp0 *= dres;
1557         add     %i0,stridey,%i3         ! py += stridey
1558         ld      [%o4],%f26              ! (1_0) dtmp0 = ((double*)((char*)dll1 +
1559         faddd   %f10,D2ON36,%f46        ! (3_0) x_hi0 = x0 + D2ON36;

1561         nop
1562         add     %i3,stridey,%i0         ! py += stridey
1563         lda     [%i3]0x82,%o4           ! (5_0) hy0 = *(int*)py;
1564         faddd   %f60,D2ON36,%f50        ! (3_0) y_hi0 = y0 + D2ON36;

1566         fmuld   %f14,%f24,%f0           ! (4_1) res0 = scl0 * res0;
1567         and     %o1,_0x7fffffff,%o7     ! (5_0) hx0 &= 0x7fffffff;
1568         nop
1569         faddd   %f30,%f40,%f14          ! (2_0) dres = res0_hi + res0_lo;

1571         fmuld   %f54,%f20,%f24          ! (0_0) dd *= dtmp1;
1572         cmp     %o7,_0x7ff00000         ! (5_0) hx0 ? 0x7ff00000
1573         st      %f14,[%fp+ftmp0]        ! (2_0) iarr = ((int*)&dres)[0];
1574         fpsub32 %f26,%f2,%f26           ! (1_0) dd = vis_fpsub32(dtmp0, dexp0);

1576         and     %o4,_0x7fffffff,%l7     ! (5_0) hy0 &= 0x7fffffff;
1577         st      %f0,[%i5]               ! (4_1) ((float*)pz)[0] = ((float*)&res0
1578         bge,pn  %icc,.update49          ! (5_0) if ( hx0 >= 0x7ff00000 )
1579         fsubd   %f46,D2ON36,%f20        ! (3_0) x_hi0 -= D2ON36;
```

```
1581         sub     %l7,%o7,%o1             ! (5_0) diff0 = hy0 - hx0;
1582         cmp     %l7,_0x7ff00000         ! (5_0) hy0 ? 0x7ff00000
1583         bge,pn  %icc,.update50          ! (5_0) if ( hy0 >= 0x7ff00000 )
1584         fsubd   %f50,D2ON36,%f54        ! (3_0) y_hi0 -= D2ON36;

1586         fmuld   %f26,%f18,%f50          ! (1_0) dtmp0 = dd * dres;
1587         sra     %o1,31,%o3              ! (5_0) j0 = diff0 >> 31;
1588         st      %f1,[%i5+4]             ! (4_1) ((float*)pz)[1] = ((float*)&res0
1589         faddd   %f48,%f52,%f52          ! (6_1) res0 += dtmp0;

1591         and     %o1,%o3,%o1             ! (5_0) j0 &= diff0;
1592         cmp     %o7,_0x00100000         ! (5_0) hx0 ? 0x00100000
1593         bl,pn   %icc,.update51          ! (5_0) if ( hx0 < 0x00100000 )
1594         fand    %f28,DA0,%f48           ! (7_1) res0 = vis_fand(dres,DA0);
1595 .cont51a:
1596         fmuld   %f20,%f20,%f2           ! (3_0) res0_hi = x_hi0 * x_hi0;
1597         sub     %l7,%o1,%o4             ! (5_0) j0 = hy0 - j0;
1598         stx     %g1,[%fp+dtmp10]        ! (4_0) *(long long*)&scl0 = ll;
1599         fsubd   %f10,%f20,%f0           ! (3_0) x_lo0 = x0 - x_hi0;

1601         fmuld   %f54,%f54,%f46          ! (3_0) dtmp0 = y_hi0 * y_hi0;
1602         and     %o4,%l0,%o4             ! (5_0) j0 &= 0x7ff00000;
1603         add     %i5,stridez,%i5         ! pz += stridez
1604         faddd   %f10,%f20,%f62          ! (3_0) res0_lo = x0 + x_hi0;

1606         fmuld   %f44,%f48,%f10          ! (7_1) dtmp0 = res0_hi * res0;
1607         sub     %l0,%o4,%g1             ! (5_0) j0 = 0x7ff00000 - j0;
1608         nop
1609         fsubd   DTWO,%f50,%f20          ! (1_0) dtmp0 = DTWO - dtmp0;
1610 .cont51b:
1611         fmuld   %f24,%f22,%f22          ! (0_0) dtmp2 = dd * dres;
1612         sllx    %g1,32,%g1              ! (5_0) ll = (long long)j0 << 32;
1613         stx     %g1,[%fp+dtmp11]        ! (5_0) *(long long*)&scl0 = ll;
1614         faddd   %f60,%f54,%f50          ! (3_0) dtmp1 = y0 + y_hi0;

1616         fmuld   %f38,%f48,%f38          ! (7_1) dtmp1 = res0_lo * res0;
1617         nop
1618         nop
1619         fsubd   %f60,%f54,%f12          ! (3_0) y_lo0 = y0 - y_hi0;
1620 .cont52:
1621         fmuld   %f62,%f0,%f0            ! (3_0) res0_lo *= x_lo0;
1622         nop
1623         ldd     [%fp+dtmp9],%f62        ! (4_0) *(long long*)&scl0 = ll;
1624         faddd   %f2,%f46,%f44           ! (3_0) res0_hi += dtmp0;

1626         fsubd   DONE,%f10,%f60          ! (7_1) dtmp0 = DONE - dtmp0;
1627         nop
1628         lda     [%i2]%asi,%f10          ! (4_0) ((float*)&x0)[0] = ((float*)px)[
1629         fmuld   %f26,%f20,%f54          ! (1_0) dd *= dtmp0;

1631         nop
1632         nop
1633         lda     [%i2+4]%asi,%f11        ! (4_0) ((float*)&x0)[1] = ((float*)px)[
1634         bn,pn   %icc,.exit

1636         fmuld   %f50,%f12,%f26          ! (3_0) dtmp1 *= y_lo0;
1637         nop
1638         lda     [%o0]%asi,%f12          ! (4_0) ((float*)&y0)[0] = ((float*)py)[
1639         fsubd   DTWO,%f22,%f20          ! (0_0) dtmp2 = DTWO - dtmp2;

1641         nop
1642         nop
1643         lda     [%o0+4]%asi,%f13        ! (4_0) ((float*)&y0)[1] = ((float*)py)[
1644         bn,pn   %icc,.exit
```



```
1646         fmuld   %f54,%f18,%f50          ! (1_0) dtmp1 = dd * dres;
1647         nop
1648         ld      [%fp+ftmp0],%o2         ! (2_0) iarr = ((int*)&dres)[0];
1649         fand    %f14,DA1,%f2            ! (2_0) dexp0 = vis_fand(dres,DA1);

1651         fmuld   %f10,%f62,%f10          ! (4_0) x0 *= scl0;
1652         nop
1653         ldd     [%fp+dtmp12],%f22       ! (5_1) *(long long*)&scl0 = ll;
1654         fsubd   %f60,%f38,%f46          ! (7_1) dtmp0 -= dtmp1;

1656         fmuld   %f12,%f62,%f60          ! (4_0) y0 *= scl0;
1657         sra     %o2,11,%o4              ! (2_0) iarr >>= 11;
1658         nop
1659         faddd   %f0,%f26,%f38           ! (3_0) res0_lo += dtmp1;

1661         and     %o4,0x1fc,%o4           ! (2_0) iarr &= 0x1fc;
1662         nop
1663         bn,pn   %icc,.exit
1664         fmuld   %f24,%f20,%f26          ! (0_0) dres = dd * dtmp2;

1666         fsqrtd  %f52,%f24               ! (6_1) res0 = sqrt ( res0 );
1667         add     %o4,TBL,%o4             ! (2_0) (char*)dll1 + iarr
1668         lda     [%i1]0x82,%o1           ! (6_0) hx0 = *(int*)px;
1669         fsubd   DTWO,%f50,%f52          ! (1_0) dtmp1 = DTWO - dtmp1;

1671         fmuld   %f46,%f28,%f28          ! (7_1) dtmp0 *= dres;
1672         mov     %i1,%i2
1673         ld      [%o4],%f20              ! (2_0) dtmp0 = ((double*)((char*)dll1 +
1674         faddd   %f10,D2ON36,%f46        ! (4_0) x_hi0 = x0 + D2ON36;

1676         nop
1677         mov     %i0,%o0
1678         lda     [%i0]0x82,%o4           ! (6_0) hy0 = *(int*)py;
1679         faddd   %f60,D2ON36,%f50        ! (4_0) y_hi0 = y0 + D2ON36;

1681         fmuld   %f22,%f16,%f0           ! (5_1) res0 = scl0 * res0;
1682         and     %o1,_0x7fffffff,%o7     ! (6_0) hx0 &= 0x7fffffff;
1683         nop
1684         faddd   %f44,%f38,%f22          ! (3_0) dres = res0_hi + res0_lo;

1686         fmuld   %f54,%f52,%f16          ! (1_0) dd *= dtmp1;
1687         cmp     %o7,_0x7ff00000         ! (6_0) hx0 ? 0x7ff00000
1688         st      %f22,[%fp+ftmp0]        ! (3_0) iarr = ((int*)&dres)[0];
1689         fpsub32 %f20,%f2,%f52           ! (2_0) dd = vis_fpsub32(dtmp0, dexp0);

1691         and     %o4,_0x7fffffff,%l7     ! (6_0) hy0 &= 0x7fffffff;
1692         st      %f0,[%i5]               ! (5_1) ((float*)pz)[0] = ((float*)&res0
1693         bge,pn  %icc,.update53          ! (6_0) if ( hx0 >= 0x7ff00000 )
1694         fsubd   %f46,D2ON36,%f46        ! (4_0) x_hi0 -= D2ON36;

1696         sub     %l7,%o7,%o1             ! (6_0) diff0 = hy0 - hx0;
1697         cmp     %l7,_0x7ff00000         ! (6_0) hy0 ? 0x7ff00000
1698         bge,pn  %icc,.update54          ! (6_0) if ( hy0 >= 0x7ff00000 )
1699         fsubd   %f50,D2ON36,%f54        ! (4_0) y_hi0 -= D2ON36;

1701         fmuld   %f52,%f14,%f50          ! (2_0) dtmp0 = dd * dres;
1702         sra     %o1,31,%o3              ! (6_0) j0 = diff0 >> 31;
1703         st      %f1,[%i5+4]             ! (5_1) ((float*)pz)[1] = ((float*)&res0
1704         faddd   %f48,%f28,%f48          ! (7_1) res0 += dtmp0;

1706         and     %o1,%o3,%o1             ! (6_0) j0 &= diff0;
1707         cmp     %o7,_0x00100000         ! (6_0) hx0 ? 0x00100000
1708         bl,pn   %icc,.update55          ! (6_0) if ( hx0 < 0x00100000 )
1709         fand    %f26,DA0,%f28           ! (0_0) res0 = vis_fand(dres,DA0);
1710 .cont55a:
1711         fmuld   %f46,%f46,%f0           ! (4_0) res0_hi = x_hi0 * x_hi0;
```

```
1712         sub     %l7,%o1,%o4             ! (6_0) j0 = hy0 - j0;
1713         stx     %g1,[%fp+dtmp12]        ! (5_0) *(long long*)&scl0 = ll;
1714         fsubd   %f10,%f46,%f2           ! (4_0) x_lo0 = x0 - x_hi0;

1716         fmuld   %f54,%f54,%f20          ! (4_0) dtmp0 = y_hi0 * y_hi0;
1717         and     %o4,%l0,%o4             ! (6_0) j0 &= 0x7ff00000;
1718         add     %i5,stridez,%i5         ! pz += stridez
1719         faddd   %f10,%f46,%f62          ! (4_0) res0_lo = x0 + x_hi0;

1721         fmuld   %f16,%f18,%f18          ! (1_0) dtmp2 = dd * dres;
1722         sub     %l0,%o4,%g1             ! (6_0) j0 = 0x7ff00000 - j0;
1723         nop
1724         fsubd   DTWO,%f50,%f10          ! (2_0) dtmp0 = DTWO - dtmp0;
1725 .cont55b:
1726         fmuld   %f32,%f28,%f50          ! (0_0) dtmp0 = res0_hi * res0;
1727         sllx    %g1,32,%g1              ! (6_0) ll = (long long)j0 << 32;
1728         stx     %g1,[%fp+dtmp13]        ! (6_0) *(long long*)&scl0 = ll;
1729         faddd   %f60,%f54,%f46          ! (4_0) dtmp1 = y0 + y_hi0;

1731         fmuld   %f36,%f28,%f36          ! (0_0) dtmp1 = res0_lo * res0;
1732         nop
1733         nop
1734         fsubd   %f60,%f54,%f60          ! (4_0) y_lo0 = y0 - y_hi0;
1735 .cont56:
1736         fmuld   %f62,%f2,%f2            ! (4_0) res0_lo *= x_lo0;
1737         nop
1738         ldd     [%fp+dtmp11],%f62       ! (5_0) *(long long*)&scl0 = ll;
1739         faddd   %f0,%f20,%f32           ! (4_0) res0_hi += dtmp0;

1741         lda     [%i4]%asi,%f0           ! (5_0) ((float*)&x0)[0] = ((float*)px)[
1742         nop
1743         nop
1744         fmuld   %f52,%f10,%f10          ! (2_0) dd *= dtmp0;

1746         lda     [%i4+4]%asi,%f1         ! (5_0) ((float*)&x0)[1] = ((float*)px)[
1747         nop
1748         nop
1749         fsubd   DONE,%f50,%f52          ! (0_0) dtmp0 = DONE - dtmp0;

1751         fmuld   %f46,%f60,%f46          ! (4_0) dtmp1 *= y_lo0;
1752         nop
1753         lda     [%i3]%asi,%f12          ! (5_0) ((float*)&y0)[0] = ((float*)py)[
1754         fsubd   DTWO,%f18,%f18          ! (1_0) dtmp2 = DTWO - dtmp2;

1756         nop
1757         add     %i1,stridex,%i4         ! px += stridex
1758         lda     [%i3+4]%asi,%f13        ! (5_0) ((float*)&y0)[1] = ((float*)py)[
1759         bn,pn   %icc,.exit

1761         fmuld   %f10,%f14,%f50          ! (2_0) dtmp1 = dd * dres;
1762         add     %i4,stridex,%i1         ! px += stridex
1763         ld      [%fp+ftmp0],%o2         ! (3_0) iarr = ((int*)&dres)[0];
1764         fand    %f22,DA1,%f54           ! (3_0) dexp0 = vis_fand(dres,DA1);

1766         fmuld   %f0,%f62,%f60           ! (5_0) x0 *= scl0;
1767         nop
1768         ldd     [%fp+dtmp14],%f0        ! (6_1) *(long long*)&scl0 = ll;
1769         fsubd   %f52,%f36,%f20          ! (0_0) dtmp0 -= dtmp1;

1771         fmuld   %f12,%f62,%f52          ! (5_0) y0 *= scl0;
1772         sra     %o2,11,%i3              ! (3_0) iarr >>= 11;
1773         nop
1774         faddd   %f2,%f46,%f36           ! (4_0) res0_lo += dtmp1;

1776         and     %i3,0x1fc,%i3           ! (3_0) iarr &= 0x1fc;
1777         nop
```



```
1778         bn,pn   %icc,.exit
1779         fmuld   %f16,%f18,%f16          ! (1_0) dres = dd * dtmp2;

1781         fsqrtd  %f48,%f18               ! (7_1) res0 = sqrt ( res0 );
1782         add     %i3,TBL,%o4             ! (3_0) (char*)dll1 + iarr
1783         lda     [%i4]0x82,%o1           ! (7_0) hx0 = *(int*)px;
1784         fsubd   DTWO,%f50,%f46          ! (2_0) dtmp1 = DTWO - dtmp1;

1786         fmuld   %f20,%f26,%f48          ! (0_0) dtmp0 *= dres;
1787         add     %i0,stridey,%i3         ! py += stridey
1788         ld      [%o4],%f20              ! (3_0) dtmp0 = ((double*)((char*)dll1 +
1789         faddd   %f60,D2ON36,%f50        ! (5_0) x_hi0 = x0 + D2ON36;

1791         nop
1792         add     %i3,stridey,%i0         ! py += stridey
1793         lda     [%i3]0x82,%o4           ! (7_0) hy0 = *(int*)py;
1794         faddd   %f52,D2ON36,%f12        ! (5_0) y_hi0 = y0 + D2ON36;

1796         fmuld   %f0,%f24,%f2            ! (6_1) res0 = scl0 * res0;
1797         and     %o1,_0x7fffffff,%o7     ! (7_0) hx0 &= 0x7fffffff;
1798         nop
1799         faddd   %f32,%f36,%f24          ! (4_0) dres = res0_hi + res0_lo;

1801         fmuld   %f10,%f46,%f26          ! (2_0) dd *= dtmp1;
1802         cmp     %o7,_0x7ff00000         ! (7_0) hx0 ? 0x7ff00000
1803         st      %f24,[%fp+ftmp0]        ! (4_0) iarr = ((int*)&dres)[0];
1804         fpsub32 %f20,%f54,%f10          ! (3_0) dd = vis_fpsub32(dtmp0, dexp0);

1806         and     %o4,_0x7fffffff,%l7     ! (7_0) hy0 &= 0x7fffffff;
1807         st      %f2,[%i5]               ! (6_1) ((float*)pz)[0] = ((float*)&res0
1808         bge,pn  %icc,.update57          ! (7_0) if ( hx0 >= 0x7ff00000 )
1809         fsubd   %f50,D2ON36,%f20        ! (5_0) x_hi0 -= D2ON36;

1811         sub     %l7,%o7,%o1             ! (7_0) diff0 = hy0 - hx0;
1812         cmp     %l7,_0x7ff00000         ! (7_0) hy0 ? 0x7ff00000
1813         bge,pn  %icc,.update58          ! (7_0) if ( hy0 >= 0x7ff00000 )
1814         fsubd   %f12,D2ON36,%f54        ! (5_0) y_hi0 -= D2ON36;

1816         fmuld   %f10,%f22,%f50          ! (3_0) dtmp0 = dd * dres;
1817         sra     %o1,31,%o3              ! (7_0) j0 = diff0 >> 31;
1818         st      %f3,[%i5+4]             ! (6_1) ((float*)pz)[1] = ((float*)&res0
1819         faddd   %f28,%f48,%f48          ! (0_0) res0 += dtmp0;

1821         and     %o1,%o3,%o1             ! (7_0) j0 &= diff0;
1822         cmp     %o7,_0x00100000         ! (7_0) hx0 ? 0x00100000
1823         bl,pn   %icc,.update59          ! (7_0) if ( hx0 < 0x00100000 )
1824         fand    %f16,DA0,%f28           ! (1_0) res0 = vis_fand(dres,DA0);
1825 .cont59a:
1826         fmuld   %f20,%f20,%f0           ! (5_0) res0_hi = x_hi0 * x_hi0;
1827         sub     %l7,%o1,%o4             ! (7_0) j0 = hy0 - j0;
1828         stx     %g1,[%fp+dtmp14]        ! (6_0) *(long long*)&scl0 = ll;
1829         fsubd   %f60,%f20,%f2           ! (5_0) x_lo0 = x0 - x_hi0;

1831         fmuld   %f54,%f54,%f46          ! (5_0) dtmp0 = y_hi0 * y_hi0;
1832         and     %o4,%l0,%o4             ! (7_0) j0 &= 0x7ff00000;
1833         add     %i5,stridez,%i5         ! pz += stridez
1834         faddd   %f60,%f20,%f62          ! (5_0) res0_lo = x0 + x_hi0;

1836         fmuld   %f26,%f14,%f14          ! (2_0) dtmp2 = dd * dres;
1837         sub     %l0,%o4,%g1             ! (7_0) j0 = 0x7ff00000 - j0;
1838         nop
1839         fsubd   DTWO,%f50,%f20          ! (3_0) dtmp0 = DTWO - dtmp0;
1840 .cont59b:
1841         fmuld   %f42,%f28,%f60          ! (1_0) dtmp0 = res0_hi * res0;
1842         sllx    %g1,32,%g1              ! (7_0) ll = (long long)j0 << 32;
1843         stx     %g1,[%fp+dtmp15]        ! (7_0) *(long long*)&scl0 = ll;
```

```
1844         faddd   %f52,%f54,%f50          ! (5_0) dtmp1 = y0 + y_hi0;

1846         fmuld   %f34,%f28,%f34          ! (1_0) dtmp1 = res0_lo * res0;
1847         nop
1848         nop
1849         fsubd   %f52,%f54,%f54          ! (5_0) y_lo0 = y0 - y_hi0;
1850 .cont60:
1851         fmuld   %f62,%f2,%f2            ! (5_0) res0_lo *= x_lo0;
1852         nop
1853         ldd     [%fp+dtmp13],%f62       ! (6_0) *(long long*)&scl0 = ll;
1854         faddd   %f0,%f46,%f42           ! (5_0) res0_hi += dtmp0;

1856         fmuld   %f10,%f20,%f52          ! (3_0) dd *= dtmp0;
1857         nop
1858         lda     [%i2]%asi,%f10          ! (6_0) ((float*)&x0)[0] = ((float*)px)[
1859         bn,pn   %icc,.exit

1861         lda     [%i2+4]%asi,%f11        ! (6_0) ((float*)&x0)[1] = ((float*)px)[
1862         nop
1863         nop
1864         fsubd   DONE,%f60,%f60          ! (1_0) dtmp0 = DONE - dtmp0;

1866         fmuld   %f50,%f54,%f46          ! (5_0) dtmp1 *= y_lo0;
1867         nop
1868         lda     [%o0]%asi,%f12          ! (6_0) ((float*)&y0)[0] = ((float*)py)[
1869         fsubd   DTWO,%f14,%f14          ! (2_0) dtmp2 = DTWO - dtmp2;

1871         nop
1872         nop
1873         lda     [%o0+4]%asi,%f13        ! (6_0) ((float*)&y0)[1] = ((float*)py)[
1874         bn,pn   %icc,.exit

1876         fmuld   %f52,%f22,%f50          ! (3_0) dtmp1 = dd * dres;
1877         nop
1878         ld      [%fp+ftmp0],%o2         ! (4_0) iarr = ((int*)&dres)[0];
1879         fand    %f24,DA1,%f54           ! (4_0) dexp0 = vis_fand(dres,DA1);

1881         fmuld   %f10,%f62,%f10          ! (6_0) x0 *= scl0;
1882         nop
1883         ldd     [%fp+dtmp0],%f0         ! (7_1) *(long long*)&scl0 = ll;
1884         fsubd   %f60,%f34,%f20          ! (1_0) dtmp0 -= dtmp1;

1886         fmuld   %f12,%f62,%f60          ! (6_0) y0 *= scl0;
1887         sra     %o2,11,%o4              ! (4_0) iarr >>= 11;
1888         nop
1889         faddd   %f2,%f46,%f34           ! (5_0) res0_lo += dtmp1;

1891         and     %o4,0x1fc,%o4           ! (4_0) iarr &= 0x1fc;
1892         subcc   counter,8,counter       ! counter -= 8;
1893         bpos,pt %icc,.main_loop
1894         fmuld   %f26,%f14,%f26          ! (2_0) dres = dd * dtmp2;

1896         add     counter,8,counter

1898 .tail:
1899         subcc   counter,1,counter
1900         bneg    .begin
1901         nop

1903         fsqrtd  %f48,%f14               ! (0_1) res0 = sqrt ( res0 );
1904         add     %o4,TBL,%o4             ! (4_1) (char*)dll1 + iarr
1905         fsubd   DTWO,%f50,%f46          ! (3_1) dtmp1 = DTWO - dtmp1;

1907         fmuld   %f20,%f16,%f48          ! (1_1) dtmp0 *= dres;
1908         ld      [%o4],%f20              ! (4_1) dtmp0 = ((double*)((char*)dll1 +
```



```
1910         fmuld   %f0,%f18,%f0            ! (7_2) res0 = scl0 * res0;
1911         st      %f0,[%i5]               ! (7_2) ((float*)pz)[0] = ((float*)&res0
1912         faddd   %f42,%f34,%f16          ! (5_1) dres = res0_hi + res0_lo;

1914         subcc   counter,1,counter
1915         st      %f1,[%i5+4]             ! (7_2) ((float*)pz)[1] = ((float*)&res0
1916         bneg    .begin
1917         add     %i5,stridez,%i5         ! pz += stridez

1919         fmuld   %f52,%f46,%f18          ! (3_1) dd *= dtmp1;
1920         st      %f16,[%fp+ftmp0]        ! (5_1) iarr = ((int*)&dres)[0];
1921         fpsub32 %f20,%f54,%f54          ! (4_1) dd = vis_fpsub32(dtmp0, dexp0);

1923         fmuld   %f54,%f24,%f50          ! (4_1) dtmp0 = dd * dres;
1924         faddd   %f28,%f48,%f52          ! (1_1) res0 += dtmp0;


1927         fand    %f26,DA0,%f48           ! (2_1) res0 = vis_fand(dres,DA0);

1929         fmuld   %f18,%f22,%f22          ! (3_1) dtmp2 = dd * dres;
1930         fsubd   DTWO,%f50,%f20          ! (4_1) dtmp0 = DTWO - dtmp0;

1932         fmuld   %f30,%f48,%f12          ! (2_1) dtmp0 = res0_hi * res0;

1934         fmuld   %f40,%f48,%f40          ! (2_1) dtmp1 = res0_lo * res0;

1936         fmuld   %f54,%f20,%f54          ! (4_1) dd *= dtmp0;

1938         fsubd   DONE,%f12,%f60          ! (2_1) dtmp0 = DONE - dtmp0;

1940         fsubd   DTWO,%f22,%f22          ! (3_1) dtmp2 = DTWO - dtmp2;

1942         fmuld   %f54,%f24,%f50          ! (4_1) dtmp1 = dd * dres;
1943         ld      [%fp+ftmp0],%o2         ! (5_1) iarr = ((int*)&dres)[0];
1944         fand    %f16,DA1,%f2            ! (5_1) dexp0 = vis_fand(dres,DA1);

1946         ldd     [%fp+dtmp2],%f0         ! (0_1) *(long long*)&scl0 = ll;
1947         fsubd   %f60,%f40,%f20          ! (2_1) dtmp0 -= dtmp1;

1949         sra     %o2,11,%i3              ! (5_1) iarr >>= 11;

1951         and     %i3,0x1fc,%i3           ! (5_1) iarr &= 0x1fc;
1952         fmuld   %f18,%f22,%f28          ! (3_1) dres = dd * dtmp2;

1954         fsqrtd  %f52,%f22               ! (1_1) res0 = sqrt ( res0 );
1955         add     %i3,TBL,%g1             ! (5_1) (char*)dll1 + iarr
1956         fsubd   DTWO,%f50,%f62          ! (4_1) dtmp1 = DTWO - dtmp1;

1958         fmuld   %f20,%f26,%f52          ! (2_1) dtmp0 *= dres;
1959         ld      [%g1],%f26              ! (5_1) dtmp0 = ((double*)((char*)dll1 +

1961         fmuld   %f0,%f14,%f0            ! (0_1) res0 = scl0 * res0;

1963         fmuld   %f54,%f62,%f14          ! (4_1) dd *= dtmp1;
1964         fpsub32 %f26,%f2,%f26           ! (5_1) dd = vis_fpsub32(dtmp0, dexp0);

1966         st      %f0,[%i5]               ! (0_1) ((float*)pz)[0] = ((float*)&res0

1968         fmuld   %f26,%f16,%f50          ! (5_1) dtmp0 = dd * dres;
1969         st      %f1,[%i5+4]             ! (0_1) ((float*)pz)[1] = ((float*)&res0
1970         faddd   %f48,%f52,%f52          ! (2_1) res0 += dtmp0;

1972         subcc   counter,1,counter
1973         bneg    .begin
1974         add     %i5,stridez,%i5         ! pz += stridez
```

```
1976         fand    %f28,DA0,%f48           ! (3_1) res0 = vis_fand(dres,DA0);

1978         fmuld   %f44,%f48,%f10          ! (3_1) dtmp0 = res0_hi * res0;
1979         fsubd   DTWO,%f50,%f20          ! (5_1) dtmp0 = DTWO - dtmp0;

1981         fmuld   %f14,%f24,%f24          ! (4_1) dtmp2 = dd * dres;

1983         fmuld   %f38,%f48,%f38          ! (3_1) dtmp1 = res0_lo * res0;

1985         fsubd   DONE,%f10,%f60          ! (3_1) dtmp0 = DONE - dtmp0;
1986         fmuld   %f26,%f20,%f54          ! (5_1) dd *= dtmp0;

1988         fsubd   DTWO,%f24,%f24          ! (4_1) dtmp2 = DTWO - dtmp2;

1990         fmuld   %f54,%f16,%f46          ! (5_1) dtmp1 = dd * dres;

1992         ldd     [%fp+dtmp4],%f50        ! (1_1) *(long long*)&scl0 = ll;
1993         fsubd   %f60,%f38,%f20          ! (3_1) dtmp0 -= dtmp1;

1995         fmuld   %f14,%f24,%f26          ! (4_1) dres = dd * dtmp2;

1997         fsqrtd  %f52,%f24               ! (2_1) res0 = sqrt ( res0 );
1998         fsubd   DTWO,%f46,%f62          ! (5_1) dtmp1 = DTWO - dtmp1;

2000         fmuld   %f20,%f28,%f52          ! (3_1) dtmp0 *= dres;

2002         fmuld   %f50,%f22,%f0           ! (1_1) res0 = scl0 * res0;

2004         fmuld   %f54,%f62,%f22          ! (5_1) dd *= dtmp1;

2006         st      %f0,[%i5]               ! (1_1) ((float*)pz)[0] = ((float*)&res0

2008         subcc   counter,1,counter
2009         st      %f1,[%i5+4]             ! (1_1) ((float*)pz)[1] = ((float*)&res0
2010         bneg    .begin
2011         add     %i5,stridez,%i5         ! pz += stridez

2013         faddd   %f48,%f52,%f52          ! (3_1) res0 += dtmp0;

2015         fand    %f26,DA0,%f48           ! (4_1) res0 = vis_fand(dres,DA0);

2017         fmuld   %f32,%f48,%f10          ! (4_1) dtmp0 = res0_hi * res0;

2019         fmuld   %f22,%f16,%f16          ! (5_1) dtmp2 = dd * dres;

2021         fmuld   %f36,%f48,%f36          ! (4_1) dtmp1 = res0_lo * res0;

2023         fsubd   DONE,%f10,%f60          ! (4_1) dtmp0 = DONE - dtmp0;

2025         fsubd   DTWO,%f16,%f16          ! (5_1) dtmp2 = DTWO - dtmp2;

2027         ldd     [%fp+dtmp6],%f50        ! (2_1) *(long long*)&scl0 = ll;
2028         fsubd   %f60,%f36,%f20          ! (4_1) dtmp0 -= dtmp1;

2030         fmuld   %f22,%f16,%f28          ! (5_1) dres = dd * dtmp2;

2032         fsqrtd  %f52,%f16               ! (3_1) res0 = sqrt ( res0 );

2034         fmuld   %f20,%f26,%f52          ! (4_1) dtmp0 *= dres;

2036         fmuld   %f50,%f24,%f0           ! (2_1) res0 = scl0 * res0;

2038         st      %f0,[%i5]               ! (2_1) ((float*)pz)[0] = ((float*)&res0

2040         st      %f1,[%i5+4]             ! (2_1) ((float*)pz)[1] = ((float*)&res0
2041         faddd   %f48,%f52,%f52          ! (4_1) res0 += dtmp0;
```



```
2043         subcc   counter,1,counter
2044         bneg    .begin
2045         add     %i5,stridez,%i5         ! pz += stridez

2047         fand    %f28,DA0,%f48           ! (5_1) res0 = vis_fand(dres,DA0);

2049         fmuld   %f42,%f48,%f10          ! (5_1) dtmp0 = res0_hi * res0;

2051         fmuld   %f34,%f48,%f34          ! (5_1) dtmp1 = res0_lo * res0;

2053         fsubd   DONE,%f10,%f60          ! (5_1) dtmp0 = DONE - dtmp0;

2055         ldd     [%fp+dtmp8],%f18        ! (3_1) *(long long*)&scl0 = ll;
2056         fsubd   %f60,%f34,%f46          ! (5_1) dtmp0 -= dtmp1;

2058         fsqrtd  %f52,%f24               ! (4_1) res0 = sqrt ( res0 );

2060         fmuld   %f46,%f28,%f52          ! (5_1) dtmp0 -= dtmp1;

2062         fmuld   %f18,%f16,%f0           ! (3_1) res0 = scl0 * res0;
2063         st      %f0,[%i5]               ! (3_1) ((float*)pz)[0] = ((float*)&res0
2064         st      %f1,[%i5+4]             ! (3_1) ((float*)pz)[1] = ((float*)&res0
2065         faddd   %f48,%f52,%f52          ! (5_1) res0 += dtmp0;

2067         subcc   counter,1,counter
2068         bneg    .begin
2069         add     %i5,stridez,%i5         ! pz += stridez

2071         ldd     [%fp+dtmp10],%f14       ! (4_1) *(long long*)&scl0 = ll;

2073         fsqrtd  %f52,%f16               ! (5_1) res0 = sqrt ( res0 );

2075         fmuld   %f14,%f24,%f0           ! (4_1) res0 = scl0 * res0
2076         st      %f0,[%i5]               ! (4_1) ((float*)pz)[0] = ((float*)&res0
2077         st      %f1,[%i5+4]             ! (4_1) ((float*)pz)[1] = ((float*)&res0

2079         subcc   counter,1,counter
2080         bneg    .begin
2081         add     %i5,stridez,%i5         ! pz += stridez

2083         ldd     [%fp+dtmp12],%f22       ! (5_1) *(long long*)&scl0 = ll;

2085         fmuld   %f22,%f16,%f0           ! (5_1) res0 = scl0 * res0;
2086         st      %f0,[%i5]               ! (5_1) ((float*)pz)[0] = ((float*)&res0
2087         st      %f1,[%i5+4]             ! (5_1) ((float*)pz)[1] = ((float*)&res0

2089         ba      .begin
2090         add     %i5,stridez,%i5

2092         .align  16
2093 .spec0:
2094         cmp     %o7,_0x7ff00000         ! hx0 ? 0x7ff00000
2095         bne     1f                      ! if ( hx0 != 0x7ff00000 )
2096         ld      [%i4+4],%i2             ! lx = ((int*)px)[1];

2098         cmp     %i2,0                   ! lx ? 0
2099         be      3f                      ! if ( lx == 0 )
2100         nop
2101 1:
2102         cmp     %l7,_0x7ff00000         ! hy0 ? 0x7ff00000
2103         bne     2f                      ! if ( hy0 != 0x7ff00000 )
2104         ld      [%i3+4],%o2             ! ly = ((int*)py)[1];

2106         cmp     %o2,0                   ! ly ? 0
2107         be      3f                      ! if ( ly == 0 )
```

```
2108 2:
2109         ld      [%i4],%f0               ! ((float*)&x0)[0] = ((float*)px)[0];
2110         ld      [%i4+4],%f1             ! ((float*)&x0)[1] = ((float*)px)[1];

2112         ld      [%i3],%f2               ! ((float*)&y0)[0] = ((float*)py)[0];
2113         add     %i4,stridex,%i4         ! px += stridex
2114         ld      [%i3+4],%f3             ! ((float*)&y0)[1] = ((float*)py)[1];

2116         fabsd   %f0,%f0

2118         fabsd   %f2,%f2

2120         fmuld   %f0,%f2,%f0             ! res0 = fabs(x0) * fabs(y0);
2121         add     %i3,stridey,%i3         ! py += stridey;
2122         st      %f0,[%i5]               ! ((float*)pz)[0] = ((float*)&res0)[0];

2124         st      %f1,[%i5+4]             ! ((float*)pz)[1] = ((float*)&res0)[1];
2125         add     %i5,stridez,%i5         ! pz += stridez
2126         ba      .begin1
2127         sub     counter,1,counter
2128 3:
2129         add     %i4,stridex,%i4         ! px += stridex
2130         add     %i3,stridey,%i3         ! py += stridey
2131         st      %g0,[%i5]               ! ((int*)pz)[0] = 0;

2133         add     %i5,stridez,%i5         ! pz += stridez;
2134         st      %g0,[%i5+4]             ! ((int*)pz)[1] = 0;
2135         ba      .begin1
2136         sub     counter,1,counter

2138         .align  16
2139 .spec1:
2140         and     %o1,%o3,%o1             ! (7_0) j0 &= diff0;

2142         cmp     %l7,_0x00100000         ! (7_0) hy0 ? 0x00100000
2143         bge,pn  %icc,.cont_spec0        ! (7_0) if ( hy0 < 0x00100000 )

2145         ld      [%i4+4],%i2             ! lx = ((int*)px)[1];
2146         or      %o7,%l7,%g5             ! ii = hx0 | hy0;
2147         fzero   %f0

2149         ld      [%i3+4],%o2             ! ly = ((int*)py)[1];
2150         or      %i2,%g5,%g5             ! ii |= lx;

2152         orcc    %o2,%g5,%g5             ! ii |= ly;
2153         bnz,a,pn        %icc,1f         ! if ( ii != 0 )
2154         sethi   %hi(0x00080000),%i2

2156         fdivd   DONE,%f0,%f0            ! res0 = 1.0 / 0.0;

2158         st      %f0,[%i5]               ! ((float*)pz)[0] = ((float*)&res0)[0];

2160         add     %i4,stridex,%i4         ! px += stridex;
2161         add     %i3,stridey,%i3         ! py += stridey;
2162         st      %f1,[%i5+4]             ! ((float*)pz)[1] = ((float*)&res0)[1];

2164         add     %i5,stridez,%i5         ! pz += stridez;
2165         ba      .begin1
2166         sub     counter,1,counter
2167 1:
2168         ld      [%i4],%f0               ! ((float*)&x0)[0] = ((float*)px)[0];

2170         ld      [%i4+4],%f1             ! ((float*)&x0)[1] = ((float*)px)[1];

2172         ld      [%i3],%f2               ! ((float*)&y0)[0] = ((float*)py)[0];
```



```
2174         fabsd   %f0,%f0                 ! x0 = fabs(x0);
2175         ld      [%i3+4],%f3             ! ((float*)&y0)[1] = ((float*)py)[1];

2177         ldd     [TBL+TBL_SHIFT+64],%f12 ! ((long long*)&dtmp0)[0] = 0x0007ffffff
2178         add     %fp,dtmp2,%i4
2179         add     %fp,dtmp3,%i3

2181         fabsd   %f2,%f2                 ! y0 = fabs(y0);
2182         ldd     [TBL+TBL_SHIFT+56],%f10 ! D2ON51

2184         ldx     [TBL+TBL_SHIFT+48],%g5  ! D2ONM52
2185         cmp     %o7,%i2                 ! hx0 ? 0x00080000
2186         bl,a    1f                      ! if ( hx0 < 0x00080000 )
2187         fxtod   %f0,%f0                 ! x0 = *(long long*)&x0;

2189         fand    %f0,%f12,%f0            ! x0 = vis_fand(x0, dtmp0);
2190         fxtod   %f0,%f0                 ! x0 = *(long long*)&x0;
2191         faddd   %f0,%f10,%f0            ! x0 += D2ON51;
2192 1:
2193         std     %f0,[%i4]

2195         ldx     [TBL+TBL_SHIFT+40],%g1  ! D2ON1022
2196         cmp     %l7,%i2                 ! hy0 ? 0x00080000
2197         bl,a    1f                      ! if ( hy0 < 0x00080000 )
2198         fxtod   %f2,%f2                 ! y0 = *(long long*)&y0;

2200         fand    %f2,%f12,%f2            ! y0 = vis_fand(y0, dtmp0);
2201         fxtod   %f2,%f2                 ! y0 = *(long long*)&y0;
2202         faddd   %f2,%f10,%f2            ! y0 += D2ON51;
2203 1:
2204         std     %f2,[%i3]

2206         stx     %g5,[%fp+dtmp15]        ! D2ONM52

2208         ba      .cont_spec1
2209         stx     %g1,[%fp+dtmp0]         ! D2ON1022

2211         .align  16
2212 .update0:
2213         cmp     counter,1
2214         ble     1f
2215         nop

2217         sub     counter,1,counter
2218         st      counter,[%fp+tmp_counter]

2220         stx     %i2,[%fp+tmp_px]

2222         stx     %o0,[%fp+tmp_py]

2224         mov     1,counter
2225 1:
2226         sethi   %hi(0x3ff00000),%o4
2227         add     TBL,TBL_SHIFT+24,%i2
2228         ba      .cont1
2229         add     TBL,TBL_SHIFT+24,%o0

2231         .align  16
2232 .update1:
2233         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
2234         bge,pn  %icc,.cont0             ! (0_0) if ( hy0 < 0x00100000 )

2236         cmp     counter,1
2237         ble,a   1f
2238         nop
```

```
2240         sub     counter,1,counter
2241         st      counter,[%fp+tmp_counter]

2243         stx     %i2,[%fp+tmp_px]

2245         mov     1,counter
2246         stx     %o0,[%fp+tmp_py]
2247 1:
2248         sethi   %hi(0x3ff00000),%o4
2249         add     TBL,TBL_SHIFT+24,%i2
2250         ba      .cont1
2251         add     TBL,TBL_SHIFT+24,%o0

2253         .align  16
2254 .update2:
2255         cmp     counter,2
2256         ble     1f
2257         nop

2259         sub     counter,2,counter
2260         st      counter,[%fp+tmp_counter]

2262         stx     %i4,[%fp+tmp_px]

2264         stx     %i3,[%fp+tmp_py]

2266         mov     2,counter
2267 1:
2268         fsubd   %f50,D2ON36,%f54        ! (7_1) y_hi0 -= D2ON36;

2270         fmuld   %f20,%f20,%f2           ! (7_1) res0_hi = x_hi0 * x_hi0;
2271         fsubd   %f10,%f20,%f0           ! (7_1) x_lo0 = x0 - x_hi0;

2273         fmuld   %f54,%f54,%f46          ! (7_1) dtmp0 = y_hi0 * y_hi0;
2274         faddd   %f10,%f20,%f62          ! (7_1) res0_lo = x0 + x_hi0;

2276         sethi   %hi(0x3ff00000),%o4
2277         add     TBL,TBL_SHIFT+24,%i4
2278         ba      .cont4
2279         add     TBL,TBL_SHIFT+24,%i3

2281         .align  16
2282 .update3:
2283         cmp     counter,2
2284         ble     1f
2285         nop

2287         sub     counter,2,counter
2288         st      counter,[%fp+tmp_counter]

2290         stx     %i4,[%fp+tmp_px]

2292         stx     %i3,[%fp+tmp_py]

2294         mov     2,counter
2295 1:
2296         fmuld   %f20,%f20,%f2           ! (7_1) res0_hi = x_hi0 * x_hi0;
2297         fsubd   %f10,%f20,%f0           ! (7_1) x_lo0 = x0 - x_hi0;

2299         fmuld   %f54,%f54,%f46          ! (7_1) dtmp0 = y_hi0 * y_hi0;
2300         faddd   %f10,%f20,%f62          ! (7_1) res0_lo = x0 + x_hi0;

2302         sethi   %hi(0x3ff00000),%o4
2303         add     TBL,TBL_SHIFT+24,%i4
2304         ba      .cont4
2305         add     TBL,TBL_SHIFT+24,%i3
```



```
2307         .align  16
2308 .update4:
2309         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
2310         bge,a,pn        %icc,.cont4     ! (0_0) if ( hy0 < 0x00100000 )
2311         sub     %l0,%o4,%o4             ! (1_0) j0 = 0x7ff00000 - j0;

2313         cmp     counter,2
2314         ble,a   1f
2315         nop

2317         sub     counter,2,counter
2318         st      counter,[%fp+tmp_counter]

2320         stx     %i4,[%fp+tmp_px]

2322         mov     2,counter
2323         stx     %i3,[%fp+tmp_py]
2324 1:
2325         sethi   %hi(0x3ff00000),%o4
2326         add     TBL,TBL_SHIFT+24,%i4
2327         ba      .cont4
2328         add     TBL,TBL_SHIFT+24,%i3

2330         .align  16
2331 .update5:
2332         cmp     counter,3
2333         ble     1f
2334         nop

2336         sub     counter,3,counter
2337         st      counter,[%fp+tmp_counter]

2339         stx     %i2,[%fp+tmp_px]

2341         stx     %o0,[%fp+tmp_py]

2343         mov     3,counter
2344 1:
2345         st      %f14,[%fp+ftmp0]        ! (7_1) iarr = ((int*)&dres)[0];
2346         fsubd   %f46,D2ON36,%f20        ! (0_0) x_hi0 -= D2ON36;

2348         fsubd   %f12,D2ON36,%f54        ! (0_0) y_hi0 -= D2ON36;

2350         fmuld   %f20,%f20,%f2           ! (0_0) res0_hi = x_hi0 * x_hi0;
2351         fsubd   %f10,%f20,%f0           ! (0_0) x_lo0 = x0 - x_hi0;

2353         fmuld   %f54,%f54,%f46          ! (0_0) dtmp0 = y_hi0 * y_hi0;
2354         faddd   %f10,%f20,%f62          ! (0_0) res0_lo = x0 + x_hi0;

2356         sethi   %hi(0x3ff00000),%g1
2357         add     TBL,TBL_SHIFT+24,%i2

2359         sllx    %g1,32,%g1
2360         ba      .cont8
2361         add     TBL,TBL_SHIFT+24,%o0

2363         .align  16
2364 .update6:
2365         cmp     counter,3
2366         ble     1f
2367         nop

2369         sub     counter,3,counter
2370         st      counter,[%fp+tmp_counter]
```

```
2372         stx     %i2,[%fp+tmp_px]

2374         stx     %o0,[%fp+tmp_py]

2376         mov     3,counter
2377 1:
2378         fmuld   %f20,%f20,%f2           ! (0_0) res0_hi = x_hi0 * x_hi0;
2379         fsubd   %f10,%f20,%f0           ! (0_0) x_lo0 = x0 - x_hi0;

2381         fmuld   %f54,%f54,%f46          ! (0_0) dtmp0 = y_hi0 * y_hi0;
2382         faddd   %f10,%f20,%f62          ! (0_0) res0_lo = x0 + x_hi0;

2384         sethi   %hi(0x3ff00000),%g1
2385         add     TBL,TBL_SHIFT+24,%i2

2387         sllx    %g1,32,%g1
2388         ba      .cont8
2389         add     TBL,TBL_SHIFT+24,%o0

2391         .align  16
2392 .update7:
2393         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
2394         bge,pn  %icc,.cont7             ! (0_0) if ( hy0 < 0x00100000 )

2396         cmp     counter,3
2397         ble,a   1f
2398         nop

2400         sub     counter,3,counter
2401         st      counter,[%fp+tmp_counter]

2403         stx     %i2,[%fp+tmp_px]

2405         mov     3,counter
2406         stx     %o0,[%fp+tmp_py]
2407 1:
2408         sethi   %hi(0x3ff00000),%g1
2409         add     TBL,TBL_SHIFT+24,%i2

2411         sllx    %g1,32,%g1
2412         ba      .cont8
2413         add     TBL,TBL_SHIFT+24,%o0

2415         .align  16
2416 .update9:
2417         cmp     counter,4
2418         ble     1f
2419         nop

2421         sub     counter,4,counter
2422         st      counter,[%fp+tmp_counter]

2424         stx     %i4,[%fp+tmp_px]

2426         stx     %i3,[%fp+tmp_py]

2428         mov     4,counter
2429 1:
2430         st      %f22,[%fp+ftmp0]        ! (0_0) iarr = ((int*)&dres)[0];
2431         fsubd   %f46,D2ON36,%f20        ! (1_0) x_hi0 -= D2ON36;

2433         fsubd   %f12,D2ON36,%f54        ! (1_0) y_hi0 -= D2ON36;

2435         fmuld   %f26,%f14,%f50          ! (7_1) dtmp0 = dd * dres;
```



```
2438         fmuld   %f20,%f20,%f2           ! (1_0) res0_hi = x_hi0 * x_hi0;
2439         fsubd   %f10,%f20,%f0           ! (1_0) x_lo0 = x0 - x_hi0;

2441         fmuld   %f54,%f54,%f46          ! (1_0) dtmp0 = y_hi0 * y_hi0;
2442         faddd   %f10,%f20,%f62          ! (1_0) res0_lo = x0 + x_hi0;

2444         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp0 = DTWO - dtmp0;

2446         sethi   %hi(0x3ff00000),%g1
2447         add     TBL,TBL_SHIFT+24,%i4
2448         ba      .cont12
2449         add     TBL,TBL_SHIFT+24,%i3

2451         .align  16
2452 .update10:
2453         cmp     counter,4
2454         ble     1f
2455         nop

2457         sub     counter,4,counter
2458         st      counter,[%fp+tmp_counter]

2460         stx     %i4,[%fp+tmp_px]

2462         stx     %i3,[%fp+tmp_py]

2464         mov     4,counter
2465 1:
2466         fmuld   %f26,%f14,%f50          ! (7_1) dtmp0 = dd * dres;


2469         fmuld   %f20,%f20,%f2           ! (1_0) res0_hi = x_hi0 * x_hi0;
2470         fsubd   %f10,%f20,%f0           ! (1_0) x_lo0 = x0 - x_hi0;

2472         fmuld   %f54,%f54,%f46          ! (1_0) dtmp0 = y_hi0 * y_hi0;
2473         faddd   %f10,%f20,%f62          ! (1_0) res0_lo = x0 + x_hi0;

2475         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp0 = DTWO - dtmp0;

2477         sethi   %hi(0x3ff00000),%g1
2478         add     TBL,TBL_SHIFT+24,%i4
2479         ba      .cont12
2480         add     TBL,TBL_SHIFT+24,%i3

2482         .align  16
2483 .update11:
2484         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
2485         bge,pn  %icc,.cont11            ! (0_0) if ( hy0 < 0x00100000 )

2487         cmp     counter,4
2488         ble,a   1f
2489         nop

2491         sub     counter,4,counter
2492         st      counter,[%fp+tmp_counter]

2494         stx     %i4,[%fp+tmp_px]

2496         mov     4,counter
2497         stx     %i3,[%fp+tmp_py]
2498 1:
2499         sethi   %hi(0x3ff00000),%g1
2500         add     TBL,TBL_SHIFT+24,%i4

2502         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp0 = DTWO - dtmp0;
2503         ba      .cont12
```

```
2504         add     TBL,TBL_SHIFT+24,%i3

2506         .align  16
2507 .update13:
2508         cmp     counter,5
2509         ble     1f
2510         nop

2512         sub     counter,5,counter
2513         st      counter,[%fp+tmp_counter]

2515         stx     %i2,[%fp+tmp_px]

2517         stx     %o0,[%fp+tmp_py]

2519         mov     5,counter
2520 1:
2521         fsubd   %f46,D2ON36,%f20        ! (2_0) x_hi0 -= D2ON36;

2523         fsubd   %f50,D2ON36,%f54        ! (2_0) y_hi0 -= D2ON36;

2525         fmuld   %f28,%f22,%f50          ! (0_0) dtmp0 = dd * dres;

2527         fmuld   %f20,%f20,%f2           ! (2_0) res0_hi = x_hi0 * x_hi0;
2528         fsubd   %f10,%f20,%f0           ! (2_0) x_lo0 = x0 - x_hi0;

2530         fmuld   %f54,%f54,%f46          ! (2_0) dtmp0 = y_hi0 * y_hi0;
2531         faddd   %f10,%f20,%f62          ! (2_0) res0_lo = x0 + x_hi0;

2533         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp0 = DTWO - dtmp0;

2535         sethi   %hi(0x3ff00000),%g1
2536         add     TBL,TBL_SHIFT+24,%i2
2537         ba      .cont16
2538         add     TBL,TBL_SHIFT+24,%o0

2540         .align  16
2541 .update14:
2542         cmp     counter,5
2543         ble     1f
2544         nop

2546         sub     counter,5,counter
2547         st      counter,[%fp+tmp_counter]

2549         stx     %i2,[%fp+tmp_px]

2551         stx     %o0,[%fp+tmp_py]

2553         mov     5,counter
2554 1:
2555         fmuld   %f28,%f22,%f50          ! (0_0) dtmp0 = dd * dres;

2557         fmuld   %f20,%f20,%f2           ! (2_0) res0_hi = x_hi0 * x_hi0;
2558         fsubd   %f10,%f20,%f0           ! (2_0) x_lo0 = x0 - x_hi0;

2560         fmuld   %f54,%f54,%f46          ! (2_0) dtmp0 = y_hi0 * y_hi0;
2561         faddd   %f10,%f20,%f62          ! (2_0) res0_lo = x0 + x_hi0;

2563         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp0 = DTWO - dtmp0;

2565         sethi   %hi(0x3ff00000),%g1
2566         add     TBL,TBL_SHIFT+24,%i2
2567         ba      .cont16
2568         add     TBL,TBL_SHIFT+24,%o0
```



```
2570         .align  16
2571 .update15:
2572         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
2573         bge,pn  %icc,.cont15            ! (0_0) if ( hy0 < 0x00100000 )

2575         cmp     counter,5
2576         ble,a   1f
2577         nop

2579         sub     counter,5,counter
2580         st      counter,[%fp+tmp_counter]

2582         stx     %i2,[%fp+tmp_px]

2584         mov     5,counter
2585         stx     %o0,[%fp+tmp_py]
2586 1:
2587         sethi   %hi(0x3ff00000),%g1
2588         add     TBL,TBL_SHIFT+24,%i2

2590         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp0 = DTWO - dtmp0;
2591         ba      .cont16
2592         add     TBL,TBL_SHIFT+24,%o0

2594         .align  16
2595 .update17:
2596         cmp     counter,6
2597         ble     1f
2598         nop

2600         sub     counter,6,counter
2601         st      counter,[%fp+tmp_counter]

2603         stx     %i4,[%fp+tmp_px]

2605         stx     %i3,[%fp+tmp_py]

2607         mov     6,counter
2608 1:
2609         fsubd   %f50,D2ON36,%f54        ! (3_0) y_hi0 -= D2ON36;

2611         fmuld   %f26,%f18,%f50          ! (1_0) dtmp0 = dd * dres;

2613         fand    %f28,DA0,%f48           ! (7_1) res0 = vis_fand(dres,DA0);

2615         fmuld   %f20,%f20,%f2           ! (3_0) res0_hi = x_hi0 * x_hi0;
2616         fsubd   %f10,%f20,%f0           ! (3_0) x_lo0 = x0 - x_hi0;

2618         fmuld   %f54,%f54,%f46          ! (3_0) dtmp0 = y_hi0 * y_hi0;
2619         faddd   %f10,%f20,%f62          ! (3_0) res0_lo = x0 + x_hi0;

2621         fmuld   %f44,%f48,%f10          ! (7_1) dtmp0 = res0_hi * res0;
2622         fsubd   DTWO,%f50,%f20          ! (1_0) dtmp0 = DTWO - dtmp0;

2624         fmuld   %f24,%f22,%f22          ! (0_0) dtmp2 = dd * dres;
2625         faddd   %f60,%f54,%f50          ! (3_0) dtmp1 = y0 + y_hi0;

2627         fmuld   %f38,%f48,%f38          ! (7_1) dtmp1 = res0_lo * res0;
2628         fsubd   %f60,%f54,%f12          ! (3_0) y_lo0 = y0 - y_hi0;

2630         sethi   %hi(0x3ff00000),%g1
2631         add     TBL,TBL_SHIFT+24,%i4

2633         sllx    %g1,32,%g1              ! (5_0) ll = (long long)j0 << 32;
2634         stx     %g1,[%fp+dtmp11]        ! (5_0) *(long long*)&scl0 = ll;
2635         ba      .cont20
```

```
2636         add     TBL,TBL_SHIFT+24,%i3

2638         .align  16
2639 .update18:
2640         cmp     counter,6
2641         ble     1f
2642         nop

2644         sub     counter,6,counter
2645         st      counter,[%fp+tmp_counter]

2647         stx     %i4,[%fp+tmp_px]

2649         stx     %i3,[%fp+tmp_py]

2651         mov     6,counter
2652 1:
2653         fmuld   %f26,%f18,%f50          ! (1_0) dtmp0 = dd * dres;

2655         fand    %f28,DA0,%f48           ! (7_1) res0 = vis_fand(dres,DA0);

2657         fmuld   %f20,%f20,%f2           ! (3_0) res0_hi = x_hi0 * x_hi0;
2658         fsubd   %f10,%f20,%f0           ! (3_0) x_lo0 = x0 - x_hi0;

2660         fmuld   %f54,%f54,%f46          ! (3_0) dtmp0 = y_hi0 * y_hi0;
2661         faddd   %f10,%f20,%f62          ! (3_0) res0_lo = x0 + x_hi0;

2663         fmuld   %f44,%f48,%f10          ! (7_1) dtmp0 = res0_hi * res0;
2664         fsubd   DTWO,%f50,%f20          ! (1_0) dtmp0 = DTWO - dtmp0;

2666         fmuld   %f24,%f22,%f22          ! (0_0) dtmp2 = dd * dres;
2667         faddd   %f60,%f54,%f50          ! (3_0) dtmp1 = y0 + y_hi0;

2669         fmuld   %f38,%f48,%f38          ! (7_1) dtmp1 = res0_lo * res0;
2670         fsubd   %f60,%f54,%f12          ! (3_0) y_lo0 = y0 - y_hi0;

2672         sethi   %hi(0x3ff00000),%g1
2673         add     TBL,TBL_SHIFT+24,%i4

2675         sllx    %g1,32,%g1              ! (5_0) ll = (long long)j0 << 32;
2676         stx     %g1,[%fp+dtmp11]        ! (5_0) *(long long*)&scl0 = ll;
2677         ba      .cont20
2678         add     TBL,TBL_SHIFT+24,%i3

2680         .align  16
2681 .update19:
2682         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
2683         bge,pn  %icc,.cont19a           ! (0_0) if ( hy0 < 0x00100000 )

2685         cmp     counter,6
2686         ble,a   1f
2687         nop

2689         sub     counter,6,counter
2690         st      counter,[%fp+tmp_counter]

2692         stx     %i4,[%fp+tmp_px]

2694         mov     6,counter
2695         stx     %i3,[%fp+tmp_py]
2696 1:
2697         fmuld   %f44,%f48,%f10          ! (7_1) dtmp0 = res0_hi * res0;
2698         sethi   %hi(0x3ff00000),%g1
2699         add     TBL,TBL_SHIFT+24,%i4
2700         fsubd   DTWO,%f50,%f20          ! (1_0) dtmp0 = DTWO - dtmp0;
```



```
2702         ba      .cont19b
2703         add     TBL,TBL_SHIFT+24,%i3

2705         .align  16
2706 .update21:
2707         cmp     counter,7
2708         ble     1f
2709         nop

2711         sub     counter,7,counter
2712         st      counter,[%fp+tmp_counter]

2714         stx     %i2,[%fp+tmp_px]

2716         stx     %o0,[%fp+tmp_py]

2718         mov     7,counter
2719 1:
2720         fsubd   %f50,D2ON36,%f54        ! (4_0) y_hi0 -= D2ON36;

2722         fmuld   %f52,%f14,%f50          ! (2_0) dtmp0 = dd * dres;
2723         faddd   %f48,%f28,%f48          ! (7_1) res0 += dtmp0;

2725         fand    %f26,DA0,%f28           ! (0_0) res0 = vis_fand(dres,DA0);

2727         fmuld   %f46,%f46,%f0           ! (4_0) res0_hi = x_hi0 * x_hi0;
2728         fsubd   %f10,%f46,%f2           ! (4_0) x_lo0 = x0 - x_hi0;

2730         fmuld   %f54,%f54,%f20          ! (4_0) dtmp0 = y_hi0 * y_hi0;
2731         faddd   %f10,%f46,%f62          ! (4_0) res0_lo = x0 + x_hi0;

2733         fmuld   %f16,%f18,%f18          ! (1_0) dtmp2 = dd * dres;
2734         fsubd   DTWO,%f50,%f10          ! (2_0) dtmp0 = DTWO - dtmp0;

2736         fmuld   %f32,%f28,%f50          ! (0_0) dtmp0 = res0_hi * res0;
2737         faddd   %f60,%f54,%f46          ! (4_0) dtmp1 = y0 + y_hi0;

2739         fmuld   %f36,%f28,%f36          ! (0_0) dtmp1 = res0_lo * res0;
2740         sethi   %hi(0x3ff00000),%g1
2741         add     TBL,TBL_SHIFT+24,%i2
2742         fsubd   %f60,%f54,%f60          ! (4_0) y_lo0 = y0 - y_hi0;

2744         sllx    %g1,32,%g1              ! (6_0) ll = (long long)j0 << 32;
2745         stx     %g1,[%fp+dtmp13]        ! (6_0) *(long long*)&scl0 = ll;
2746         ba      .cont24
2747         add     TBL,TBL_SHIFT+24,%o0

2749         .align  16
2750 .update22:
2751         cmp     counter,7
2752         ble     1f
2753         nop

2755         sub     counter,7,counter
2756         st      counter,[%fp+tmp_counter]

2758         stx     %i2,[%fp+tmp_px]

2760         stx     %o0,[%fp+tmp_py]

2762         mov     7,counter
2763 1:
2764         fmuld   %f52,%f14,%f50          ! (2_0) dtmp0 = dd * dres;
2765         faddd   %f48,%f28,%f48          ! (7_1) res0 += dtmp0;

2767         fand    %f26,DA0,%f28           ! (0_0) res0 = vis_fand(dres,DA0);
```

```
2769         fmuld   %f46,%f46,%f0           ! (4_0) res0_hi = x_hi0 * x_hi0;
2770         fsubd   %f10,%f46,%f2           ! (4_0) x_lo0 = x0 - x_hi0;

2772         fmuld   %f54,%f54,%f20          ! (4_0) dtmp0 = y_hi0 * y_hi0;
2773         faddd   %f10,%f46,%f62          ! (4_0) res0_lo = x0 + x_hi0;

2775         fmuld   %f16,%f18,%f18          ! (1_0) dtmp2 = dd * dres;
2776         fsubd   DTWO,%f50,%f10          ! (2_0) dtmp0 = DTWO - dtmp0;

2778         fmuld   %f32,%f28,%f50          ! (0_0) dtmp0 = res0_hi * res0;
2779         faddd   %f60,%f54,%f46          ! (4_0) dtmp1 = y0 + y_hi0;

2781         fmuld   %f36,%f28,%f36          ! (0_0) dtmp1 = res0_lo * res0;
2782         sethi   %hi(0x3ff00000),%g1
2783         add     TBL,TBL_SHIFT+24,%i2
2784         fsubd   %f60,%f54,%f60          ! (4_0) y_lo0 = y0 - y_hi0;

2786         sllx    %g1,32,%g1              ! (6_0) ll = (long long)j0 << 32;
2787         stx     %g1,[%fp+dtmp13]        ! (6_0) *(long long*)&scl0 = ll;
2788         ba      .cont24
2789         add     TBL,TBL_SHIFT+24,%o0

2791         .align  16
2792 .update23:
2793         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
2794         bge,pn  %icc,.cont23a           ! (0_0) if ( hy0 < 0x00100000 )

2796         cmp     counter,7
2797         ble,a   1f
2798         nop

2800         sub     counter,7,counter
2801         st      counter,[%fp+tmp_counter]

2803         stx     %i2,[%fp+tmp_px]

2805         mov     7,counter
2806         stx     %o0,[%fp+tmp_py]
2807 1:
2808         fmuld   %f16,%f18,%f18          ! (1_0) dtmp2 = dd * dres;
2809         sethi   %hi(0x3ff00000),%g1
2810         add     TBL,TBL_SHIFT+24,%i2
2811         fsubd   DTWO,%f50,%f10          ! (2_0) dtmp0 = DTWO - dtmp0;

2813         ba      .cont23b
2814         add     TBL,TBL_SHIFT+24,%o0

2816         .align  16
2817 .update25:
2818         cmp     counter,8
2819         ble     1f
2820         nop

2822         sub     counter,8,counter
2823         st      counter,[%fp+tmp_counter]

2825         stx     %i4,[%fp+tmp_px]

2827         stx     %i3,[%fp+tmp_py]

2829         mov     8,counter
2830 1:
2831         fsubd   %f12,D2ON36,%f54        ! (5_0) y_hi0 -= D2ON36;

2833         fmuld   %f10,%f22,%f50          ! (3_0) dtmp0 = dd * dres;
```



```
2834         faddd   %f28,%f48,%f48          ! (0_0) res0 += dtmp0;

2836         fand    %f16,DA0,%f28           ! (1_0) res0 = vis_fand(dres,DA0);

2838         fmuld   %f20,%f20,%f0           ! (5_0) res0_hi = x_hi0 * x_hi0;
2839         fsubd   %f60,%f20,%f2           ! (5_0) x_lo0 = x0 - x_hi0;

2841         fmuld   %f54,%f54,%f46          ! (5_0) dtmp0 = y_hi0 * y_hi0;
2842         faddd   %f60,%f20,%f62          ! (5_0) res0_lo = x0 + x_hi0;

2844         fmuld   %f26,%f14,%f14          ! (2_0) dtmp2 = dd * dres;
2845         fsubd   DTWO,%f50,%f20          ! (3_0) dtmp0 = DTWO - dtmp0;

2847         fmuld   %f42,%f28,%f60          ! (1_0) dtmp0 = res0_hi * res0;
2848         faddd   %f52,%f54,%f50          ! (5_0) dtmp1 = y0 + y_hi0;

2850         fmuld   %f34,%f28,%f34          ! (1_0) dtmp1 = res0_lo * res0;
2851         sethi   %hi(0x3ff00000),%g1
2852         add     TBL,TBL_SHIFT+24,%i4
2853         fsubd   %f52,%f54,%f54          ! (5_0) y_lo0 = y0 - y_hi0;

2855         sllx    %g1,32,%g1              ! (7_0) ll = (long long)j0 << 32;
2856         stx     %g1,[%fp+dtmp15]        ! (7_0) *(long long*)&scl0 = ll;
2857         ba      .cont28
2858         add     TBL,TBL_SHIFT+24,%i3

2860         .align  16
2861 .update26:
2862         cmp     counter,8
2863         ble     1f
2864         nop

2866         sub     counter,8,counter
2867         st      counter,[%fp+tmp_counter]

2869         stx     %i4,[%fp+tmp_px]

2871         stx     %i3,[%fp+tmp_py]

2873         mov     8,counter
2874 1:
2875         fmuld   %f10,%f22,%f50          ! (3_0) dtmp0 = dd * dres;
2876         faddd   %f28,%f48,%f48          ! (0_0) res0 += dtmp0;

2878         fand    %f16,DA0,%f28           ! (1_0) res0 = vis_fand(dres,DA0);

2880         fmuld   %f20,%f20,%f0           ! (5_0) res0_hi = x_hi0 * x_hi0;
2881         fsubd   %f60,%f20,%f2           ! (5_0) x_lo0 = x0 - x_hi0;

2883         fmuld   %f54,%f54,%f46          ! (5_0) dtmp0 = y_hi0 * y_hi0;
2884         faddd   %f60,%f20,%f62          ! (5_0) res0_lo = x0 + x_hi0;

2886         fmuld   %f26,%f14,%f14          ! (2_0) dtmp2 = dd * dres;
2887         fsubd   DTWO,%f50,%f20          ! (3_0) dtmp0 = DTWO - dtmp0;

2889         fmuld   %f42,%f28,%f60          ! (1_0) dtmp0 = res0_hi * res0;
2890         faddd   %f52,%f54,%f50          ! (5_0) dtmp1 = y0 + y_hi0;

2892         fmuld   %f34,%f28,%f34          ! (1_0) dtmp1 = res0_lo * res0;
2893         sethi   %hi(0x3ff00000),%g1
2894         add     TBL,TBL_SHIFT+24,%i4
2895         fsubd   %f52,%f54,%f54          ! (5_0) y_lo0 = y0 - y_hi0;

2897         sllx    %g1,32,%g1              ! (7_0) ll = (long long)j0 << 32;
2898         stx     %g1,[%fp+dtmp15]        ! (7_0) *(long long*)&scl0 = ll;
2899         ba      .cont28
```

```
2900         add     TBL,TBL_SHIFT+24,%i3

2902         .align  16
2903 .update27:
2904         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
2905         bge,pn  %icc,.cont27a           ! (0_0) if ( hy0 < 0x00100000 )

2907         cmp     counter,8
2908         ble,a   1f
2909         nop

2911         sub     counter,8,counter
2912         st      counter,[%fp+tmp_counter]

2914         stx     %i4,[%fp+tmp_px]

2916         mov     8,counter
2917         stx     %i3,[%fp+tmp_py]
2918 1:
2919         fmuld   %f26,%f14,%f14          ! (2_0) dtmp2 = dd * dres;
2920         sethi   %hi(0x3ff00000),%g1
2921         add     TBL,TBL_SHIFT+24,%i4
2922         fsubd   DTWO,%f50,%f20          ! (3_0) dtmp0 = DTWO - dtmp0;

2924         ba      .cont27b
2925         add     TBL,TBL_SHIFT+24,%i3

2927         .align  16
2928 .update29:
2929         cmp     counter,1
2930         ble     1f
2931         nop

2933         sub     counter,1,counter
2934         st      counter,[%fp+tmp_counter]

2936         stx     %i2,[%fp+tmp_px]

2938         stx     %o0,[%fp+tmp_py]

2940         mov     1,counter
2941 1:
2942         fsubd   %f2,D2ON36,%f2          ! (6_1) y_hi0 -= D2ON36;

2944         fmuld   %f54,%f24,%f50          ! (4_1) dtmp0 = dd * dres;
2945         stx     %g1,[%fp+dtmp0]         ! (7_1) *(long long*)&scl0 = ll;
2946         faddd   %f28,%f48,%f52          ! (1_1) res0 += dtmp0;

2948         fand    %f26,DA0,%f48           ! (2_1) res0 = vis_fand(dres,DA0);

2950         fmuld   %f20,%f20,%f0           ! (6_1) res0_hi = x_hi0 * x_hi0;
2951         fsubd   %f10,%f20,%f28          ! (6_1) x_lo0 = x0 - x_hi0;

2953         fmuld   %f2,%f2,%f46            ! (6_1) dtmp0 = y_hi0 * y_hi0;
2954         add     %i5,stridez,%i5         ! pz += stridez
2955         faddd   %f10,%f20,%f62          ! (6_1) res0_lo = x0 + x_hi0;

2957         fmuld   %f18,%f22,%f22          ! (3_1) dtmp2 = dd * dres;
2958         sethi   %hi(0x3ff00000),%o4
2959         add     TBL,TBL_SHIFT+24,%i2
2960         fsubd   DTWO,%f50,%f20          ! (4_1) dtmp0 = DTWO - dtmp0;

2962         ba      .cont32
2963         add     TBL,TBL_SHIFT+24,%o0

2965         .align  16
```



```
2966 .update30:
2967         cmp     counter,1
2968         ble     1f
2969         nop

2971         sub     counter,1,counter
2972         st      counter,[%fp+tmp_counter]

2974         stx     %i2,[%fp+tmp_px]

2976         stx     %o0,[%fp+tmp_py]

2978         mov     1,counter
2979 1:
2980         fmuld   %f54,%f24,%f50          ! (4_1) dtmp0 = dd * dres;
2981         stx     %g1,[%fp+dtmp0]         ! (7_1) *(long long*)&scl0 = ll;
2982         faddd   %f28,%f48,%f52          ! (1_1) res0 += dtmp0;

2984         fand    %f26,DA0,%f48           ! (2_1) res0 = vis_fand(dres,DA0);

2986         fmuld   %f20,%f20,%f0           ! (6_1) res0_hi = x_hi0 * x_hi0;
2987         fsubd   %f10,%f20,%f28          ! (6_1) x_lo0 = x0 - x_hi0;

2989         fmuld   %f2,%f2,%f46            ! (6_1) dtmp0 = y_hi0 * y_hi0;
2990         add     %i5,stridez,%i5         ! pz += stridez
2991         faddd   %f10,%f20,%f62          ! (6_1) res0_lo = x0 + x_hi0;

2993         fmuld   %f18,%f22,%f22          ! (3_1) dtmp2 = dd * dres;
2994         sethi   %hi(0x3ff00000),%o4
2995         add     TBL,TBL_SHIFT+24,%i2
2996         fsubd   DTWO,%f50,%f20          ! (4_1) dtmp0 = DTWO - dtmp0;

2998         ba      .cont32
2999         add     TBL,TBL_SHIFT+24,%o0

3001         .align  16
3002 .update31:
3003         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
3004         bge,pn  %icc,.cont31            ! (0_0) if ( hy0 < 0x00100000 )

3006         cmp     counter,1
3007         ble,a   1f
3008         nop

3010         sub     counter,1,counter
3011         st      counter,[%fp+tmp_counter]

3013         stx     %i2,[%fp+tmp_px]

3015         mov     1,counter
3016         stx     %o0,[%fp+tmp_py]
3017 1:
3018         fmuld   %f20,%f20,%f0           ! (6_1) res0_hi = x_hi0 * x_hi0;
3019         fsubd   %f10,%f20,%f28          ! (6_1) x_lo0 = x0 - x_hi0;

3021         fmuld   %f2,%f2,%f46            ! (6_1) dtmp0 = y_hi0 * y_hi0;
3022         add     %i5,stridez,%i5         ! pz += stridez
3023         faddd   %f10,%f20,%f62          ! (6_1) res0_lo = x0 + x_hi0;

3025         fmuld   %f18,%f22,%f22          ! (3_1) dtmp2 = dd * dres;
3026         sethi   %hi(0x3ff00000),%o4
3027         add     TBL,TBL_SHIFT+24,%i2
3028         fsubd   DTWO,%f50,%f20          ! (4_1) dtmp0 = DTWO - dtmp0;

3030         ba      .cont32
3031         add     TBL,TBL_SHIFT+24,%o0
```

```
3033         .align  16
3034 .update33:
3035         cmp     counter,2
3036         ble     1f
3037         nop

3039         sub     counter,2,counter
3040         st      counter,[%fp+tmp_counter]

3042         stx     %i4,[%fp+tmp_px]

3044         stx     %i3,[%fp+tmp_py]

3046         mov     2,counter
3047 1:
3048         st      %f1,[%i5+4]             ! (0_1) ((float*)pz)[1] = ((float*)&res0
3049         fsubd   %f50,D2ON36,%f54        ! (7_1) y_hi0 -= D2ON36;

3051         fmuld   %f26,%f16,%f50          ! (5_1) dtmp0 = dd * dres;
3052         faddd   %f48,%f52,%f52          ! (2_1) res0 += dtmp0;

3054         add     %i5,stridez,%i5         ! pz += stridez
3055         stx     %o4,[%fp+dtmp2]         ! (0_0) *(long long*)&scl0 = ll;
3056         fand    %f28,DA0,%f48           ! (3_1) res0 = vis_fand(dres,DA0);

3058         fmuld   %f20,%f20,%f2           ! (7_1) res0_hi = x_hi0 * x_hi0;
3059         fsubd   %f10,%f20,%f0           ! (7_1) x_lo0 = x0 - x_hi0;

3061         fmuld   %f54,%f54,%f46          ! (7_1) dtmp0 = y_hi0 * y_hi0;
3062         faddd   %f10,%f20,%f62          ! (7_1) res0_lo = x0 + x_hi0;

3064         fmuld   %f44,%f48,%f10          ! (3_1) dtmp0 = res0_hi * res0;
3065         fsubd   DTWO,%f50,%f20          ! (5_1) dtmp0 = DTWO - dtmp0;

3067         fmuld   %f14,%f24,%f24          ! (4_1) dtmp2 = dd * dres;
3068         faddd   %f60,%f54,%f50          ! (7_1) dtmp1 = y0 + y_hi0;

3070         fmuld   %f38,%f48,%f38          ! (3_1) dtmp1 = res0_lo * res0;
3071         sethi   %hi(0x3ff00000),%o4
3072         add     TBL,TBL_SHIFT+24,%i4
3073         fsubd   %f60,%f54,%f12          ! (7_1) y_lo0 = y0 - y_hi0;

3075         sllx    %o4,32,%o4              ! (1_0) ll = (long long)j0 << 32;
3076         stx     %o4,[%fp+dtmp3]         ! (1_0) *(long long*)&scl0 = ll;
3077         ba      .cont36
3078         add     TBL,TBL_SHIFT+24,%i3

3080         .align  16
3081 .update34:
3082         cmp     counter,2
3083         ble     1f
3084         nop

3086         sub     counter,2,counter
3087         st      counter,[%fp+tmp_counter]

3089         stx     %i4,[%fp+tmp_px]

3091         stx     %i3,[%fp+tmp_py]

3093         mov     2,counter
3094 1:
3095         add     %i5,stridez,%i5         ! pz += stridez
3096         stx     %o4,[%fp+dtmp2]         ! (0_0) *(long long*)&scl0 = ll;
3097         fand    %f28,DA0,%f48           ! (3_1) res0 = vis_fand(dres,DA0);
```



```
3099         fmuld   %f20,%f20,%f2           ! (7_1) res0_hi = x_hi0 * x_hi0;
3100         fsubd   %f10,%f20,%f0           ! (7_1) x_lo0 = x0 - x_hi0;

3102         fmuld   %f54,%f54,%f46          ! (7_1) dtmp0 = y_hi0 * y_hi0;
3103         faddd   %f10,%f20,%f62          ! (7_1) res0_lo = x0 + x_hi0;

3105         fmuld   %f44,%f48,%f10          ! (3_1) dtmp0 = res0_hi * res0;
3106         fsubd   DTWO,%f50,%f20          ! (5_1) dtmp0 = DTWO - dtmp0;

3108         fmuld   %f14,%f24,%f24          ! (4_1) dtmp2 = dd * dres;
3109         faddd   %f60,%f54,%f50          ! (7_1) dtmp1 = y0 + y_hi0;

3111         fmuld   %f38,%f48,%f38          ! (3_1) dtmp1 = res0_lo * res0;
3112         sethi   %hi(0x3ff00000),%o4
3113         add     TBL,TBL_SHIFT+24,%i4
3114         fsubd   %f60,%f54,%f12          ! (7_1) y_lo0 = y0 - y_hi0;

3116         sllx    %o4,32,%o4              ! (1_0) ll = (long long)j0 << 32;
3117         stx     %o4,[%fp+dtmp3]         ! (1_0) *(long long*)&scl0 = ll;
3118         ba      .cont36
3119         add     TBL,TBL_SHIFT+24,%i3

3121         .align  16
3122 .update35:
3123         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
3124         bge,pn  %icc,.cont35a           ! (0_0) if ( hy0 < 0x00100000 )

3126         cmp     counter,2
3127         ble,a   1f
3128         nop

3130         sub     counter,2,counter
3131         st      counter,[%fp+tmp_counter]

3133         stx     %i4,[%fp+tmp_px]

3135         mov     2,counter
3136         stx     %i3,[%fp+tmp_py]
3137 1:
3138         fmuld   %f44,%f48,%f10          ! (3_1) dtmp0 = res0_hi * res0;
3139         sethi   %hi(0x3ff00000),%o4
3140         add     TBL,TBL_SHIFT+24,%i4
3141         fsubd   DTWO,%f50,%f20          ! (5_1) dtmp0 = DTWO - dtmp0;

3143         ba      .cont35b
3144         add     TBL,TBL_SHIFT+24,%i3

3146         .align  16
3147 .update37:
3148         cmp     counter,3
3149         ble     1f
3150         nop

3152         sub     counter,3,counter
3153         st      counter,[%fp+tmp_counter]

3155         stx     %i2,[%fp+tmp_px]

3157         stx     %o0,[%fp+tmp_py]

3159         mov     3,counter
3160 1:
3161         st      %f1,[%i5+4]             ! (1_1) ((float*)pz)[1] = ((float*)&res0
3162         fsubd   %f12,D2ON36,%f54        ! (0_0) y_hi0 -= D2ON36;
```

```
3164         fmuld   %f28,%f18,%f50          ! (6_1) dtmp0 = dd * dres;
3165         faddd   %f48,%f52,%f52          ! (3_1) res0 += dtmp0;

3167         add     %i5,stridez,%i5         ! pz += stridez
3168         stx     %o4,[%fp+dtmp4]         ! (1_0) *(long long*)&scl0 = ll;
3169         fand    %f26,DA0,%f48           ! (4_1) res0 = vis_fand(dres,DA0);

3171         fmuld   %f20,%f20,%f2           ! (0_0) res0_hi = x_hi0 * x_hi0;
3172         fsubd   %f10,%f20,%f0           ! (0_0) x_lo0 = x0 - x_hi0;

3174         fmuld   %f54,%f54,%f46          ! (0_0) dtmp0 = y_hi0 * y_hi0;
3175         faddd   %f10,%f20,%f62          ! (0_0) res0_lo = x0 + x_hi0;

3177         fmuld   %f32,%f48,%f10          ! (4_1) dtmp0 = res0_hi * res0;
3178         fsubd   DTWO,%f50,%f20          ! (6_1) dtmp0 = DTWO - dtmp0;

3180         fmuld   %f22,%f16,%f16          ! (5_1) dtmp2 = dd * dres;
3181         faddd   %f60,%f54,%f50          ! (0_0) dtmp1 = y0 + y_hi0;

3183         fmuld   %f36,%f48,%f36          ! (4_1) dtmp1 = res0_lo * res0;
3184         sethi   %hi(0x3ff00000),%g1
3185         add     TBL,TBL_SHIFT+24,%i2
3186         fsubd   %f60,%f54,%f12          ! (0_0) y_lo0 = y0 - y_hi0;

3188         sllx    %g1,32,%g1              ! (2_0) ll = (long long)j0 << 32;
3189         stx     %g1,[%fp+dtmp5]         ! (2_0) *(long long*)&scl0 = ll;
3190         ba      .cont40
3191         add     TBL,TBL_SHIFT+24,%o0

3193         .align  16
3194 .update38:
3195         cmp     counter,3
3196         ble     1f
3197         nop

3199         sub     counter,3,counter
3200         st      counter,[%fp+tmp_counter]

3202         stx     %i2,[%fp+tmp_px]

3204         stx     %o0,[%fp+tmp_py]

3206         mov     3,counter
3207 1:
3208         add     %i5,stridez,%i5         ! pz += stridez
3209         stx     %o4,[%fp+dtmp4]         ! (1_0) *(long long*)&scl0 = ll;
3210         fand    %f26,DA0,%f48           ! (4_1) res0 = vis_fand(dres,DA0);

3212         fmuld   %f20,%f20,%f2           ! (0_0) res0_hi = x_hi0 * x_hi0;
3213         fsubd   %f10,%f20,%f0           ! (0_0) x_lo0 = x0 - x_hi0;

3215         fmuld   %f54,%f54,%f46          ! (0_0) dtmp0 = y_hi0 * y_hi0;
3216         faddd   %f10,%f20,%f62          ! (0_0) res0_lo = x0 + x_hi0;

3218         fmuld   %f32,%f48,%f10          ! (4_1) dtmp0 = res0_hi * res0;
3219         fsubd   DTWO,%f50,%f20          ! (6_1) dtmp0 = DTWO - dtmp0;

3221         fmuld   %f22,%f16,%f16          ! (5_1) dtmp2 = dd * dres;
3222         faddd   %f60,%f54,%f50          ! (0_0) dtmp1 = y0 + y_hi0;

3224         fmuld   %f36,%f48,%f36          ! (4_1) dtmp1 = res0_lo * res0;
3225         sethi   %hi(0x3ff00000),%g1
3226         add     TBL,TBL_SHIFT+24,%i2
3227         fsubd   %f60,%f54,%f12          ! (0_0) y_lo0 = y0 - y_hi0;

3229         sllx    %g1,32,%g1              ! (2_0) ll = (long long)j0 << 32;
```



```
3230         stx     %g1,[%fp+dtmp5]         ! (2_0) *(long long*)&scl0 = ll;
3231         ba      .cont40
3232         add     TBL,TBL_SHIFT+24,%o0

3234         .align  16
3235 .update39:
3236         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
3237         bge,pn  %icc,.cont39a           ! (0_0) if ( hy0 < 0x00100000 )

3239         cmp     counter,3
3240         ble,a   1f
3241         nop

3243         sub     counter,3,counter
3244         st      counter,[%fp+tmp_counter]

3246         stx     %i2,[%fp+tmp_px]

3248         mov     3,counter
3249         stx     %o0,[%fp+tmp_py]
3250 1:
3251         fmuld   %f32,%f48,%f10          ! (4_1) dtmp0 = res0_hi * res0;
3252         sethi   %hi(0x3ff00000),%g1
3253         add     TBL,TBL_SHIFT+24,%i2
3254         fsubd   DTWO,%f50,%f20          ! (6_1) dtmp0 = DTWO - dtmp0;

3256         ba      .cont39b
3257         add     TBL,TBL_SHIFT+24,%o0

3259         .align  16
3260 .update41:
3261         cmp     counter,4
3262         ble     1f
3263         nop

3265         sub     counter,4,counter
3266         st      counter,[%fp+tmp_counter]

3268         stx     %i4,[%fp+tmp_px]

3270         stx     %i3,[%fp+tmp_py]

3272         mov     4,counter
3273 1:
3274         st      %f1,[%i5+4]             ! (2_1) ((float*)pz)[1] = ((float*)&res0
3275         fsubd   %f12,D2ON36,%f54        ! (1_0) y_hi0 -= D2ON36;

3277         fmuld   %f26,%f14,%f50          ! (7_1) dtmp0 = dd * dres;
3278         faddd   %f48,%f52,%f52          ! (4_1) res0 += dtmp0;

3280         add     %i5,stridez,%i5         ! pz += stridez
3281         stx     %g1,[%fp+dtmp6]         ! (2_0) *(long long*)&scl0 = ll;
3282         fand    %f28,DA0,%f48           ! (5_1) res0 = vis_fand(dres,DA0);

3284         fmuld   %f20,%f20,%f2           ! (1_0) res0_hi = x_hi0 * x_hi0;
3285         fsubd   %f10,%f20,%f0           ! (1_0) x_lo0 = x0 - x_hi0;

3287         fmuld   %f54,%f54,%f46          ! (1_0) dtmp0 = y_hi0 * y_hi0;
3288         faddd   %f10,%f20,%f62          ! (1_0) res0_lo = x0 + x_hi0;

3290         fmuld   %f42,%f48,%f10          ! (5_1) dtmp0 = res0_hi * res0;
3291         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp0 = DTWO - dtmp0;

3293         fmuld   %f24,%f18,%f18          ! (6_1) dtmp2 = dd * dres;
3294         faddd   %f60,%f54,%f50          ! (1_0) dtmp1 = y0 + y_hi0;
```

```
3296         fmuld   %f34,%f48,%f34          ! (5_1) dtmp1 = res0_lo * res0;
3297         sethi   %hi(0x3ff00000),%g1
3298         add     TBL,TBL_SHIFT+24,%i4
3299         fsubd   %f60,%f54,%f12          ! (1_0) y_lo0 = y0 - y_hi0

3301         sllx    %g1,32,%g1              ! (3_0) ll = (long long)j0 << 32;
3302         stx     %g1,[%fp+dtmp7]         ! (3_0) *(long long*)&scl0 = ll;
3303         ba      .cont44
3304         add     TBL,TBL_SHIFT+24,%i3

3306         .align  16
3307 .update42:
3308         cmp     counter,4
3309         ble     1f
3310         nop

3312         sub     counter,4,counter
3313         st      counter,[%fp+tmp_counter]

3315         stx     %i4,[%fp+tmp_px]

3317         stx     %i3,[%fp+tmp_py]

3319         mov     4,counter
3320 1:
3321         add     %i5,stridez,%i5         ! pz += stridez
3322         stx     %g1,[%fp+dtmp6]         ! (2_0) *(long long*)&scl0 = ll;
3323         fand    %f28,DA0,%f48           ! (5_1) res0 = vis_fand(dres,DA0);

3325         fmuld   %f20,%f20,%f2           ! (1_0) res0_hi = x_hi0 * x_hi0;
3326         fsubd   %f10,%f20,%f0           ! (1_0) x_lo0 = x0 - x_hi0;

3328         fmuld   %f54,%f54,%f46          ! (1_0) dtmp0 = y_hi0 * y_hi0;
3329         faddd   %f10,%f20,%f62          ! (1_0) res0_lo = x0 + x_hi0;

3331         fmuld   %f42,%f48,%f10          ! (5_1) dtmp0 = res0_hi * res0;
3332         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp0 = DTWO - dtmp0;

3334         fmuld   %f24,%f18,%f18          ! (6_1) dtmp2 = dd * dres;
3335         faddd   %f60,%f54,%f50          ! (1_0) dtmp1 = y0 + y_hi0;

3337         fmuld   %f34,%f48,%f34          ! (5_1) dtmp1 = res0_lo * res0;
3338         sethi   %hi(0x3ff00000),%g1
3339         add     TBL,TBL_SHIFT+24,%i4
3340         fsubd   %f60,%f54,%f12          ! (1_0) y_lo0 = y0 - y_hi0

3342         sllx    %g1,32,%g1              ! (3_0) ll = (long long)j0 << 32;
3343         stx     %g1,[%fp+dtmp7]         ! (3_0) *(long long*)&scl0 = ll;
3344         ba      .cont44
3345         add     TBL,TBL_SHIFT+24,%i3

3347         .align  16
3348 .update43:
3349         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
3350         bge,pn  %icc,.cont43a           ! (0_0) if ( hy0 < 0x00100000 )

3352         cmp     counter,4
3353         ble,a   1f
3354         nop

3356         sub     counter,4,counter
3357         st      counter,[%fp+tmp_counter]

3359         stx     %i4,[%fp+tmp_px]

3361         mov     4,counter
```



```
3362         stx     %i3,[%fp+tmp_py]
3363 1:
3364         fmuld   %f42,%f48,%f10          ! (5_1) dtmp0 = res0_hi * res0;
3365         sethi   %hi(0x3ff00000),%g1
3366         add     TBL,TBL_SHIFT+24,%i4
3367         fsubd   DTWO,%f50,%f20          ! (7_1) dtmp0 = DTWO - dtmp0;

3369         ba      .cont43b
3370         add     TBL,TBL_SHIFT+24,%i3

3372         .align  16
3373 .update45:
3374         cmp     counter,5
3375         ble     1f
3376         nop

3378         sub     counter,5,counter
3379         st      counter,[%fp+tmp_counter]

3381         stx     %i2,[%fp+tmp_px]

3383         stx     %o0,[%fp+tmp_py]

3385         mov     5,counter
3386 1:
3387         fsubd   %f50,D2ON36,%f54        ! (2_0) y_hi0 -= D2ON36;

3389         fmuld   %f28,%f22,%f50          ! (0_0) dtmp0 = dd * dres;
3390         st      %f1,[%i5+4]             ! (3_1) ((float*)pz)[1] = ((float*)&res0
3391         faddd   %f48,%f52,%f52          ! (5_1) res0 += dtmp0;

3393         fand    %f26,DA0,%f48           ! (6_1) res0 = vis_fand(dres,DA0);

3395         fmuld   %f20,%f20,%f2           ! (2_0) res0_hi = x_hi0 * x_hi0;
3396         stx     %g1,[%fp+dtmp8]         ! (3_0) *(long long*)&scl0 = ll;
3397         fsubd   %f10,%f20,%f0           ! (2_0) x_lo0 = x0 - x_hi0;

3399         fmuld   %f54,%f54,%f46          ! (2_0) dtmp0 = y_hi0 * y_hi0;
3400         add     %i5,stridez,%i5         ! pz += stridez
3401         faddd   %f10,%f20,%f62          ! (2_0) res0_lo = x0 + x_hi0;

3403         fmuld   %f30,%f48,%f10          ! (6_1) dtmp0 = res0_hi * res0;
3404         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp0 = DTWO - dtmp0;

3406         fmuld   %f16,%f14,%f14          ! (7_1) dtmp2 = dd * dres;
3407         faddd   %f60,%f54,%f50          ! (2_0) dtmp1 = y0 + y_hi0;

3409         fmuld   %f40,%f48,%f40          ! (6_1) dtmp1 = res0_lo * res0;
3410         sethi   %hi(0x3ff00000),%g1
3411         add     TBL,TBL_SHIFT+24,%i2
3412         fsubd   %f60,%f54,%f12          ! (2_0) y_lo0 = y0 - y_hi0;

3414         sllx    %g1,32,%g1              ! (4_0) ll = (long long)j0 << 32;
3415         stx     %g1,[%fp+dtmp9]         ! (4_0) *(long long*)&scl0 = ll;
3416         ba      .cont48
3417         add     TBL,TBL_SHIFT+24,%o0

3419         .align  16
3420 .update46:
3421         cmp     counter,5
3422         ble     1f
3423         nop

3425         sub     counter,5,counter
3426         st      counter,[%fp+tmp_counter]
```

```
3428         stx     %i2,[%fp+tmp_px]

3430         stx     %o0,[%fp+tmp_py]

3432         mov     5,counter
3433 1:
3434         fmuld   %f28,%f22,%f50          ! (0_0) dtmp0 = dd * dres;
3435         st      %f1,[%i5+4]             ! (3_1) ((float*)pz)[1] = ((float*)&res0
3436         faddd   %f48,%f52,%f52          ! (5_1) res0 += dtmp0;

3438         fand    %f26,DA0,%f48           ! (6_1) res0 = vis_fand(dres,DA0);

3440         fmuld   %f20,%f20,%f2           ! (2_0) res0_hi = x_hi0 * x_hi0;
3441         stx     %g1,[%fp+dtmp8]         ! (3_0) *(long long*)&scl0 = ll;
3442         fsubd   %f10,%f20,%f0           ! (2_0) x_lo0 = x0 - x_hi0;

3444         fmuld   %f54,%f54,%f46          ! (2_0) dtmp0 = y_hi0 * y_hi0;
3445         add     %i5,stridez,%i5         ! pz += stridez
3446         faddd   %f10,%f20,%f62          ! (2_0) res0_lo = x0 + x_hi0;

3448         fmuld   %f30,%f48,%f10          ! (6_1) dtmp0 = res0_hi * res0;
3449         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp0 = DTWO - dtmp0;

3451         fmuld   %f16,%f14,%f14          ! (7_1) dtmp2 = dd * dres;
3452         faddd   %f60,%f54,%f50          ! (2_0) dtmp1 = y0 + y_hi0;

3454         fmuld   %f40,%f48,%f40          ! (6_1) dtmp1 = res0_lo * res0;
3455         sethi   %hi(0x3ff00000),%g1
3456         add     TBL,TBL_SHIFT+24,%i2
3457         fsubd   %f60,%f54,%f12          ! (2_0) y_lo0 = y0 - y_hi0;

3459         sllx    %g1,32,%g1              ! (4_0) ll = (long long)j0 << 32;
3460         stx     %g1,[%fp+dtmp9]         ! (4_0) *(long long*)&scl0 = ll;
3461         ba      .cont48
3462         add     TBL,TBL_SHIFT+24,%o0

3464         .align  16
3465 .update47:
3466         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
3467         bge,pn  %icc,.cont47a           ! (0_0) if ( hy0 < 0x00100000 )

3469         cmp     counter,5
3470         ble,a   1f
3471         nop

3473         sub     counter,5,counter
3474         st      counter,[%fp+tmp_counter]

3476         stx     %i2,[%fp+tmp_px]

3478         mov     5,counter
3479         stx     %o0,[%fp+tmp_py]
3480 1:
3481         fmuld   %f20,%f20,%f2           ! (2_0) res0_hi = x_hi0 * x_hi0;
3482         stx     %g1,[%fp+dtmp8]         ! (3_0) *(long long*)&scl0 = ll;
3483         fsubd   %f10,%f20,%f0           ! (2_0) x_lo0 = x0 - x_hi0;

3485         fmuld   %f54,%f54,%f46          ! (2_0) dtmp0 = y_hi0 * y_hi0;
3486         add     %i5,stridez,%i5         ! pz += stridez
3487         faddd   %f10,%f20,%f62          ! (2_0) res0_lo = x0 + x_hi0;

3489         fmuld   %f30,%f48,%f10          ! (6_1) dtmp0 = res0_hi * res0;
3490         sethi   %hi(0x3ff00000),%g1
3491         add     TBL,TBL_SHIFT+24,%i2
3492         fsubd   DTWO,%f50,%f20          ! (0_0) dtmp0 = DTWO - dtmp0;
```



```
3494         ba      .cont47b
3495         add     TBL,TBL_SHIFT+24,%o0

3497         .align  16
3498 .update49:
3499         cmp     counter,6
3500         ble     1f
3501         nop

3503         sub     counter,6,counter
3504         st      counter,[%fp+tmp_counter]

3506         stx     %i4,[%fp+tmp_px]

3508         stx     %i3,[%fp+tmp_py]

3510         mov     6,counter
3511 1:
3512         fsubd   %f50,D2ON36,%f54        ! (3_0) y_hi0 -= D2ON36;

3514         fmuld   %f26,%f18,%f50          ! (1_0) dtmp0 = dd * dres;
3515         st      %f1,[%i5+4]             ! (4_1) ((float*)pz)[1] = ((float*)&res0
3516         faddd   %f48,%f52,%f52          ! (6_1) res0 += dtmp0;

3518         fand    %f28,DA0,%f48           ! (7_1) res0 = vis_fand(dres,DA0);

3520         fmuld   %f20,%f20,%f2           ! (3_0) res0_hi = x_hi0 * x_hi0;
3521         stx     %g1,[%fp+dtmp10]        ! (4_0) *(long long*)&scl0 = ll;
3522         fsubd   %f10,%f20,%f0           ! (3_0) x_lo0 = x0 - x_hi0;

3524         fmuld   %f54,%f54,%f46          ! (3_0) dtmp0 = y_hi0 * y_hi0;
3525         add     %i5,stridez,%i5         ! pz += stridez
3526         faddd   %f10,%f20,%f62          ! (3_0) res0_lo = x0 + x_hi0;

3528         fmuld   %f44,%f48,%f10          ! (7_1) dtmp0 = res0_hi * res0;
3529         fsubd   DTWO,%f50,%f20          ! (1_0) dtmp0 = DTWO - dtmp0;

3531         fmuld   %f24,%f22,%f22          ! (0_0) dtmp2 = dd * dres;
3532         faddd   %f60,%f54,%f50          ! (3_0) dtmp1 = y0 + y_hi0;

3534         fmuld   %f38,%f48,%f38          ! (7_1) dtmp1 = res0_lo * res0;
3535         sethi   %hi(0x3ff00000),%g1
3536         add     TBL,TBL_SHIFT+24,%i4
3537         fsubd   %f60,%f54,%f12          ! (3_0) y_lo0 = y0 - y_hi0;

3539         sllx    %g1,32,%g1              ! (5_0) ll = (long long)j0 << 32;
3540         stx     %g1,[%fp+dtmp11]        ! (5_0) *(long long*)&scl0 = ll;
3541         ba      .cont52
3542         add     TBL,TBL_SHIFT+24,%i3

3544         .align  16
3545 .update50:
3546         cmp     counter,6
3547         ble     1f
3548         nop

3550         sub     counter,6,counter
3551         st      counter,[%fp+tmp_counter]

3553         stx     %i4,[%fp+tmp_px]

3555         stx     %i3,[%fp+tmp_py]

3557         mov     6,counter
3558 1:
3559         fmuld   %f26,%f18,%f50          ! (1_0) dtmp0 = dd * dres;
```

```
3560         st      %f1,[%i5+4]             ! (4_1) ((float*)pz)[1] = ((float*)&res0
3561         faddd   %f48,%f52,%f52          ! (6_1) res0 += dtmp0;

3563         fand    %f28,DA0,%f48           ! (7_1) res0 = vis_fand(dres,DA0);

3565         fmuld   %f20,%f20,%f2           ! (3_0) res0_hi = x_hi0 * x_hi0;
3566         stx     %g1,[%fp+dtmp10]        ! (4_0) *(long long*)&scl0 = ll;
3567         fsubd   %f10,%f20,%f0           ! (3_0) x_lo0 = x0 - x_hi0;

3569         fmuld   %f54,%f54,%f46          ! (3_0) dtmp0 = y_hi0 * y_hi0;
3570         add     %i5,stridez,%i5         ! pz += stridez
3571         faddd   %f10,%f20,%f62          ! (3_0) res0_lo = x0 + x_hi0;

3573         fmuld   %f44,%f48,%f10          ! (7_1) dtmp0 = res0_hi * res0;
3574         fsubd   DTWO,%f50,%f20          ! (1_0) dtmp0 = DTWO - dtmp0;

3576         fmuld   %f24,%f22,%f22          ! (0_0) dtmp2 = dd * dres;
3577         faddd   %f60,%f54,%f50          ! (3_0) dtmp1 = y0 + y_hi0;

3579         fmuld   %f38,%f48,%f38          ! (7_1) dtmp1 = res0_lo * res0;
3580         sethi   %hi(0x3ff00000),%g1
3581         add     TBL,TBL_SHIFT+24,%i4
3582         fsubd   %f60,%f54,%f12          ! (3_0) y_lo0 = y0 - y_hi0;

3584         sllx    %g1,32,%g1              ! (5_0) ll = (long long)j0 << 32;
3585         stx     %g1,[%fp+dtmp11]        ! (5_0) *(long long*)&scl0 = ll;
3586         ba      .cont52
3587         add     TBL,TBL_SHIFT+24,%i3

3589         .align  16
3590 .update51:
3591         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
3592         bge,pn  %icc,.cont51a           ! (0_0) if ( hy0 < 0x00100000 )

3594         cmp     counter,6
3595         ble,a   1f
3596         nop

3598         sub     counter,6,counter
3599         st      counter,[%fp+tmp_counter]

3601         stx     %i4,[%fp+tmp_px]

3603         mov     6,counter
3604         stx     %i3,[%fp+tmp_py]
3605 1:
3606         fmuld   %f20,%f20,%f2           ! (3_0) res0_hi = x_hi0 * x_hi0;
3607         stx     %g1,[%fp+dtmp10]        ! (4_0) *(long long*)&scl0 = ll;
3608         fsubd   %f10,%f20,%f0           ! (3_0) x_lo0 = x0 - x_hi0;

3610         fmuld   %f54,%f54,%f46          ! (3_0) dtmp0 = y_hi0 * y_hi0;
3611         add     %i5,stridez,%i5         ! pz += stridez
3612         faddd   %f10,%f20,%f62          ! (3_0) res0_lo = x0 + x_hi0;

3614         fmuld   %f44,%f48,%f10          ! (7_1) dtmp0 = res0_hi * res0;
3615         sethi   %hi(0x3ff00000),%g1
3616         add     TBL,TBL_SHIFT+24,%i4
3617         fsubd   DTWO,%f50,%f20          ! (1_0) dtmp0 = DTWO - dtmp0;

3619         ba      .cont51b
3620         add     TBL,TBL_SHIFT+24,%i3

3622         .align  16
3623 .update53:
3624         cmp     counter,7
3625         ble     1f
```



```
3626         nop

3628         sub     counter,7,counter
3629         st      counter,[%fp+tmp_counter]

3631         stx     %i2,[%fp+tmp_px]

3633         stx     %o0,[%fp+tmp_py]

3635         mov     7,counter
3636 1:
3637         fsubd   %f50,D2ON36,%f54        ! (4_0) y_hi0 -= D2ON36;

3639         fmuld   %f52,%f14,%f50          ! (2_0) dtmp0 = dd * dres;
3640         st      %f1,[%i5+4]             ! (5_1) ((float*)pz)[1] = ((float*)&res0
3641         faddd   %f48,%f28,%f48          ! (7_1) res0 += dtmp0;

3643         fand    %f26,DA0,%f28           ! (0_0) res0 = vis_fand(dres,DA0);

3645         fmuld   %f46,%f46,%f0           ! (4_0) res0_hi = x_hi0 * x_hi0;
3646         stx     %g1,[%fp+dtmp12]        ! (5_0) *(long long*)&scl0 = ll;
3647         fsubd   %f10,%f46,%f2           ! (4_0) x_lo0 = x0 - x_hi0;

3649         fmuld   %f54,%f54,%f20          ! (4_0) dtmp0 = y_hi0 * y_hi0;
3650         add     %i5,stridez,%i5         ! pz += stridez
3651         faddd   %f10,%f46,%f62          ! (4_0) res0_lo = x0 + x_hi0;

3653         fmuld   %f16,%f18,%f18          ! (1_0) dtmp2 = dd * dres;
3654         fsubd   DTWO,%f50,%f10          ! (2_0) dtmp0 = DTWO - dtmp0;

3656         fmuld   %f32,%f28,%f50          ! (0_0) dtmp0 = res0_hi * res0;
3657         faddd   %f60,%f54,%f46          ! (4_0) dtmp1 = y0 + y_hi0;

3659         fmuld   %f36,%f28,%f36          ! (0_0) dtmp1 = res0_lo * res0;
3660         sethi   %hi(0x3ff00000),%g1
3661         add     TBL,TBL_SHIFT+24,%i2
3662         fsubd   %f60,%f54,%f60          ! (4_0) y_lo0 = y0 - y_hi0;

3664         sllx    %g1,32,%g1              ! (6_0) ll = (long long)j0 << 32;
3665         stx     %g1,[%fp+dtmp13]        ! (6_0) *(long long*)&scl0 = ll;
3666         ba      .cont56
3667         add     TBL,TBL_SHIFT+24,%o0

3669         .align  16
3670 .update54:
3671         cmp     counter,7
3672         ble     1f
3673         nop

3675         sub     counter,7,counter
3676         st      counter,[%fp+tmp_counter]

3678         stx     %i2,[%fp+tmp_px]

3680         stx     %o0,[%fp+tmp_py]

3682         mov     7,counter
3683 1:
3684         fmuld   %f52,%f14,%f50          ! (2_0) dtmp0 = dd * dres;
3685         st      %f1,[%i5+4]             ! (5_1) ((float*)pz)[1] = ((float*)&res0
3686         faddd   %f48,%f28,%f48          ! (7_1) res0 += dtmp0;

3688         fand    %f26,DA0,%f28           ! (0_0) res0 = vis_fand(dres,DA0);

3690         fmuld   %f46,%f46,%f0           ! (4_0) res0_hi = x_hi0 * x_hi0;
3691         stx     %g1,[%fp+dtmp12]        ! (5_0) *(long long*)&scl0 = ll;
```

```
3692         fsubd   %f10,%f46,%f2           ! (4_0) x_lo0 = x0 - x_hi0;

3694         fmuld   %f54,%f54,%f20          ! (4_0) dtmp0 = y_hi0 * y_hi0;
3695         add     %i5,stridez,%i5         ! pz += stridez
3696         faddd   %f10,%f46,%f62          ! (4_0) res0_lo = x0 + x_hi0;

3698         fmuld   %f16,%f18,%f18          ! (1_0) dtmp2 = dd * dres;
3699         fsubd   DTWO,%f50,%f10          ! (2_0) dtmp0 = DTWO - dtmp0;

3701         fmuld   %f32,%f28,%f50          ! (0_0) dtmp0 = res0_hi * res0;
3702         faddd   %f60,%f54,%f46          ! (4_0) dtmp1 = y0 + y_hi0;

3704         fmuld   %f36,%f28,%f36          ! (0_0) dtmp1 = res0_lo * res0;
3705         sethi   %hi(0x3ff00000),%g1
3706         add     TBL,TBL_SHIFT+24,%i2
3707         fsubd   %f60,%f54,%f60          ! (4_0) y_lo0 = y0 - y_hi0;

3709         sllx    %g1,32,%g1              ! (6_0) ll = (long long)j0 << 32;
3710         stx     %g1,[%fp+dtmp13]        ! (6_0) *(long long*)&scl0 = ll;
3711         ba      .cont56
3712         add     TBL,TBL_SHIFT+24,%o0

3714         .align  16
3715 .update55:
3716         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
3717         bge,pn  %icc,.cont55a           ! (0_0) if ( hy0 < 0x00100000 )

3719         cmp     counter,7
3720         ble,a   1f
3721         nop

3723         sub     counter,7,counter
3724         st      counter,[%fp+tmp_counter]

3726         stx     %i2,[%fp+tmp_px]

3728         mov     7,counter
3729         stx     %o0,[%fp+tmp_py]
3730 1:
3731         fmuld   %f46,%f46,%f0           ! (4_0) res0_hi = x_hi0 * x_hi0;
3732         stx     %g1,[%fp+dtmp12]        ! (5_0) *(long long*)&scl0 = ll;
3733         fsubd   %f10,%f46,%f2           ! (4_0) x_lo0 = x0 - x_hi0;

3735         fmuld   %f54,%f54,%f20          ! (4_0) dtmp0 = y_hi0 * y_hi0;
3736         add     %i5,stridez,%i5         ! pz += stridez
3737         faddd   %f10,%f46,%f62          ! (4_0) res0_lo = x0 + x_hi0;

3739         fmuld   %f16,%f18,%f18          ! (1_0) dtmp2 = dd * dres;
3740         sethi   %hi(0x3ff00000),%g1
3741         add     TBL,TBL_SHIFT+24,%i2
3742         fsubd   DTWO,%f50,%f10          ! (2_0) dtmp0 = DTWO - dtmp0;

3744         ba      .cont55b
3745         add     TBL,TBL_SHIFT+24,%o0

3747         .align  16
3748 .update57:
3749         cmp     counter,8
3750         ble     1f
3751         nop

3753         sub     counter,8,counter
3754         st      counter,[%fp+tmp_counter]

3756         stx     %i4,[%fp+tmp_px]
```



```
3758         stx     %i3,[%fp+tmp_py]

3760         mov     8,counter
3761 1:
3762         fsubd   %f12,D2ON36,%f54        ! (5_0) y_hi0 -= D2ON36;

3764         fmuld   %f10,%f22,%f50          ! (3_0) dtmp0 = dd * dres;
3765         st      %f3,[%i5+4]             ! (6_1) ((float*)pz)[1] = ((float*)&res0
3766         faddd   %f28,%f48,%f48          ! (0_0) res0 += dtmp0;

3768         fand    %f16,DA0,%f28           ! (1_0) res0 = vis_fand(dres,DA0);

3770         fmuld   %f20,%f20,%f0           ! (5_0) res0_hi = x_hi0 * x_hi0;
3771         stx     %g1,[%fp+dtmp14]        ! (6_0) *(long long*)&scl0 = ll;
3772         fsubd   %f60,%f20,%f2           ! (5_0) x_lo0 = x0 - x_hi0;

3774         fmuld   %f54,%f54,%f46          ! (5_0) dtmp0 = y_hi0 * y_hi0;
3775         add     %i5,stridez,%i5         ! pz += stridez
3776         faddd   %f60,%f20,%f62          ! (5_0) res0_lo = x0 + x_hi0;

3778         fmuld   %f26,%f14,%f14          ! (2_0) dtmp2 = dd * dres;
3779         fsubd   DTWO,%f50,%f20          ! (3_0) dtmp0 = DTWO - dtmp0;

3781         fmuld   %f42,%f28,%f60          ! (1_0) dtmp0 = res0_hi * res0;
3782         faddd   %f52,%f54,%f50          ! (5_0) dtmp1 = y0 + y_hi0;

3784         fmuld   %f34,%f28,%f34          ! (1_0) dtmp1 = res0_lo * res0;
3785         fsubd   %f52,%f54,%f54          ! (5_0) y_lo0 = y0 - y_hi0;

3787         sethi   %hi(0x3ff00000),%g1
3788         add     TBL,TBL_SHIFT+24,%i4

3790         sllx    %g1,32,%g1              ! (7_0) ll = (long long)j0 << 32;
3791         stx     %g1,[%fp+dtmp15]        ! (7_0) *(long long*)&scl0 = ll;
3792         ba      .cont60
3793         add     TBL,TBL_SHIFT+24,%i3

3795         .align  16
3796 .update58:
3797         cmp     counter,8
3798         ble     1f
3799         nop

3801         sub     counter,8,counter
3802         st      counter,[%fp+tmp_counter]

3804         stx     %i4,[%fp+tmp_px]

3806         stx     %i3,[%fp+tmp_py]

3808         mov     8,counter
3809 1:
3810         fmuld   %f10,%f22,%f50          ! (3_0) dtmp0 = dd * dres;
3811         st      %f3,[%i5+4]             ! (6_1) ((float*)pz)[1] = ((float*)&res0
3812         faddd   %f28,%f48,%f48          ! (0_0) res0 += dtmp0;

3814         fand    %f16,DA0,%f28           ! (1_0) res0 = vis_fand(dres,DA0);

3816         fmuld   %f20,%f20,%f0           ! (5_0) res0_hi = x_hi0 * x_hi0;
3817         stx     %g1,[%fp+dtmp14]        ! (6_0) *(long long*)&scl0 = ll;
3818         fsubd   %f60,%f20,%f2           ! (5_0) x_lo0 = x0 - x_hi0;

3820         fmuld   %f54,%f54,%f46          ! (5_0) dtmp0 = y_hi0 * y_hi0;
3821         add     %i5,stridez,%i5         ! pz += stridez
3822         faddd   %f60,%f20,%f62          ! (5_0) res0_lo = x0 + x_hi0;
```

```
3824         fmuld   %f26,%f14,%f14          ! (2_0) dtmp2 = dd * dres;
3825         fsubd   DTWO,%f50,%f20          ! (3_0) dtmp0 = DTWO - dtmp0;

3827         fmuld   %f42,%f28,%f60          ! (1_0) dtmp0 = res0_hi * res0;
3828         faddd   %f52,%f54,%f50          ! (5_0) dtmp1 = y0 + y_hi0;

3830         fmuld   %f34,%f28,%f34          ! (1_0) dtmp1 = res0_lo * res0;
3831         fsubd   %f52,%f54,%f54          ! (5_0) y_lo0 = y0 - y_hi0;

3833         sethi   %hi(0x3ff00000),%g1
3834         add     TBL,TBL_SHIFT+24,%i4

3836         sllx    %g1,32,%g1              ! (7_0) ll = (long long)j0 << 32;
3837         stx     %g1,[%fp+dtmp15]        ! (7_0) *(long long*)&scl0 = ll;
3838         ba      .cont60
3839         add     TBL,TBL_SHIFT+24,%i3

3841         .align  16
3842 .update59:
3843         cmp     %l7,_0x00100000         ! (0_0) hy0 ? 0x00100000
3844         bge,pn  %icc,.cont59a           ! (0_0) if ( hy0 < 0x00100000 )

3846         cmp     counter,8
3847         ble,a   1f
3848         nop

3850         sub     counter,8,counter
3851         st      counter,[%fp+tmp_counter]

3853         stx     %i4,[%fp+tmp_px]

3855         mov     8,counter
3856         stx     %i3,[%fp+tmp_py]
3857 1:
3858         fmuld   %f20,%f20,%f0           ! (5_0) res0_hi = x_hi0 * x_hi0;
3859         stx     %g1,[%fp+dtmp14]        ! (6_0) *(long long*)&scl0 = ll;
3860         fsubd   %f60,%f20,%f2           ! (5_0) x_lo0 = x0 - x_hi0;

3862         fmuld   %f54,%f54,%f46          ! (5_0) dtmp0 = y_hi0 * y_hi0;
3863         add     %i5,stridez,%i5         ! pz += stridez
3864         faddd   %f60,%f20,%f62          ! (5_0) res0_lo = x0 + x_hi0;

3866         fmuld   %f26,%f14,%f14          ! (2_0) dtmp2 = dd * dres;
3867         sethi   %hi(0x3ff00000),%g1
3868         add     TBL,TBL_SHIFT+24,%i4
3869         fsubd   DTWO,%f50,%f20          ! (3_0) dtmp0 = DTWO - dtmp0;

3871         ba      .cont59b
3872         add     TBL,TBL_SHIFT+24,%i3

3874         .align  16
3875 .exit:
3876         ret
3877         restore
3878         SET_SIZE(__vrhypot)
```

```
**********************************************************
   41645 Sat May 10 12:10:00 2014
new/usr/src/lib/libmvec/common/vis/__vrhypotf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
 *
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 * fields enclosed by brackets "[]" replaced with your own identifying
 * information: Portions Copyright [yyyy] [name of copyright owner]
 *
 * CDDL HEADER END
 */
/*
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 */
/*
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 */

        .file   "__vrhypotf.S"

#include "libm.h"

        RO_DATA
        .align  64
.CONST_TBL:
! i = [0,63]
! TBL[2*i+0] = 1.0 / (*(double*)&(0x3ff0000000000000LL + (i << 46)));
! TBL[2*i+1] = (double)(0.5/sqrtl(2) / sqrtl(*(double*)&(0x3ff0000000000000LL +
! TBL[128+2*i+0] = 1.0 / (*(double*)&(0x3ff0000000000000LL + (i << 46)));
! TBL[128+2*i+1] = (double)(0.25 / sqrtl(*(double*)&(0x3ff0000000000000LL + (i <

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169         .word   0x3fe02040, 0x81020408, 0x3fc6b761, 0x2ec892f6,

171         .word   0x000fffff, 0xffffffff  ! DC0
172         .word   0x3ff00000, 0           ! DC1
173         .word   0x7fffc000, 0           ! DC2
174         .word   0x7fe00000, 0           ! DA0
175         .word   0x60000000, 0           ! DA1
176         .word   0x80808080, 0x3f800000  ! SCALE , FONE = 1.0f
177         .word   0x3feffffe, 0xfee7f18f  ! KA0 =  9.99999997962321453275e-01
178         .word   0xbfdfffff, 0xfe07e52f  ! KA1 = -4.99999998166077580600e-01
179         .word   0x3fd80118, 0x0ca296d9  ! KA2 = 3.75066768969515586277e-01
180         .word   0xbfd400fc, 0x0bbb8e78  ! KA3 = -3.12560092408808548438e-01

182 #define _0x7f800000     %o0
183 #define _0x7fffffff     %o7
184 #define TBL             %l2

186 #define TBL_SHIFT       2048

188 #define stridex         %l3
189 #define stridey         %l4
190 #define stridez         %l5
191 #define counter         %i0

193 #define DA0             %f52
```



```
194 #define DA1             %f44
195 #define SCALE           %f6

197 #define DC0             %f46
198 #define DC1             %f8
199 #define FZERO           %f9
200 #define DC2             %f50

202 #define KA3             %f56
203 #define KA2             %f58
204 #define KA1             %f60
205 #define KA0             %f54

207 #define tmp_counter     STACK_BIAS-0x04
208 #define tmp_px          STACK_BIAS-0x20
209 #define tmp_py          STACK_BIAS-0x18

211 #define ftmp0           STACK_BIAS-0x10
212 #define ftmp1           STACK_BIAS-0x0c
213 #define ftmp2           STACK_BIAS-0x10
214 #define ftmp3           STACK_BIAS-0x0c
215 #define ftmp4           STACK_BIAS-0x08

217 ! sizeof temp storage - must be a multiple of 16 for V9
218 #define tmps            0x20

220 !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
221 !       !!!!!   algorithm   !!!!!
222 !  x0 = *px;
223 !  ax = *(int*)px;
224 !
225 !  y0 = *py;
226 !  ay = *(int*)py;
227 !
228 !  ax &= 0x7fffffff;
229 !  ay &= 0x7fffffff;
230 !
231 !  px += stridex;
232 !  py += stridey;
233 !
234 !  if ( ax >= 0x7f800000 || ay >= 0x7f800000 )
235 !  {
236 !    *pz = fabsf(x0) * fabsf(y0);
237 !    if( ax == 0x7f800000 ) *pz = 0.0f;
238 !    else if( ay == 0x7f800000 ) *pz = 0.0f;
239 !    pz += stridez;
240 !    continue;
241 !  }
242 !
243 !  if ( ay == 0 )
244 !  {
245 !    if ( ax == 0 )
246 !    {
247 !      *pz = 1.0f / 0.0f;
248 !      pz += stridez;
249 !      continue;
250 !    }
251 !  }
252 !
253 !  hyp0 = x0 * (double)x0;
254 !  dtmp0 = y0 * (double)y0;
255 !  hyp0 += dtmp0;
256 !
257 !  ibase0 = ((int*)&hyp0)[0];
258 !
259 !  dbase0 = vis_fand(hyp0,DA0);
```

```
260 !  dbase0 = vis_fmul8x16(SCALE, dbase0);
261 !  dbase0 = vis_fpsub32(DA1,dbase0);
262 !
263 !  hyp0 = vis_fand(hyp0,DC0);
264 !  hyp0 = vis_for(hyp0,DC1);
265 !  h_hi0 = vis_fand(hyp0,DC2);
266 !
267 !  ibase0 >>= 10;
268 !  si0 = ibase0 & 0x7f0;
269 !  xx0 = ((double*)((char*)TBL + si0))[0];
270 !
271 !  dtmp1 = hyp0 - h_hi0;
272 !  xx0 = dtmp1 * xx0;
273 !  res0 = ((double*)((char*)arr + si0))[1];
274 !  dtmp2 = KA3 * xx0;
275 !  dtmp2 += KA2;
276 !  dtmp2 *= xx0;
277 !  dtmp2 += KA1;
278 !  dtmp2 *= xx0;
279 !  dtmp2 += KA0;
280 !  res0 *= dtmp2;
281 !  res0 *= dbase0;
282 !  ftmp0 = (float)res0;
283 !  *pz = ftmp0;
284 !  pz += stridez;
285 !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

287         ENTRY(__vrhypotf)
288         save    %sp,-SA(MINFRAME)-tmps,%sp
289         PIC_SETUP(l7)
290         PIC_SET(l7,.CONST_TBL,l2)
291         wr      %g0,0x82,%asi

293 #ifdef __sparcv9
294         ldx     [%fp+STACK_BIAS+176],stridez
295 #else
296         ld      [%fp+STACK_BIAS+92],stridez
297 #endif

299         stx     %i1,[%fp+tmp_px]
300         sll     %i2,2,stridex

302         stx     %i3,[%fp+tmp_py]
303         sll     %i4,2,stridey

305         st      %i0,[%fp+tmp_counter]
306         sll     stridez,2,stridez
307         mov     %i5,%o1

309         ldd     [TBL+TBL_SHIFT],DC0
310         ldd     [TBL+TBL_SHIFT+8],DC1
311         ldd     [TBL+TBL_SHIFT+16],DC2
312         ldd     [TBL+TBL_SHIFT+24],DA0
313         ldd     [TBL+TBL_SHIFT+32],DA1
314         ldd     [TBL+TBL_SHIFT+40],SCALE
315         ldd     [TBL+TBL_SHIFT+48],KA0

317         ldd     [TBL+TBL_SHIFT+56],KA1
318         sethi   %hi(0x7f800000),%o0

320         ldd     [TBL+TBL_SHIFT+64],KA2
321         sethi   %hi(0x7ffffc00),%o7

323         ldd     [TBL+TBL_SHIFT+72],KA3
324         add     %o7,1023,%o7
```



```
326 .begin:
327         ld      [%fp+tmp_counter],counter
328         ldx     [%fp+tmp_px],%o4
329         ldx     [%fp+tmp_py],%i2
330         st      %g0,[%fp+tmp_counter]
331 .begin1:
332         cmp     counter,0
333         ble,pn  %icc,.exit
334         nop

336         lda     [%i2]0x82,%l6           ! (3_0) ay = *(int*)py;

338         lda     [%o4]0x82,%i5           ! (3_0) ax = *(int*)px;

340         lda     [%i2]0x82,%f2           ! (3_0) y0 = *py;
341         and     %l6,_0x7fffffff,%l6     ! (3_0) ay &= 0x7fffffff;

343         and     %i5,_0x7fffffff,%i5     ! (3_0) ax &= 0x7fffffff;
344         cmp     %l6,_0x7f800000         ! (3_0) ay ? 0x7f800000
345         bge,pn  %icc,.spec0             ! (3_0) if ( ay >= 0x7f800000 )
346         lda     [%o4]0x82,%f4           ! (3_0) x0 = *px;

348         cmp     %i5,_0x7f800000         ! (3_0) ax ? 0x7f800000
349         bge,pn  %icc,.spec0             ! (3_0) if ( ax >= 0x7f800000 )
350         nop

352         cmp     %l6,0                   ! (3_0)
353         be,pn   %icc,.spec1             ! (3_0) if ( ay == 0 )
354         fsmuld  %f4,%f4,%f36            ! (3_0) hyp0 = x0 * (double)x0;
355 .cont_spec1:
356         lda     [%i2+stridey]0x82,%l6   ! (4_0) ay = *(int*)py;

358         fsmuld  %f2,%f2,%f62            ! (3_0) dtmp0 = y0 * (double)y0;
359         lda     [stridex+%o4]0x82,%i5   ! (4_0) ax = *(int*)px;

361         add     %o4,stridex,%l0         ! px += stridex

363         add     %i2,stridey,%i2         ! py += stridey
364         and     %l6,_0x7fffffff,%l6     ! (4_0) ay &= 0x7fffffff;

366         and     %i5,_0x7fffffff,%i5     ! (4_0) ax &= 0x7fffffff;
367         lda     [%i2]0x82,%f2           ! (4_0) y0 = *py;

369         faddd   %f36,%f62,%f20          ! (3_0) hyp0 += dtmp0;
370         cmp     %l6,_0x7f800000         ! (4_0) ay ? 0x7f800000

372         bge,pn  %icc,.update0           ! (4_0) if ( ay >= 0x7f800000 )
373         lda     [stridex+%o4]0x82,%f4   ! (4_0) x0 = *px;
374 .cont0:
375         cmp     %i5,_0x7f800000         ! (4_0) ax ? 0x7f800000
376         bge,pn  %icc,.update1           ! (4_0) if ( ax >= 0x7f800000 )
377         st      %f20,[%fp+ftmp4]        ! (3_0) ibase0 = ((int*)&hyp0)[0];
378 .cont1:
379         cmp     %l6,0                   ! (4_1) ay ? 0
380         be,pn   %icc,.update2           ! (4_1) if ( ay == 0 )
381         fsmuld  %f4,%f4,%f38            ! (4_1) hyp0 = x0 * (double)x0;
382 .cont2:
383         lda     [%i2+stridey]0x82,%l6   ! (0_0) ay = *(int*)py;

385         fsmuld  %f2,%f2,%f62            ! (4_1) dtmp0 = y0 * (double)y0;
386         lda     [%l0+stridex]0x82,%i5   ! (0_0) ax = *(int*)px;

388         add     %l0,stridex,%i1         ! px += stridex

390         add     %i2,stridey,%i2         ! py += stridey
391         and     %l6,_0x7fffffff,%l6     ! (0_0) ay &= 0x7fffffff;
```

```
393         and     %i5,_0x7fffffff,%i5     ! (0_0) ax &= 0x7fffffff;
394         lda     [%i2]0x82,%f2           ! (0_0) y0 = *py;

396         cmp     %l6,_0x7f800000         ! (0_0) ay ? 0x7f800000
397         bge,pn  %icc,.update3           ! (0_0) if ( ay >= 0x7f800000 )
398         faddd   %f38,%f62,%f12          ! (4_1) hyp0 += dtmp0;
399 .cont3:
400         lda     [%i1]0x82,%f4           ! (0_0) x0 = *px;

402         cmp     %i5,_0x7f800000         ! (0_0) ax ? 0x7f800000
403         bge,pn  %icc,.update4           ! (0_0) if ( ax >= 0x7f800000 )
404         st      %f12,[%fp+ftmp0]        ! (4_1) ibase0 = ((int*)&hyp0)[0];
405 .cont4:
406         cmp     %l6,0                   ! (0_0) ay ? 0
407         be,pn   %icc,.update5           ! (0_0) if ( ay == 0 )
408         fsmuld  %f4,%f4,%f38            ! (0_0) hyp0 = x0 * (double)x0;
409 .cont5:
410         lda     [%i2+stridey]0x82,%l6   ! (1_0) ay = *(int*)py;

412         fsmuld  %f2,%f2,%f62            ! (0_0) dtmp0 = y0 * (double)y0;
413         lda     [%i1+stridex]0x82,%i5   ! (1_0) ax = *(int*)px;

415         add     %i1,stridex,%g5         ! px += stridex

417         add     %i2,stridey,%o3         ! py += stridey
418         and     %l6,_0x7fffffff,%l6     ! (1_0) ay &= 0x7fffffff;
419         fand    %f20,DC0,%f30           ! (3_1) hyp0 = vis_fand(hyp0,DC0);

421         and     %i5,_0x7fffffff,%i5     ! (1_0) ax &= 0x7fffffff;
422         lda     [%o3]0x82,%f2           ! (1_0) y0 = *py;

424         faddd   %f38,%f62,%f14          ! (0_0) hyp0 += dtmp0;
425         cmp     %l6,_0x7f800000         ! (1_0) ay ? 0x7f800000

427         lda     [%g5]0x82,%f4           ! (1_0) x0 = *px;
428         bge,pn  %icc,.update6           ! (1_0) if ( ay >= 0x7f800000 )
429         for     %f30,DC1,%f28           ! (3_1) hyp0 = vis_for(hyp0,DC1);
430 .cont6:
431         cmp     %i5,_0x7f800000         ! (1_0) ax ? 0x7f800000
432         bge,pn  %icc,.update7           ! (1_0) if ( ax >= 0x7f800000 )
433         ld      [%fp+ftmp4],%l1         ! (3_1) ibase0 = ((int*)&hyp0)[0];
434 .cont7:
435         st      %f14,[%fp+ftmp1]        ! (0_0) ibase0 = ((int*)&hyp0)[0];

437         cmp     %l6,0                   ! (1_0) ay ? 0
438         be,pn   %icc,.update8           ! (1_0) if ( ay == 0 )
439         fand    %f28,DC2,%f30           ! (3_1) h_hi0 = vis_fand(hyp0,DC2);
440 .cont8:
441         fsmuld  %f4,%f4,%f38            ! (1_0) hyp0 = x0 * (double)x0;
442         sra     %l1,10,%o5              ! (3_1) ibase0 >>= 10;

444         and     %o5,2032,%o4            ! (3_1) si0 = ibase0 & 0x7f0;
445         lda     [%o3+stridey]0x82,%l6   ! (2_0) ay = *(int*)py;

447         fsmuld  %f2,%f2,%f62            ! (1_0) dtmp0 = y0 * (double)y0;
448         add     %o4,TBL,%l7             ! (3_1) (char*)TBL + si0
449         lda     [stridex+%g5]0x82,%i5   ! (2_0) ax = *(int*)px;
450         fsubd   %f28,%f30,%f28          ! (3_1) dtmp1 = hyp0 - h_hi0;

452         add     %g5,stridex,%i4         ! px += stridex
453         ldd     [TBL+%o4],%f42          ! (3_1) xx0 = ((double*)((char*)TBL + si

455         and     %l6,_0x7fffffff,%l6     ! (2_0) ay &= 0x7fffffff;
456         add     %o3,stridey,%i2         ! py += stridey
457         fand    %f12,DC0,%f30           ! (4_1) hyp0 = vis_fand(hyp0,DC0);
```



```
459         and     %i5,_0x7fffffff,%i5     ! (2_0) ax &= 0x7fffffff;
460         lda     [%i2]0x82,%f2           ! (2_0) y0 = *py;

462         faddd   %f38,%f62,%f16          ! (1_0) hyp0 += dtmp0;
463         cmp     %l6,_0x7f800000         ! (2_0) ay ? 0x7f800000
464         fmuld   %f28,%f42,%f26          ! (3_1) xx0 = dtmp1 * xx0;

466         lda     [stridex+%g5]0x82,%f4   ! (2_0) x0 = *px;
467         bge,pn  %icc,.update9           ! (2_0) if ( ay >= 0x7f800000
468         for     %f30,DC1,%f28           ! (4_1) hyp0 = vis_for(hyp0,DC1);
469 .cont9:
470         cmp     %i5,_0x7f800000         ! (2_0) ax ? 0x7f800000
471         bge,pn  %icc,.update10          ! (2_0) if ( ax >= 0x7f800000 )
472         ld      [%fp+ftmp0],%i3         ! (4_1) ibase0 = ((int*)&hyp0)[0];
473 .cont10:
474         st      %f16,[%fp+ftmp2]        ! (1_0) ibase0 = ((int*)&hyp0)[0];

476         fmuld   KA3,%f26,%f34           ! (3_1) dtmp2 = KA3 * xx0;
477         cmp     %l6,0                   ! (2_0) ay ? 0
478         be,pn   %icc,.update11          ! (2_0) if ( ay == 0 )
479         fand    %f28,DC2,%f30           ! (4_1) h_hi0 = vis_fand(hyp0,DC2);
480 .cont11:
481         fsmuld  %f4,%f4,%f36            ! (2_0) hyp0 = x0 * (double)x0;
482         sra     %i3,10,%i3              ! (4_1) ibase0 >>= 10;

484         and     %i3,2032,%i3            ! (4_1) si0 = ibase0 & 0x7f0;
485         lda     [%i2+stridey]0x82,%l6   ! (3_0) ay = *(int*)py;

487         fsmuld  %f2,%f2,%f62            ! (2_0) dtmp0 = y0 * (double)y0;
488         add     %i3,TBL,%i3             ! (4_1) (char*)TBL + si0
489         lda     [%i4+stridex]0x82,%i5   ! (3_0) ax = *(int*)px;
490         fsubd   %f28,%f30,%f28          ! (4_1) dtmp1 = hyp0 - h_hi0;

492         add     %i4,stridex,%o4         ! px += stridex
493         ldd     [%i3],%f42              ! (4_1) xx0 = ((double*)((char*)TBL + si
494         faddd   %f34,KA2,%f10           ! (3_1) dtmp2 += KA2;

496         add     %i2,stridey,%i2         ! py += stridey
497         and     %l6,_0x7fffffff,%l6     ! (3_0) ay &= 0x7fffffff;
498         fand    %f14,DC0,%f30           ! (0_0) hyp0 = vis_fand(hyp0,DC0);

500         and     %i5,_0x7fffffff,%i5     ! (3_0) ax &= 0x7fffffff;
501         lda     [%i2]0x82,%f2           ! (3_0) y0 = *py;

503         faddd   %f36,%f62,%f18          ! (2_0) hyp0 += dtmp0;
504         cmp     %l6,_0x7f800000         ! (3_0) ay ? 0x7f800000
505         fmuld   %f28,%f42,%f32          ! (4_1) xx0 = dtmp1 * xx0;

507         fmuld   %f10,%f26,%f10          ! (3_1) dtmp2 *= xx0;
508         lda     [%o4]0x82,%f4           ! (3_0) x0 = *px;
509         bge,pn  %icc,.update12          ! (3_0) if ( ay >= 0x7f800000 )
510         for     %f30,DC1,%f28           ! (0_0) hyp0 = vis_for(hyp0,DC1);
511 .cont12:
512         cmp     %i5,_0x7f800000         ! (3_0) ax ? 0x7f800000
513         bge,pn  %icc,.update13          ! (3_0) if ( ax >= 0x7f800000 )
514         ld      [%fp+ftmp1],%i1         ! (0_0) ibase0 = ((int*)&hyp0)[0];
515 .cont13:
516         st      %f18,[%fp+ftmp3]        ! (2_0) ibase0 = ((int*)&hyp0)[0];

518         fmuld   KA3,%f32,%f34           ! (4_1) dtmp2 = KA3 * xx0;
519         cmp     %l6,0                   ! (3_0)
520         be,pn   %icc,.update14          ! (3_0) if ( ay == 0 )
521         fand    %f28,DC2,%f30           ! (0_0) h_hi0 = vis_fand(hyp0,DC2);
522 .cont14:
523         fsmuld  %f4,%f4,%f36            ! (3_0) hyp0 = x0 * (double)x0;
```

```
524         sra     %i1,10,%l1              ! (0_0) ibase0 >>= 10;
525         faddd   %f10,KA1,%f40           ! (3_1) dtmp2 += KA1;

527         and     %l1,2032,%o5            ! (0_0) si0 = ibase0 & 0x7f0;
528         lda     [%i2+stridey]0x82,%l6   ! (4_0) ay = *(int*)py;

530         fsmuld  %f2,%f2,%f62            ! (3_0) dtmp0 = y0 * (double)y0;
531         add     %o5,TBL,%l1             ! (0_0) (char*)TBL + si0
532         lda     [stridex+%o4]0x82,%i5   ! (4_0) ax = *(int*)px;
533         fsubd   %f28,%f30,%f28          ! (0_0) dtmp1 = hyp0 - h_hi0;

535         add     %o4,stridex,%l0         ! px += stridex
536         ldd     [TBL+%o5],%f42          ! (0_0) xx0 = ((double*)((char*)TBL + si
537         faddd   %f34,KA2,%f10           ! (4_1) dtmp2 += KA2;

539         fmuld   %f40,%f26,%f40          ! (3_1) dtmp2 *= xx0;
540         add     %i2,stridey,%i2         ! py += stridey
541         and     %l6,_0x7fffffff,%l6     ! (4_0) ay &= 0x7fffffff;
542         fand    %f16,DC0,%f30           ! (1_0) hyp0 = vis_fand(hyp0,DC0);

544         and     %i5,_0x7fffffff,%i5     ! (4_0) ax &= 0x7fffffff;
545         lda     [%i2]0x82,%f2           ! (4_0) y0 = *py;
546         fand    %f20,DA0,%f24           ! (3_1) dbase0 = vis_fand(hyp0,DA0);

548         faddd   %f36,%f62,%f20          ! (3_0) hyp0 += dtmp0;
549         cmp     %l6,_0x7f800000         ! (4_0) ay ? 0x7f800000
550         ldd     [%l7+8],%f36            ! (3_1) res0 = ((double*)((char*)arr + s
551         fmuld   %f28,%f42,%f26          ! (0_0) xx0 = dtmp1 * xx0;

553         fmuld   %f10,%f32,%f10          ! (4_1) dtmp2 *= xx0;
554         lda     [stridex+%o4]0x82,%f4   ! (4_0) x0 = *px;
555         bge,pn  %icc,.update15          ! (4_0) if ( ay >= 0x7f800000 )
556         for     %f30,DC1,%f28           ! (1_0) hyp0 = vis_for(hyp0,DC1);
557 .cont15:
558         fmul8x16        SCALE,%f24,%f24 ! (3_1) dbase0 = vis_fmul8x16(SCALE, dba
559         cmp     %i5,_0x7f800000         ! (4_0) ax ? 0x7f800000
560         ld      [%fp+ftmp2],%i1         ! (1_0) ibase0 = ((int*)&hyp0)[0];
561         faddd   %f40,KA0,%f62           ! (3_1) dtmp2 += KA0;

563         bge,pn  %icc,.update16          ! (4_0) if ( ax >= 0x7f800000 )
564         st      %f20,[%fp+ftmp4]        ! (3_0) ibase0 = ((int*)&hyp0)[0];
565 .cont16:
566         fmuld   KA3,%f26,%f34           ! (0_0) dtmp2 = KA3 * xx0;
567         fand    %f28,DC2,%f30           ! (1_0) h_hi0 = vis_fand(hyp0,DC2);

569         mov     %o1,%i4
570         cmp     counter,5
571         bl,pn   %icc,.tail
572         nop

574         ba      .main_loop
575         sub     counter,5,counter

577         .align  16
578 .main_loop:
579         fsmuld  %f4,%f4,%f38            ! (4_1) hyp0 = x0 * (double)x0;
580         sra     %i1,10,%o2              ! (1_1) ibase0 >>= 10;
581         cmp     %l6,0                   ! (4_1) ay ? 0
582         faddd   %f10,KA1,%f40           ! (4_2) dtmp2 += KA1;

584         fmuld   %f36,%f62,%f36          ! (3_2) res0 *= dtmp2;
585         and     %o2,2032,%o2            ! (1_1) si0 = ibase0 & 0x7f0;
586         lda     [%i2+stridey]0x82,%l6   ! (0_0) ay = *(int*)py;
587         fpsub32 DA1,%f24,%f24           ! (3_2) dbase0 = vis_fpsub32(DA1,dbase0)

589         fsmuld  %f2,%f2,%f62            ! (4_1) dtmp0 = y0 * (double)y0;
```



```
590         add     %o2,TBL,%o2             ! (1_1) (char*)TBL + si0
591         lda     [%l0+stridex]0x82,%o1   ! (0_0) ax = *(int*)px;
592         fsubd   %f28,%f30,%f28          ! (1_1) dtmp1 = hyp0 - h_hi0;

594         add     %l0,stridex,%i1         ! px += stridex
595         ldd     [%o2],%f42              ! (1_1) xx0 = ((double*)((char*)TBL + si
596         be,pn   %icc,.update17          ! (4_1) if ( ay == 0 )
597         faddd   %f34,KA2,%f10           ! (0_1) dtmp2 += KA2;
598 .cont17:
599         fmuld   %f40,%f32,%f40          ! (4_2) dtmp2 *= xx0;
600         add     %i2,stridey,%i2         ! py += stridey
601         and     %l6,_0x7fffffff,%l6     ! (0_0) ay &= 0x7fffffff;
602         fand    %f18,DC0,%f30           ! (2_1) hyp0 = vis_fand(hyp0,DC0);

604         fmuld   %f36,%f24,%f32          ! (3_2) res0 *= dbase0;
605         and     %o1,_0x7fffffff,%o1     ! (0_0) ax &= 0x7fffffff;
606         lda     [%i2]0x82,%f2           ! (0_0) y0 = *py;
607         fand    %f12,DA0,%f24           ! (4_2) dbase0 = vis_fand(hyp0,DA0);

609         faddd   %f38,%f62,%f12          ! (4_1) hyp0 += dtmp0;
610         cmp     %l6,_0x7f800000         ! (0_0) ay ? 0x7f800000
611         ldd     [%i3+8],%f62            ! (4_2) res0 = ((double*)((char*)arr + s
612         fmuld   %f28,%f42,%f36          ! (1_1) xx0 = dtmp1 * xx0;

614         fmuld   %f10,%f26,%f10          ! (0_1) dtmp2 *= xx0;
615         lda     [%i1]0x82,%f4           ! (0_0) x0 = *px;
616         bge,pn  %icc,.update18          ! (0_0) if ( ay >= 0x7f800000 )
617         for     %f30,DC1,%f28           ! (2_1) hyp0 = vis_for(hyp0,DC1);
618 .cont18:
619         fmul8x16        SCALE,%f24,%f24 ! (4_2) dbase0 = vis_fmul8x16(SCALE, dba
620         cmp     %o1,_0x7f800000         ! (0_0) ax ? 0x7f800000
621         ld      [%fp+ftmp3],%l0         ! (2_1) ibase0 = ((int*)&hyp0)[0];
622         faddd   %f40,KA0,%f42           ! (4_2) dtmp2 += KA0;

624         add     %i4,stridez,%i3         ! pz += stridez
625         st      %f12,[%fp+ftmp0]        ! (4_1) ibase0 = ((int*)&hyp0)[0];
626         bge,pn  %icc,.update19          ! (0_0) if ( ax >= 0x7f800000 )
627         fdtos   %f32,%f1                ! (3_2) ftmp0 = (float)res0;
628 .cont19:
629         fmuld   KA3,%f36,%f34           ! (1_1) dtmp2 = KA3 * xx0;
630         cmp     %l6,0                   ! (0_0) ay ? 0
631         st      %f1,[%i4]               ! (3_2) *pz = ftmp0;
632         fand    %f28,DC2,%f30           ! (2_1) h_hi0 = vis_fand(hyp0,DC2);

634         fsmuld  %f4,%f4,%f38            ! (0_0) hyp0 = x0 * (double)x0;
635         sra     %l0,10,%i4              ! (2_1) ibase0 >>= 10;
636         be,pn   %icc,.update20          ! (0_0) if ( ay == 0 )
637         faddd   %f10,KA1,%f40           ! (0_1) dtmp2 += KA1;
638 .cont20:
639         fmuld   %f62,%f42,%f32          ! (4_2) res0 *= dtmp2;
640         and     %i4,2032,%g1            ! (2_1) si0 = ibase0 & 0x7f0;
641         lda     [%i2+stridey]0x82,%l6   ! (1_0) ay = *(int*)py;
642         fpsub32 DA1,%f24,%f24           ! (4_2) dbase0 = vis_fpsub32(DA1,dbase0)

644         fsmuld  %f2,%f2,%f62            ! (0_0) dtmp0 = y0 * (double)y0;
645         add     %g1,TBL,%l0             ! (2_1) (char*)TBL + si0
646         lda     [%i1+stridex]0x82,%i5   ! (1_0) ax = *(int*)px;
647         fsubd   %f28,%f30,%f28          ! (2_1) dtmp1 = hyp0 - h_hi0;

649         nop
650         add     %i1,stridex,%g5         ! px += stridex
651         ldd     [TBL+%g1],%f42          ! (2_1) xx0 = ((double*)((char*)TBL + si
652         faddd   %f34,KA2,%f10           ! (1_1) dtmp2 += KA2;

654         fmuld   %f40,%f26,%f40          ! (0_1) dtmp2 *= xx0;
655         add     %i2,stridey,%o3         ! py += stridey
```

```
656         and     %l6,_0x7fffffff,%l6     ! (1_0) ay &= 0x7fffffff;
657         fand    %f20,DC0,%f30           ! (3_1) hyp0 = vis_fand(hyp0,DC0);

659         fmuld   %f32,%f24,%f26          ! (4_2) res0 *= dbase0;
660         and     %i5,_0x7fffffff,%i5     ! (1_0) ax &= 0x7fffffff;
661         lda     [%o3]0x82,%f2           ! (1_0) y0 = *py;
662         fand    %f14,DA0,%f24           ! (0_1) dbase0 = vis_fand(hyp0,DA0);

664         faddd   %f38,%f62,%f14          ! (0_0) hyp0 += dtmp0;
665         cmp     %l6,_0x7f800000         ! (1_0) ay ? 0x7f800000
666         ldd     [%l1+8],%f62            ! (0_1) res0 = ((double*)((char*)arr + s
667         fmuld   %f28,%f42,%f32          ! (2_1) xx0 = dtmp1 * xx0;

669         fmuld   %f10,%f36,%f10          ! (1_1) dtmp2 *= xx0;
670         lda     [%g5]0x82,%f4           ! (1_0) x0 = *px;
671         bge,pn  %icc,.update21          ! (1_0) if ( ay >= 0x7f800000 )
672         for     %f30,DC1,%f28           ! (3_1) hyp0 = vis_for(hyp0,DC1);
673 .cont21:
674         fmul8x16        SCALE,%f24,%f24 ! (0_1) dbase0 = vis_fmul8x16(SCALE, dba
675         cmp     %i5,_0x7f800000         ! (1_0) ax ? 0x7f800000
676         ld      [%fp+ftmp4],%l1         ! (3_1) ibase0 = ((int*)&hyp0)[0];
677         faddd   %f40,KA0,%f42           ! (0_1) dtmp2 += KA0

679         add     %i3,stridez,%o1         ! pz += stridez
680         st      %f14,[%fp+ftmp1]        ! (0_0) ibase0 = ((int*)&hyp0)[0];
681         bge,pn  %icc,.update22          ! (1_0) if ( ax >= 0x7f800000 )
682         fdtos   %f26,%f1                ! (4_2) ftmp0 = (float)res0;
683 .cont22:
684         fmuld   KA3,%f32,%f34           ! (2_1) dtmp2 = KA3 * xx0;
685         cmp     %l6,0                   ! (1_0) ay ? 0
686         st      %f1,[%i3]               ! (4_2) *pz = ftmp0;
687         fand    %f28,DC2,%f30           ! (3_1) h_hi0 = vis_fand(hyp0,DC2);

689         fsmuld  %f4,%f4,%f38            ! (1_0) hyp0 = x0 * (double)x0;
690         sra     %l1,10,%o5              ! (3_1) ibase0 >>= 10;
691         be,pn   %icc,.update23          ! (1_0) if ( ay == 0 )
692         faddd   %f10,KA1,%f40           ! (1_1) dtmp2 += KA1;
693 .cont23:
694         fmuld   %f62,%f42,%f26          ! (0_1) res0 *= dtmp2;
695         and     %o5,2032,%o4            ! (3_1) si0 = ibase0 & 0x7f0;
696         lda     [%o3+stridey]0x82,%l6   ! (2_0) ay = *(int*)py;
697         fpsub32 DA1,%f24,%f24           ! (0_1) dbase0 = vis_fpsub32(DA1,dbase0)

699         fsmuld  %f2,%f2,%f62            ! (1_0) dtmp0 = y0 * (double)y0;
700         add     %o4,TBL,%l7             ! (3_1) (char*)TBL + si0
701         lda     [stridex+%g5]0x82,%i5   ! (2_0) ax = *(int*)px;
702         fsubd   %f28,%f30,%f28          ! (3_1) dtmp1 = hyp0 - h_hi0;

704         nop
705         add     %g5,stridex,%i4         ! px += stridex
706         ldd     [TBL+%o4],%f42          ! (3_1) xx0 = ((double*)((char*)TBL + si
707         faddd   %f34,KA2,%f10           ! (2_1) dtmp2 += KA2;

709         fmuld   %f40,%f36,%f40          ! (1_1) dtmp2 *= xx0;
710         and     %l6,_0x7fffffff,%l6     ! (2_0) ay &= 0x7fffffff;
711         add     %o3,stridey,%i2         ! py += stridey
712         fand    %f12,DC0,%f30           ! (4_1) hyp0 = vis_fand(hyp0,DC0);

714         fmuld   %f26,%f24,%f36          ! (0_1) res0 *= dbase0;
715         and     %i5,_0x7fffffff,%i5     ! (2_0) ax &= 0x7fffffff;
716         lda     [%i2]0x82,%f2           ! (2_0) y0 = *py;
717         fand    %f16,DA0,%f24           ! (1_1) dbase0 = vis_fand(hyp0,DA0);

719         faddd   %f38,%f62,%f16          ! (1_0) hyp0 += dtmp0;
720         cmp     %l6,_0x7f800000         ! (2_0) ay ? 0x7f800000
721         ldd     [%o2+8],%f38            ! (1_1) res0 = ((double*)((char*)arr + s
```



```
722         fmuld   %f28,%f42,%f26          ! (3_1) xx0 = dtmp1 * xx0;

724         fmuld   %f10,%f32,%f10          ! (2_1) dtmp2 *= xx0;
725         lda     [stridex+%g5]0x82,%f4   ! (2_0) x0 = *px;
726         bge,pn  %icc,.update24          ! (2_0) if ( ay >= 0x7f800000
727         for     %f30,DC1,%f28           ! (4_1) hyp0 = vis_for(hyp0,DC1);
728 .cont24:
729         fmul8x16        SCALE,%f24,%f24 ! (1_1) dbase0 = vis_fmul8x16(SCALE, dba
730         cmp     %i5,_0x7f800000         ! (2_0) ax ? 0x7f800000
731         ld      [%fp+ftmp0],%i3         ! (4_1) ibase0 = ((int*)&hyp0)[0];
732         faddd   %f40,KA0,%f62           ! (1_1) dtmp2 += KA0;

734         add     %o1,stridez,%g1         ! pz += stridez
735         st      %f16,[%fp+ftmp2]        ! (1_0) ibase0 = ((int*)&hyp0)[0];
736         bge,pn  %icc,.update25          ! (2_0) if ( ax >= 0x7f800000 )
737         fdtos   %f36,%f1                ! (0_1) ftmp0 = (float)res0;
738 .cont25:
739         fmuld   KA3,%f26,%f34           ! (3_1) dtmp2 = KA3 * xx0;
740         cmp     %l6,0                   ! (2_0) ay ? 0
741         st      %f1,[%o1]               ! (0_1) *pz = ftmp0;
742         fand    %f28,DC2,%f30           ! (4_1) h_hi0 = vis_fand(hyp0,DC2);

744         fsmuld  %f4,%f4,%f36            ! (2_0) hyp0 = x0 * (double)x0;
745         sra     %i3,10,%i3              ! (4_1) ibase0 >>= 10;
746         be,pn   %icc,.update26          ! (2_0) if ( ay == 0 )
747         faddd   %f10,KA1,%f40           ! (2_1) dtmp2 += KA1;
748 .cont26:
749         fmuld   %f38,%f62,%f38          ! (1_1) res0 *= dtmp2;
750         and     %i3,2032,%i3            ! (4_1) si0 = ibase0 & 0x7f0;
751         lda     [%i2+stridey]0x82,%l6   ! (3_0) ay = *(int*)py;
752         fpsub32 DA1,%f24,%f24           ! (1_1) dbase0 = vis_fpsub32(DA1,dbase0)

754         fsmuld  %f2,%f2,%f62            ! (2_0) dtmp0 = y0 * (double)y0;
755         add     %i3,TBL,%i3             ! (4_1) (char*)TBL + si0
756         lda     [%i4+stridex]0x82,%i5   ! (3_0) ax = *(int*)px;
757         fsubd   %f28,%f30,%f28          ! (4_1) dtmp1 = hyp0 - h_hi0;

759         nop
760         add     %i4,stridex,%o4         ! px += stridex
761         ldd     [%i3],%f42              ! (4_1) xx0 = ((double*)((char*)TBL + si
762         faddd   %f34,KA2,%f10           ! (3_1) dtmp2 += KA2;

764         fmuld   %f40,%f32,%f40          ! (2_1) dtmp2 *= xx0;
765         add     %i2,stridey,%i2         ! py += stridey
766         and     %l6,_0x7fffffff,%l6     ! (3_0) ay &= 0x7fffffff;
767         fand    %f14,DC0,%f30           ! (0_0) hyp0 = vis_fand(hyp0,DC0);

769         fmuld   %f38,%f24,%f38          ! (1_1) res0 *= dbase0;
770         and     %i5,_0x7fffffff,%i5     ! (3_0) ax &= 0x7fffffff;
771         lda     [%i2]0x82,%f2           ! (3_0) y0 = *py;
772         fand    %f18,DA0,%f24           ! (2_1) dbase0 = vis_fand(hyp0,DA0);

774         faddd   %f36,%f62,%f18          ! (2_0) hyp0 += dtmp0;
775         cmp     %l6,_0x7f800000         ! (3_0) ay ? 0x7f800000
776         ldd     [%l0+8],%f62            ! (2_1) res0 = ((double*)((char*)arr + s
777         fmuld   %f28,%f42,%f32          ! (4_1) xx0 = dtmp1 * xx0;

779         fmuld   %f10,%f26,%f10          ! (3_1) dtmp2 *= xx0;
780         lda     [%o4]0x82,%f4           ! (3_0) x0 = *px;
781         bge,pn  %icc,.update27          ! (3_0) if ( ay >= 0x7f800000 )
782         for     %f30,DC1,%f28           ! (0_0) hyp0 = vis_for(hyp0,DC1);
783 .cont27:
784         fmul8x16        SCALE,%f24,%f24 ! (2_1) dbase0 = vis_fmul8x16(SCALE, dba
785         cmp     %i5,_0x7f800000         ! (3_0) ax ? 0x7f800000
786         ld      [%fp+ftmp1],%i1         ! (0_0) ibase0 = ((int*)&hyp0)[0];
787         faddd   %f40,KA0,%f42           ! (2_1) dtmp2 += KA0;
```

```
789         add     %g1,stridez,%o3         ! pz += stridez
790         st      %f18,[%fp+ftmp3]        ! (2_0) ibase0 = ((int*)&hyp0)[0];
791         bge,pn  %icc,.update28          ! (3_0) if ( ax >= 0x7f800000 )
792         fdtos   %f38,%f1                ! (1_1) ftmp0 = (float)res0;
793 .cont28:
794         fmuld   KA3,%f32,%f34           ! (4_1) dtmp2 = KA3 * xx0;
795         cmp     %l6,0                   ! (3_0)
796         st      %f1,[%g1]               ! (1_1) *pz = ftmp0;
797         fand    %f28,DC2,%f30           ! (0_0) h_hi0 = vis_fand(hyp0,DC2);

799         fsmuld  %f4,%f4,%f36            ! (3_0) hyp0 = x0 * (double)x0;
800         sra     %i1,10,%l1              ! (0_0) ibase0 >>= 10;
801         be,pn   %icc,.update29          ! (3_0) if ( ay == 0 )
802         faddd   %f10,KA1,%f40           ! (3_1) dtmp2 += KA1;
803 .cont29:
804         fmuld   %f62,%f42,%f38          ! (2_1) res0 *= dtmp2;
805         and     %l1,2032,%o5            ! (0_0) si0 = ibase0 & 0x7f0;
806         lda     [%i2+stridey]0x82,%l6   ! (4_0) ay = *(int*)py;
807         fpsub32 DA1,%f24,%f24           ! (2_1) dbase0 = vis_fpsub32(DA1,dbase0)

809         fsmuld  %f2,%f2,%f62            ! (3_0) dtmp0 = y0 * (double)y0;
810         add     %o5,TBL,%l1             ! (0_0) (char*)TBL + si0
811         lda     [stridex+%o4]0x82,%i5   ! (4_0) ax = *(int*)px;
812         fsubd   %f28,%f30,%f28          ! (0_0) dtmp1 = hyp0 - h_hi0;

814         add     %o3,stridez,%i4         ! pz += stridez
815         add     %o4,stridex,%l0         ! px += stridex
816         ldd     [TBL+%o5],%f42          ! (0_0) xx0 = ((double*)((char*)TBL + si
817         faddd   %f34,KA2,%f10           ! (4_1) dtmp2 += KA2;

819         fmuld   %f40,%f26,%f40          ! (3_1) dtmp2 *= xx0;
820         add     %i2,stridey,%i2         ! py += stridey
821         and     %l6,_0x7fffffff,%l6     ! (4_0) ay &= 0x7fffffff;
822         fand    %f16,DC0,%f30           ! (1_0) hyp0 = vis_fand(hyp0,DC0);

824         fmuld   %f38,%f24,%f38          ! (2_1) res0 *= dbase0;
825         and     %i5,_0x7fffffff,%i5     ! (4_0) ax &= 0x7fffffff;
826         lda     [%i2]0x82,%f2           ! (4_0) y0 = *py;
827         fand    %f20,DA0,%f24           ! (3_1) dbase0 = vis_fand(hyp0,DA0);

829         faddd   %f36,%f62,%f20          ! (3_0) hyp0 += dtmp0;
830         cmp     %l6,_0x7f800000         ! (4_0) ay ? 0x7f800000
831         ldd     [%l7+8],%f36            ! (3_1) res0 = ((double*)((char*)arr + s
832         fmuld   %f28,%f42,%f26          ! (0_0) xx0 = dtmp1 * xx0;

834         fmuld   %f10,%f32,%f10          ! (4_1) dtmp2 *= xx0;
835         lda     [stridex+%o4]0x82,%f4   ! (4_0) x0 = *px;
836         bge,pn  %icc,.update30          ! (4_0) if ( ay >= 0x7f800000 )
837         for     %f30,DC1,%f28           ! (1_0) hyp0 = vis_for(hyp0,DC1);
838 .cont30:
839         fmul8x16        SCALE,%f24,%f24 ! (3_1) dbase0 = vis_fmul8x16(SCALE, dba
840         cmp     %i5,_0x7f800000         ! (4_0) ax ? 0x7f800000
841         ld      [%fp+ftmp2],%i1         ! (1_0) ibase0 = ((int*)&hyp0)[0];
842         faddd   %f40,KA0,%f62           ! (3_1) dtmp2 += KA0;

844         bge,pn  %icc,.update31          ! (4_0) if ( ax >= 0x7f800000 )
845         st      %f20,[%fp+ftmp4]        ! (3_0) ibase0 = ((int*)&hyp0)[0];
846 .cont31:
847         subcc   counter,5,counter       ! counter -= 5;
848         fdtos   %f38,%f1                ! (2_1) ftmp0 = (float)res0;

850         fmuld   KA3,%f26,%f34           ! (0_0) dtmp2 = KA3 * xx0;
851         st      %f1,[%o3]               ! (2_1) *pz = ftmp0;
852         bpos,pt %icc,.main_loop
853         fand    %f28,DC2,%f30           ! (1_0) h_hi0 = vis_fand(hyp0,DC2);
```



```
855         add     counter,5,counter

857 .tail:
858         subcc   counter,1,counter
859         bneg    .begin
860         mov     %i4,%o1

862         sra     %i1,10,%o2              ! (1_1) ibase0 >>= 10;
863         faddd   %f10,KA1,%f40           ! (4_2) dtmp2 += KA1;

865         fmuld   %f36,%f62,%f36          ! (3_2) res0 *= dtmp2;
866         and     %o2,2032,%o2            ! (1_1) si0 = ibase0 & 0x7f0;
867         fpsub32 DA1,%f24,%f24           ! (3_2) dbase0 = vis_fpsub32(DA1,dbase0)

869         add     %o2,TBL,%o2             ! (1_1) (char*)TBL + si0
870         fsubd   %f28,%f30,%f28          ! (1_1) dtmp1 = hyp0 - h_hi0;

872         ldd     [%o2],%f42              ! (1_1) xx0 = ((double*)((char*)TBL + si
873         faddd   %f34,KA2,%f10           ! (0_1) dtmp2 += KA2;

875         fmuld   %f40,%f32,%f40          ! (4_2) dtmp2 *= xx0;

877         fmuld   %f36,%f24,%f32          ! (3_2) res0 *= dbase0;
878         fand    %f12,DA0,%f24           ! (4_2) dbase0 = vis_fand(hyp0,DA0);

880         ldd     [%i3+8],%f62            ! (4_2) res0 = ((double*)((char*)arr + s
881         fmuld   %f28,%f42,%f36          ! (1_1) xx0 = dtmp1 * xx0;

883         fmuld   %f10,%f26,%f10          ! (0_1) dtmp2 *= xx0;

885         fmul8x16        SCALE,%f24,%f24 ! (4_2) dbase0 = vis_fmul8x16(SCALE, dba
886         faddd   %f40,KA0,%f42           ! (4_2) dtmp2 += KA0;

888         add     %i4,stridez,%i3         ! pz += stridez
889         fdtos   %f32,%f1                ! (3_2) ftmp0 = (float)res0;

891         fmuld   KA3,%f36,%f34           ! (1_1) dtmp2 = KA3 * xx0;
892         st      %f1,[%i4]               ! (3_2) *pz = ftmp0;

894         subcc   counter,1,counter
895         bneg    .begin
896         mov     %i3,%o1

898         faddd   %f10,KA1,%f40           ! (0_1) dtmp2 += KA1;

900         fmuld   %f62,%f42,%f32          ! (4_2) res0 *= dtmp2;
901         fpsub32 DA1,%f24,%f24           ! (4_2) dbase0 = vis_fpsub32(DA1,dbase0)


904         faddd   %f34,KA2,%f10           ! (1_1) dtmp2 += KA2;

906         fmuld   %f40,%f26,%f40          ! (0_1) dtmp2 *= xx0;

908         fmuld   %f32,%f24,%f26          ! (4_2) res0 *= dbase0;
909         fand    %f14,DA0,%f24           ! (0_1) dbase0 = vis_fand(hyp0,DA0);

911         ldd     [%l1+8],%f62            ! (0_1) res0 = ((double*)((char*)arr + s

913         fmuld   %f10,%f36,%f10          ! (1_1) dtmp2 *= xx0;

915         fmul8x16        SCALE,%f24,%f24 ! (0_1) dbase0 = vis_fmul8x16(SCALE, dba
916         faddd   %f40,KA0,%f42           ! (0_1) dtmp2 += KA0

918         add     %i3,stridez,%o1         ! pz += stridez
919         fdtos   %f26,%f1                ! (4_2) ftmp0 = (float)res0;
```

```
921         st      %f1,[%i3]               ! (4_2) *pz = ftmp0;

923         subcc   counter,1,counter
924         bneg    .begin
925         nop

927         faddd   %f10,KA1,%f40           ! (1_1) dtmp2 += KA1;

929         fmuld   %f62,%f42,%f26          ! (0_1) res0 *= dtmp2;
930         fpsub32 DA1,%f24,%f24           ! (0_1) dbase0 = vis_fpsub32(DA1,dbase0)

932         fmuld   %f40,%f36,%f40          ! (1_1) dtmp2 *= xx0;

934         fmuld   %f26,%f24,%f36          ! (0_1) res0 *= dbase0;
935         fand    %f16,DA0,%f24           ! (1_1) dbase0 = vis_fand(hyp0,DA0);

937         ldd     [%o2+8],%f38            ! (1_1) res0 = ((double*)((char*)arr + s

939         fmul8x16        SCALE,%f24,%f24 ! (1_1) dbase0 = vis_fmul8x16(SCALE, dba
940         faddd   %f40,KA0,%f62           ! (1_1) dtmp2 += KA0;

942         add     %o1,stridez,%g1         ! pz += stridez
943         fdtos   %f36,%f1                ! (0_1) ftmp0 = (float)res0;

945         st      %f1,[%o1]               ! (0_1) *pz = ftmp0;

947         subcc   counter,1,counter
948         bneg    .begin
949         mov     %g1,%o1

951         fmuld   %f38,%f62,%f38          ! (1_1) res0 *= dtmp2;
952         fpsub32 DA1,%f24,%f24           ! (1_1) dbase0 = vis_fpsub32(DA1,dbase0)

954         fmuld   %f38,%f24,%f38          ! (1_1) res0 *= dbase0;

956         fdtos   %f38,%f1                ! (1_1) ftmp0 = (float)res0;
957         st      %f1,[%g1]               ! (1_1) *pz = ftmp0;

959         ba      .begin
960         add     %g1,stridez,%o1         ! pz += stridez

962         .align  16
963 .spec0:
964         fabss   %f2,%f2                 ! fabsf(y0);

966         fabss   %f4,%f4                 ! fabsf(x0);

968         fcmps   %f2,%f4

970         cmp     %l6,_0x7f800000         ! ay ? 0x7f800000
971         be,a    1f                      ! if( ay == 0x7f800000 )
972         st      %g0,[%o1]               ! *pz = 0.0f;

974         cmp     %i5,_0x7f800000         ! ax ? 0x7f800000
975         be,a    1f                      ! if( ax == 0x7f800000 )
976         st      %g0,[%o1]               ! *pz = 0.0f;

978         fmuls   %f2,%f4,%f2             ! fabsf(x0) * fabsf(y0);
979         st      %f2,[%o1]               ! *pz = fabsf(x0) + fabsf(y0);
980 1:
981         add     %o4,stridex,%o4         ! px += stridex;
982         add     %i2,stridey,%i2         ! py += stridey;

984         add     %o1,stridez,%o1         ! pz += stridez;
985         ba      .begin1
```



```
986         sub     counter,1,counter       ! counter--;

988         .align  16
989 .spec1:
990         cmp     %i5,0                   ! ax ? 0
991         bne,pt  %icc,.cont_spec1        ! if ( ax != 0 )
992         nop

994         add     %o4,stridex,%o4         ! px += stridex;
995         add     %i2,stridey,%i2         ! py += stridey;

997         fdivs   %f7,%f9,%f2             ! 1.0f / 0.0f
998         st      %f2,[%o1]               ! *pz = 1.0f / 0.0f;

1000        add     %o1,stridez,%o1         ! pz += stridez;
1001        ba      .begin1
1002        sub     counter,1,counter       ! counter--;

1004        .align  16
1005 .update0:
1006        cmp     counter,1
1007        ble     .cont0
1008        ld      [TBL+TBL_SHIFT+44],%f2

1010        sub     counter,1,counter
1011        st      counter,[%fp+tmp_counter]

1013        stx     %l0,[%fp+tmp_px]

1015        stx     %i2,[%fp+tmp_py]
1016        ba      .cont0
1017        mov     1,counter

1019        .align  16
1020 .update1:
1021        cmp     counter,1
1022        ble     .cont1
1023        ld      [TBL+TBL_SHIFT+44],%f4

1025        sub     counter,1,counter
1026        st      counter,[%fp+tmp_counter]

1028        stx     %l0,[%fp+tmp_px]

1030        stx     %i2,[%fp+tmp_py]
1031        ba      .cont1
1032        mov     1,counter

1034        .align  16
1035 .update2:
1036        cmp     %i5,0
1037        bne     .cont2

1039        cmp     counter,1
1040        ble     .cont2
1041        ld      [TBL+TBL_SHIFT+44],%f2

1043        sub     counter,1,counter
1044        st      counter,[%fp+tmp_counter]

1046        stx     %l0,[%fp+tmp_px]

1048        stx     %i2,[%fp+tmp_py]
1049        ba      .cont2
1050        mov     1,counter
```

```
1052         .align  16
1053 .update3:
1054         cmp     counter,2
1055         ble     .cont3
1056         ld      [TBL+TBL_SHIFT+44],%f2

1058         sub     counter,2,counter
1059         st      counter,[%fp+tmp_counter]

1061         stx     %i1,[%fp+tmp_px]

1063         stx     %i2,[%fp+tmp_py]
1064         ba      .cont3
1065         mov     2,counter

1067         .align  16
1068 .update4:
1069         cmp     counter,2
1070         ble     .cont4
1071         ld      [TBL+TBL_SHIFT+44],%f4

1073         sub     counter,2,counter
1074         st      counter,[%fp+tmp_counter]

1076         stx     %i1,[%fp+tmp_px]

1078         stx     %i2,[%fp+tmp_py]
1079         ba      .cont4
1080         mov     2,counter

1082         .align  16
1083 .update5:
1084         cmp     %i5,0
1085         bne     .cont5

1087         cmp     counter,2
1088         ble     .cont5
1089         ld      [TBL+TBL_SHIFT+44],%f2

1091         sub     counter,2,counter
1092         st      counter,[%fp+tmp_counter]

1094         stx     %i1,[%fp+tmp_px]

1096         stx     %i2,[%fp+tmp_py]
1097         ba      .cont5
1098         mov     2,counter

1100         .align  16
1101 .update6:
1102         cmp     counter,3
1103         ble     .cont6
1104         ld      [TBL+TBL_SHIFT+44],%f2

1106         sub     counter,3,counter
1107         st      counter,[%fp+tmp_counter]

1109         stx     %g5,[%fp+tmp_px]

1111         stx     %o3,[%fp+tmp_py]
1112         ba      .cont6
1113         mov     3,counter

1115         .align  16
1116 .update7:
1117         cmp     counter,3
```



```
1118         ble     .cont7
1119         ld      [TBL+TBL_SHIFT+44],%f4

1121         sub     counter,3,counter
1122         st      counter,[%fp+tmp_counter]

1124         stx     %g5,[%fp+tmp_px]

1126         stx     %o3,[%fp+tmp_py]
1127         ba      .cont7
1128         mov     3,counter

1130         .align  16
1131 .update8:
1132         cmp     %i5,0
1133         bne     .cont8

1135         cmp     counter,3
1136         ble     .cont8
1137         ld      [TBL+TBL_SHIFT+44],%f2

1139         sub     counter,3,counter
1140         st      counter,[%fp+tmp_counter]

1142         stx     %g5,[%fp+tmp_px]

1144         stx     %o3,[%fp+tmp_py]
1145         ba      .cont8
1146         mov     3,counter

1148         .align  16
1149 .update9:
1150         cmp     counter,4
1151         ble     .cont9
1152         ld      [TBL+TBL_SHIFT+44],%f2

1154         sub     counter,4,counter
1155         st      counter,[%fp+tmp_counter]

1157         stx     %i4,[%fp+tmp_px]

1159         stx     %i2,[%fp+tmp_py]
1160         ba      .cont9
1161         mov     4,counter

1163         .align  16
1164 .update10:
1165         cmp     counter,4
1166         ble     .cont10
1167         ld      [TBL+TBL_SHIFT+44],%f4

1169         sub     counter,4,counter
1170         st      counter,[%fp+tmp_counter]

1172         stx     %i4,[%fp+tmp_px]

1174         stx     %i2,[%fp+tmp_py]
1175         ba      .cont10
1176         mov     4,counter

1178         .align  16
1179 .update11:
1180         cmp     %i5,0
1181         bne     .cont11

1183         cmp     counter,4
```

```
1184         ble     .cont11
1185         ld      [TBL+TBL_SHIFT+44],%f2

1187         sub     counter,4,counter
1188         st      counter,[%fp+tmp_counter]

1190         stx     %i4,[%fp+tmp_px]

1192         stx     %i2,[%fp+tmp_py]
1193         ba      .cont11
1194         mov     4,counter

1196         .align  16
1197 .update12:
1198         cmp     counter,5
1199         ble     .cont12
1200         ld      [TBL+TBL_SHIFT+44],%f2

1202         sub     counter,5,counter
1203         st      counter,[%fp+tmp_counter]

1205         stx     %o4,[%fp+tmp_px]

1207         stx     %i2,[%fp+tmp_py]
1208         ba      .cont12
1209         mov     5,counter

1211         .align  16
1212 .update13:
1213         cmp     counter,5
1214         ble     .cont13
1215         ld      [TBL+TBL_SHIFT+44],%f4

1217         sub     counter,5,counter
1218         st      counter,[%fp+tmp_counter]

1220         stx     %o4,[%fp+tmp_px]

1222         stx     %i2,[%fp+tmp_py]
1223         ba      .cont13
1224         mov     5,counter

1226         .align  16
1227 .update14:
1228         cmp     %i5,0
1229         bne     .cont14

1231         cmp     counter,5
1232         ble     .cont14
1233         ld      [TBL+TBL_SHIFT+44],%f2

1235         sub     counter,5,counter
1236         st      counter,[%fp+tmp_counter]

1238         stx     %o4,[%fp+tmp_px]

1240         stx     %i2,[%fp+tmp_py]
1241         ba      .cont14
1242         mov     5,counter

1244         .align  16
1245 .update15:
1246         cmp     counter,6
1247         ble     .cont15
1248         ld      [TBL+TBL_SHIFT+44],%f2
```



```
1250         sub     counter,6,counter
1251         st      counter,[%fp+tmp_counter]

1253         stx     %l0,[%fp+tmp_px]

1255         stx     %i2,[%fp+tmp_py]
1256         ba      .cont15
1257         mov     6,counter

1259         .align  16
1260 .update16:
1261         cmp     counter,6
1262         ble     .cont16
1263         ld      [TBL+TBL_SHIFT+44],%f4

1265         sub     counter,6,counter
1266         st      counter,[%fp+tmp_counter]

1268         stx     %l0,[%fp+tmp_px]

1270         stx     %i2,[%fp+tmp_py]
1271         ba      .cont16
1272         mov     6,counter

1274         .align  16
1275 .update17:
1276         cmp     %i5,0
1277         bne     .cont17

1279         cmp     counter,1
1280         ble     .cont17
1281         fmovd   DC1,%f62

1283         sub     counter,1,counter
1284         st      counter,[%fp+tmp_counter]

1286         stx     %l0,[%fp+tmp_px]

1288         stx     %i2,[%fp+tmp_py]
1289         ba      .cont17
1290         mov     1,counter

1292         .align  16
1293 .update18:
1294         cmp     counter,2
1295         ble     .cont18
1296         ld      [TBL+TBL_SHIFT+44],%f2

1298         sub     counter,2,counter
1299         st      counter,[%fp+tmp_counter]

1301         stx     %i1,[%fp+tmp_px]

1303         stx     %i2,[%fp+tmp_py]
1304         ba      .cont18
1305         mov     2,counter

1307         .align  16
1308 .update19:
1309         cmp     counter,2
1310         ble     .cont19
1311         ld      [TBL+TBL_SHIFT+44],%f4

1313         sub     counter,2,counter
1314         st      counter,[%fp+tmp_counter]
```

```
1316         stx     %i1,[%fp+tmp_px]

1318         stx     %i2,[%fp+tmp_py]
1319         ba      .cont19
1320         mov     2,counter

1322         .align  16
1323 .update20:
1324         cmp     %o1,0
1325         bne     .cont20

1327         cmp     counter,2
1328         ble     .cont20
1329         ld      [TBL+TBL_SHIFT+44],%f2

1331         sub     counter,2,counter
1332         st      counter,[%fp+tmp_counter]

1334         stx     %i1,[%fp+tmp_px]

1336         stx     %i2,[%fp+tmp_py]
1337         ba      .cont20
1338         mov     2,counter

1340         .align  16
1341 .update21:
1342         cmp     counter,3
1343         ble     .cont21
1344         ld      [TBL+TBL_SHIFT+44],%f2

1346         sub     counter,3,counter
1347         st      counter,[%fp+tmp_counter]

1349         stx     %g5,[%fp+tmp_px]

1351         stx     %o3,[%fp+tmp_py]
1352         ba      .cont21
1353         mov     3,counter

1355         .align  16
1356 .update22:
1357         cmp     counter,3
1358         ble     .cont22
1359         ld      [TBL+TBL_SHIFT+44],%f4

1361         sub     counter,3,counter
1362         st      counter,[%fp+tmp_counter]

1364         stx     %g5,[%fp+tmp_px]

1366         stx     %o3,[%fp+tmp_py]
1367         ba      .cont22
1368         mov     3,counter

1370         .align  16
1371 .update23:
1372         cmp     %i5,0
1373         bne     .cont23

1375         cmp     counter,3
1376         ble     .cont23
1377         ld      [TBL+TBL_SHIFT+44],%f2

1379         sub     counter,3,counter
1380         st      counter,[%fp+tmp_counter]
```



```
1382         stx     %g5,[%fp+tmp_px]

1384         stx     %o3,[%fp+tmp_py]
1385         ba      .cont23
1386         mov     3,counter

1388         .align  16
1389 .update24:
1390         cmp     counter,4
1391         ble     .cont24
1392         ld      [TBL+TBL_SHIFT+44],%f2

1394         sub     counter,4,counter
1395         st      counter,[%fp+tmp_counter]

1397         stx     %i4,[%fp+tmp_px]

1399         stx     %i2,[%fp+tmp_py]
1400         ba      .cont24
1401         mov     4,counter

1403         .align  16
1404 .update25:
1405         cmp     counter,4
1406         ble     .cont25
1407         ld      [TBL+TBL_SHIFT+44],%f4

1409         sub     counter,4,counter
1410         st      counter,[%fp+tmp_counter]

1412         stx     %i4,[%fp+tmp_px]

1414         stx     %i2,[%fp+tmp_py]
1415         ba      .cont25
1416         mov     4,counter

1418         .align  16
1419 .update26:
1420         cmp     %i5,0
1421         bne     .cont26

1423         cmp     counter,4
1424         ble     .cont26
1425         ld      [TBL+TBL_SHIFT+44],%f2

1427         sub     counter,4,counter
1428         st      counter,[%fp+tmp_counter]

1430         stx     %i4,[%fp+tmp_px]

1432         stx     %i2,[%fp+tmp_py]
1433         ba      .cont26
1434         mov     4,counter

1436         .align  16
1437 .update27:
1438         cmp     counter,5
1439         ble     .cont27
1440         ld      [TBL+TBL_SHIFT+44],%f2

1442         sub     counter,5,counter
1443         st      counter,[%fp+tmp_counter]

1445         stx     %o4,[%fp+tmp_px]

1447         stx     %i2,[%fp+tmp_py]
```

```
1448         ba      .cont27
1449         mov     5,counter

1451         .align  16
1452 .update28:
1453         cmp     counter,5
1454         ble     .cont28
1455         ld      [TBL+TBL_SHIFT+44],%f4

1457         sub     counter,5,counter
1458         st      counter,[%fp+tmp_counter]

1460         stx     %o4,[%fp+tmp_px]

1462         stx     %i2,[%fp+tmp_py]
1463         ba      .cont28
1464         mov     5,counter

1466         .align  16
1467 .update29:
1468         cmp     %i5,0
1469         bne     .cont29

1471         cmp     counter,5
1472         ble     .cont29
1473         ld      [TBL+TBL_SHIFT+44],%f2

1475         sub     counter,5,counter
1476         st      counter,[%fp+tmp_counter]

1478         stx     %o4,[%fp+tmp_px]

1480         stx     %i2,[%fp+tmp_py]
1481         ba      .cont29
1482         mov     5,counter

1484         .align  16
1485 .update30:
1486         cmp     counter,6
1487         ble     .cont30
1488         ld      [TBL+TBL_SHIFT+44],%f2

1490         sub     counter,6,counter
1491         st      counter,[%fp+tmp_counter]

1493         stx     %l0,[%fp+tmp_px]

1495         stx     %i2,[%fp+tmp_py]
1496         ba      .cont30
1497         mov     6,counter

1499         .align  16
1500 .update31:
1501         cmp     counter,6
1502         ble     .cont31
1503         ld      [TBL+TBL_SHIFT+44],%f4

1505         sub     counter,6,counter
1506         st      counter,[%fp+tmp_counter]

1508         stx     %l0,[%fp+tmp_px]

1510         stx     %i2,[%fp+tmp_py]
1511         ba      .cont31
1512         mov     6,counter
```



```
1514         .align  16
1515 .exit:
1516         ret
1517         restore
1518         SET_SIZE(__vrhypotf)
```

```
**********************************************************
   54902 Sat May 10 12:10:00 2014
new/usr/src/lib/libmvec/common/vis/__vrsqrt.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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/*
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 */

        .file   "__vrsqrt.S"

#include "libm.h"

        RO_DATA
        .align  64

.CONST_TBL:
        .word   0xbfe00000, 0x0000002f  ! K1 =-5.00000000000005209867e-01;
        .word   0x3fd80000, 0x00000058  ! K2 = 3.75000000000004884257e-01;
        .word   0xbfd3ffff, 0xff444bc8  ! K3 =-3.12499999317136886551e-01;
        .word   0x3fd17fff, 0xff5006fe  ! K4 = 2.73437499359815081532e-01;
        .word   0xbfcf80bb, 0xb33ef574  ! K5 =-2.46116125605037803130e-01;
        .word   0x3fcce0af, 0xf8156949  ! K6 = 2.25606914648617522896e-01;

        .word   0x001fffff, 0xffffffff  ! DC0
        .word   0x3fe00000, 0x00000000  ! DC1
        .word   0x00002000, 0x00000000  ! DC2
        .word   0x7fffc000, 0x00000000  ! DC3
        .word   0x0007ffff, 0xffffffff  ! DC4

        .word   0x43200000, 0x00000000  ! D2ON51  = pow(2,51)
        .word   0x3ff00000, 0x00000000  ! DONE   = 1.0

#define stridex         %l5
#define stridey         %l7
#define counter         %l0
#define TBL             %l3
#define _0x7ff00000     %o0
#define _0x00100000     %o1

#define DC0             %f56
#define DC1             %f54
```



```
#define DC2             %f48
#define DC3             %f46
#define K6              %f42
#define K5              %f20
#define K4              %f52
#define K3              %f50
#define K2              %f14
#define K1              %f12
#define DONE            %f4

#define tmp_counter     %g5
#define tmp_px          %o5

#define tmp0            STACK_BIAS-0x40
#define tmp1            STACK_BIAS-0x38
#define tmp2            STACK_BIAS-0x30
#define tmp3            STACK_BIAS-0x28
#define tmp4            STACK_BIAS-0x20
#define tmp5            STACK_BIAS-0x18
#define tmp6            STACK_BIAS-0x10
#define tmp7            STACK_BIAS-0x08

! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x40

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!      !!!!!   algorithm   !!!!!
!  ((float*)&res)[0] = ((float*)px)[0];
!  ((float*)&res)[1] = ((float*)px)[1];
!  hx = *(int*)px;
!  if ( hx >= 0x7ff00000 )
!  {
!    res = DONE / res;
!    ((float*)py)[0] = ((float*)&res)[0];
!    ((float*)py)[1] = ((float*)&res)[1];
!    px += stridex;
!    py += stridey;
!    continue;
!  }
!  if ( hx < 0x00100000 )
!  {
!    ax = hx & 0x7fffffff;
!    lx = ((int*)px)[1];
!
!    if ( (ax | lx) == 0 )
!    {
!      res = DONE / res;
!      ((float*)py)[0] = ((float*)&res)[0];
!      ((float*)py)[1] = ((float*)&res)[1];
!      px += stridex;
!      py += stridey;
!      continue;
!    }
!    else if ( hx >= 0 )
!    {
!      if ( hx < 0x00080000 )
!      {
!        res = *(long long*)&res;
!        hx = *(int*)&res - (537 << 21);
!      }
!      else
!      {
!        res = vis_fand(res,DC4);
!        res = *(long long*)&res;
!        res += D2ON51;
!        hx = *(int*)&res - (537 << 21);
```

```
!      }
!    }
!    else
!    {
!      res = sqrt(res);
!      ((float*)py)[0] = ((float*)&res)[0];
!      ((float*)py)[1] = ((float*)&res)[1];
!      px += stridex;
!      py += stridey;
!      continue;
!    }
!  }
!
!  iexp = hx >> 21;
!  iexp = -iexp;
!  iexp += 0x5fe;
!  lexp = iexp << 52;
!  dlexp = *(double*)&lexp;
!  hx >>= 10;
!  hx &= 0x7f8;
!  hx += 8;
!  hx &= -16;
!
!  res = vis_fand(res,DC0);
!  res = vis_for(res,DC1);
!  res_c = vis_fpadd32(res,DC2);
!  res_c = vis_fand(res_c,DC3);
!
!  addr = (char*)arr + hx;
!  dexp_hi = ((double*)addr)[0];
!  dexp_lo = ((double*)addr)[1];
!  dtmp0 = dexp_hi * dexp_hi;
!  xx = res - res_c;
!  xx *= dtmp0;
!  res = K6 * xx;
!  res += K5;
!  res *= xx;
!  res += K4;
!  res *= xx;
!  res += K3;
!  res *= xx;
!  res += K2;
!  res *= xx;
!  res += K1;
!  res *= xx;
!  res = dexp_hi * res;
!  res += dexp_lo;
!  res += dexp_hi;
!
!  res *= dlexp;
!
!  ((float*)py)[0] = ((float*)&res)[0];
!  ((float*)py)[1] = ((float*)&res)[1];
!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

        ENTRY(__vrsqrt)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,o3)
        PIC_SET(l7,__vlibm_TBL_rsqrt,l3)
        wr      %g0,0x82,%asi

        ldd     [%o3],K1
        sethi   %hi(0x7ff00000),%o0
        mov     %i3,%o4
```



```
        ldd     [%o3+0x08],K2
        sethi   %hi(0x00100000),%o1
        mov     %i1,tmp_px

        ldd     [%o3+0x10],K3
        sll     %i2,3,stridex
        mov     %i0,tmp_counter

        ldd     [%o3+0x18],K4
        sll     %i4,3,stridey

        ldd     [%o3+0x20],K5
        ldd     [%o3+0x28],K6
        ldd     [%o3+0x30],DC0
        ldd     [%o3+0x38],DC1
        ldd     [%o3+0x40],DC2
        ldd     [%o3+0x48],DC3

.begin:
        mov     tmp_counter,counter
        mov     tmp_px,%i1
        clr     tmp_counter
.begin1:
        cmp     counter,0
        ble,pn  %icc,.exit
        ldd     [%o3+0x60],DONE

        lda     [%i1]%asi,%f0           ! (6_0) ((float*)res)[0] = ((float*)px)[
        sethi   %hi(0x7ffffc00),%i0

        lda     [%i1+4]%asi,%f1         ! (6_0) ((float*)res)[1] = ((float*)px)[
        add     %i0,1023,%i0

        fand    %f0,DC0,%f16            ! (6_0) res = vis_fand(res,DC0);

        lda     [%i1]%asi,%g1           ! (6_1) hx = *(int*)px;
        sethi   %hi(0x00080000),%i4

        lda     [%i1+4]%asi,%l4
        add     %i1,stridex,%l6         ! px += stridex

        sra     %g1,21,%o7              ! (6_1) iexp = hx >> 21;
        lda     [%l6]%asi,%f8           ! (0_0) ((float*)res)[0] = ((float*)px)[
        for     %f16,DC1,%f44           ! (6_1) res = vis_for(res,DC1);

        lda     [%l6+4]%asi,%f9         ! (0_0) ((float*)res)[1] = ((float*)px)[
        sra     %g1,10,%o2              ! (6_1) hx >>= 10;
        and     %g1,%i0,%i2

        cmp     %g1,_0x7ff00000         ! (6_1) hx ? 0x7ff00000
        bge,pn  %icc,.spec0             ! (6_1) if ( hx >= 0x7ff00000 )
        and     %o2,2040,%o2            ! (6_1) hx &= 0x7f8;

        cmp     %g1,_0x00100000         ! (6_1) hx ? 0x00100000
        bl,pn   %icc,.spec1             ! (6_1) if ( hx < 0x00100000 )
        sub     %g0,%o7,%o7             ! (6_1) iexp = -iexp;
.cont_spec:
        fand    %f8,DC0,%f16            ! (0_0) res = vis_fand(res,DC0);

        fpadd32 %f44,DC2,%f18           ! (6_1) res_c = vis_fpadd32(res,DC2);

        add     %o2,8,%l4               ! (6_1) hx += 8;

        add     %o7,1534,%o7            ! (6_1) iexp += 0x5fe;
```

```
260         lda     [%l6]%asi,%g1           ! (0_0) hx = *(int*)px;
261         sllx    %o7,52,%o7              ! (6_1) iexp << 52;
262         and     %l4,-16,%l4             ! (6_1) hx = -16;

264         add     %l4,TBL,%l4             ! (6_1) addr = (char*)arr + hx;
265         stx     %o7,[%fp+tmp1]          ! (6_1) dlexp = *(double*)lexp;

267         add     %l6,stridex,%l6         ! px += stridex
268         ldd     [%l4],%f30              ! (6_1) dtmp0 = ((double*)addr)[0];

270         sra     %g1,21,%o7              ! (0_0) iexp = hx >> 21;
271         lda     [%l6]%asi,%f0           ! (1_0) ((float*)res)[0] = ((float*)px)[
272         for     %f16,DC1,%f28           ! (0_0) res = vis_for(res,DC1);

274         sra     %g1,10,%o2              ! (0_0) hx >>= 10;
275         sub     %g0,%o7,%o7             ! (0_0) iexp = -iexp;
276         lda     [%l6+4]%asi,%f1         ! (1_0) ((float*)res)[1] = ((float*)px)[

278         cmp     %g1,_0x7ff00000         ! (0_0) hx ? 0x7ff00000
279         bge,pn  %icc,.update0           ! (0_0) if ( hx >= 0x7ff00000 )
280         fand    %f18,DC3,%f6            ! (6_1) res_c = vis_fand(res_c,DC3);
281 .cont0:
282         and     %o2,2040,%o2            ! (0_0) hx &= 0x7f8;
283         fmuld   %f30,%f30,%f10          ! (6_1) dtmp0 = dexp_hi * dexp_hi;

285         cmp     %g1,_0x00100000         ! (0_0) hx ? 0x00100000
286         bl,pn   %icc,.update1           ! (0_0) if ( hx < 0x00100000 )
287         add     %o7,1534,%o7            ! (0_0) iexp += 0x5fe;
288 .cont1:
289         fand    %f0,DC0,%f16            ! (1_0) res = vis_fand(res,DC0);

291         fpadd32 %f28,DC2,%f18           ! (0_0) res_c = vis_fpadd32(res,DC2);

293         add     %o2,8,%l2               ! (0_0) hx += 8;
294         fsubd   %f44,%f6,%f6            ! (6_1) xx = res - res_c;

296         lda     [%l6]%asi,%g1           ! (1_0) hx = *(int*)px;
297         sllx    %o7,52,%o7              ! (0_0) iexp << 52;
298         and     %l2,-16,%l2             ! (0_0) hx = -16;

300         add     %l2,TBL,%l2             ! (0_0) addr = (char*)arr + hx;
301         add     %l6,stridex,%l6         ! px += stridex
302         stx     %o7,[%fp+tmp2]          ! (0_0) dlexp = *(double*)lexp;

304         fmuld   %f6,%f10,%f26           ! (6_1) xx *= dtmp0;
305         ldd     [%l2],%f10              ! (0_0) dtmp0 = ((double*)addr)[0];

307         sra     %g1,21,%o7              ! (1_0) iexp = hx >> 21;
308         lda     [%l6]%asi,%f6           ! (2_0) ((float*)res)[0] = ((float*)px)[
309         for     %f16,DC1,%f44           ! (1_0) res = vis_for(res,DC1);

311         sra     %g1,10,%o2              ! (1_0) hx >>= 10;
312         cmp     %g1,_0x7ff00000         ! (1_0) hx ? 0x7ff00000
313         bge,pn  %icc,.update2           ! (1_0) if ( hx >= 0x7ff00000 )
314         lda     [%l6+4]%asi,%f7         ! (2_0) ((float*)res)[1] = ((float*)px)[
315 .cont2:
316         fand    %f18,DC3,%f8            ! (0_0) res_c = vis_fand(res_c,DC3);

318         fmuld   %f10,%f10,%f10          ! (0_0) dtmp0 = dexp_hi * dexp_hi;
319         cmp     %g1,_0x00100000         ! (1_0) hx ? 0x00100000
320         bl,pn   %icc,.update3           ! (1_0) if ( hx < 0x00100000 )
321         and     %o2,2040,%o2            ! (1_0) hx &= 0x7f8;
322 .cont3:
323         sub     %g0,%o7,%o7             ! (1_0) iexp = -iexp;
324         fand    %f6,DC0,%f16            ! (2_0) res = vis_fand(res,DC0);
```



```
326         add     %o7,1534,%o7            ! (1_0) iexp += 0x5fe;
327         fpadd32 %f44,DC2,%f18           ! (1_0) res_c = vis_fpadd32(res,DC2);

329         fmuld   K6,%f26,%f62            ! (6_1) res = K6 * xx;
330         add     %o2,8,%i2               ! (1_0) hx += 8;
331         fsubd   %f28,%f8,%f32           ! (0_0) xx = res - res_c;

333         lda     [%l6]%asi,%g1           ! (2_0) hx = *(int*)px;
334         sllx    %o7,52,%o7              ! (1_0) iexp << 52;
335         and     %i2,-16,%i2             ! (1_0) hx = -16;

337         add     %i2,TBL,%i2             ! (1_0) addr = (char*)arr + hx;
338         stx     %o7,[%fp+tmp3]          ! (1_0) dlexp = *(double*)lexp;

340         fmuld   %f32,%f10,%f32          ! (0_0) xx *= dtmp0;
341         add     %l6,stridex,%l6         ! px += stridex
342         ldd     [%i2],%f10              ! (1_0) dtmp0 = ((double*)addr)[0];
343         faddd   %f62,K5,%f62            ! (6_1) res += K5;

345         sra     %g1,21,%o7              ! (2_0) iexp = hx >> 21;
346         lda     [%l6]%asi,%f0           ! (3_0) ((float*)res)[0] = ((float*)px)[
347         for     %f16,DC1,%f28           ! (2_0) res = vis_for(res,DC1);

349         sra     %g1,10,%o2              ! (2_0) hx >>= 10;
350         cmp     %g1,_0x7ff00000         ! (2_0) hx ? 0x7ff00000
351         bge,pn  %icc,.update4           ! (2_0) if ( hx >= 0x7ff00000 )
352         lda     [%l6+4]%asi,%f1         ! (3_0) ((float*)res)[1] = ((float*)px)[
353 .cont4:
354         fmuld   %f62,%f26,%f40          ! (6_1) res *= xx;
355         fand    %f18,DC3,%f8            ! (1_0) res_c = vis_fand(res_c,DC3);

357         fmuld   %f10,%f10,%f10          ! (1_0) dtmp0 = dexp_hi * dexp_hi;
358         cmp     %g1,_0x00100000         ! (2_0) hx ? 0x00100000
359         bl,pn   %icc,.update5           ! (2_0) if ( hx < 0x00100000 )
360         and     %o2,2040,%o2            ! (2_0) hx &= 0x7f8;
361 .cont5:
362         sub     %g0,%o7,%o7             ! (2_0) iexp = -iexp;
363         fand    %f0,DC0,%f16            ! (3_0) res = vis_fand(res,DC0);

365         add     %o7,1534,%o7            ! (2_0) iexp += 0x5fe;
366         fpadd32 %f28,DC2,%f18           ! (2_0) res_c = vis_fpadd32(res,DC2);

368         fmuld   K6,%f32,%f62            ! (0_0) res = K6 * xx;
369         add     %o2,8,%i4               ! (2_0) hx += 8;
370         fsubd   %f44,%f8,%f6            ! (1_0) xx = res - res_c;

372         faddd   %f40,K4,%f40            ! (6_1) res += K4;

374         lda     [%l6]%asi,%g1           ! (3_0) hx = *(int*)px;
375         sllx    %o7,52,%o7              ! (2_0) iexp << 52;
376         and     %i4,-16,%i4             ! (2_0) hx = -16;

378         add     %i4,TBL,%i4             ! (2_0) addr = (char*)arr + hx;
379         stx     %o7,[%fp+tmp4]          ! (2_0) dlexp = *(double*)lexp;

381         fmuld   %f6,%f10,%f38           ! (1_0) xx *= dtmp0;
382         ldd     [%i4],%f24              ! (2_0) dtmp0 = ((double*)addr)[0];
383         faddd   %f62,K5,%f62            ! (0_0) res += K5;

385         fmuld   %f40,%f26,%f34          ! (6_1) res *= xx;
386         add     %l6,stridex,%l6         ! px += stridex

388         sra     %g1,21,%o7              ! (3_0) iexp = hx >> 21;
389         lda     [%l6]%asi,%f8           ! (4_0) ((float*)res)[0] = ((float*)px)[
390         for     %f16,DC1,%f44           ! (3_0) res = vis_for(res,DC1);
```

```
392         sra     %g1,10,%o2              ! (3_0) hx >>= 10;
393         cmp     %g1,_0x7ff00000         ! (3_0) hx ? 0x7ff00000
394         bge,pn  %icc,.update6           ! (3_0) if ( hx >= 0x7ff00000 )
395         lda     [%l6+4]%asi,%f9         ! (4_0) ((float*)res)[1] = ((float*)px)[
396 .cont6:
397         fmuld   %f62,%f32,%f60          ! (0_0) res *= xx;
398         cmp     %g1,_0x00100000         ! (3_0) hx ? 0x00100000
399         fand    %f18,DC3,%f22           ! (2_0) res_c = vis_fand(res_c,DC3);

401         fmuld   %f24,%f24,%f24          ! (2_0) dtmp0 = dexp_hi * dexp_hi;
402         bl,pn   %icc,.update7           ! (3_0) if ( hx < 0x00100000 )
403         and     %o2,2040,%o2            ! (3_0) hx &= 0x7f8;
404         faddd   %f34,K3,%f6             ! (6_1) res += K3;
405 .cont7:
406         sub     %g0,%o7,%o7             ! (3_0) iexp = -iexp;
407         fand    %f8,DC0,%f16            ! (4_0) res = vis_fand(res,DC0);

409         add     %o7,1534,%o7            ! (3_0) iexp += 0x5fe;
410         fpadd32 %f44,DC2,%f18           ! (3_0) res_c = vis_fpadd32(res,DC2);

412         fmuld   K6,%f38,%f62            ! (1_0) res = K6 * xx;
413         add     %o2,8,%i5               ! (3_0) hx += 8;
414         fsubd   %f28,%f22,%f28          ! (2_0) xx = res - res_c;

416         fmuld   %f6,%f26,%f22           ! (6_1) res *= xx;
417         faddd   %f60,K4,%f60            ! (0_0) res += K4;

419         lda     [%l6]%asi,%g1           ! (4_0) hx = *(int*)px;
420         sllx    %o7,52,%o7              ! (3_0) iexp << 52;
421         and     %i5,-16,%i5             ! (3_0) hx = -16;

423         add     %i5,TBL,%i5             ! (3_0) addr = (char*)arr + hx;
424         stx     %o7,[%fp+tmp5]          ! (3_0) dlexp = *(double*)lexp;

426         fmuld   %f28,%f24,%f36          ! (2_0) xx *= dtmp0;
427         add     %l6,stridex,%i0         ! px += stridex
428         ldd     [%i5],%f28              ! (3_0) dtmp0 = ((double*)addr)[0];
429         faddd   %f62,K5,%f62            ! (1_0) res += K5;

431         faddd   %f22,K2,%f10            ! (6_1) res += K2;
432         fmuld   %f60,%f32,%f34          ! (0_0) res *= xx;

434         sra     %g1,21,%o7              ! (4_0) iexp = hx >> 21;
435         lda     [%i0]%asi,%f0           ! (5_0) ((float*)res)[0] = ((float*)px)[
436         for     %f16,DC1,%f24           ! (4_0) res = vis_for(res,DC1);

438         sra     %g1,10,%o2              ! (4_0) hx >>= 10;
439         cmp     %g1,_0x7ff00000         ! (4_0) hx ? 0x7ff00000
440         bge,pn  %icc,.update8           ! (4_0) if ( hx >= 0x7ff00000 )
441         lda     [%i0+4]%asi,%f1         ! (5_0) ((float*)res)[1] = ((float*)px)[
442 .cont8:
443         fand    %f18,DC3,%f40           ! (3_0) res_c = vis_fand(res_c,DC3);
444         fmuld   %f62,%f38,%f62          ! (1_0) res *= xx;

446         fmuld   %f10,%f26,%f58          ! (6_1) res *= xx;
447         cmp     %g1,_0x00100000         ! (4_0) hx ? 0x00100000
448         and     %o2,2040,%o2            ! (4_0) hx &= 0x7f8;
449         faddd   %f34,K3,%f60            ! (0_0) res += K3;

451         fmuld   %f28,%f28,%f28          ! (3_0) dtmp0 = dexp_hi * dexp_hi;
452         bl,pn   %icc,.update9           ! (4_0) if ( hx < 0x00100000 )
453         sub     %g0,%o7,%o7             ! (4_0) iexp = -iexp;
454         fand    %f0,DC0,%f16            ! (5_0) res = vis_fand(res,DC0);
455 .cont9:
456         add     %o7,1534,%o7            ! (4_0) iexp += 0x5fe;
457         fpadd32 %f24,DC2,%f18           ! (4_0) res_c = vis_fpadd32(res,DC2);
```



```
459         fmuld   K6,%f36,%f10            ! (2_0) res = K6 * xx;
460         add     %o2,8,%l1               ! (4_0) hx += 8;
461         fsubd   %f44,%f40,%f44          ! (3_0) xx = res - res_c;

463         fmuld   %f60,%f32,%f60          ! (0_0) res *= xx;
464         faddd   %f62,K4,%f6             ! (1_0) res += K4;

466         lda     [%i0]%asi,%g1           ! (5_0) hx = *(int*)px;
467         sllx    %o7,52,%o7              ! (4_0) iexp << 52;
468         and     %l1,-16,%l1             ! (4_0) hx = -16;
469         faddd   %f58,K1,%f58            ! (6_1) res += K1;

471         add     %i0,stridex,%i1         ! px += stridex
472         add     %l1,TBL,%l1             ! (4_0) addr = (char*)arr + hx;
473         stx     %o7,[%fp+tmp6]          ! (4_0) dlexp = *(double*)lexp;

475         fmuld   %f44,%f28,%f40          ! (3_0) xx *= dtmp0;
476         ldd     [%l1],%f44              ! (4_0) dtmp0 = ((double*)addr)[0];
477         faddd   %f10,K5,%f62            ! (2_0) res += K5;

479         fmuld   %f6,%f38,%f34           ! (1_0) res *= xx;
480         sra     %g1,21,%o7              ! (5_0) iexp = hx >> 21;
481         nop
482         faddd   %f60,K2,%f60            ! (0_0) res += K2;

484         for     %f16,DC1,%f28           ! (5_0) res = vis_for(res,DC1);
485         sub     %g0,%o7,%o7             ! (5_0) iexp = -iexp;
486         lda     [%i1]%asi,%f6           ! (6_0) ((float*)res)[0] = ((float*)px)[
487         fmuld   %f58,%f26,%f26          ! (6_1) res *= xx;

489         sra     %g1,10,%o2              ! (5_0) hx >>= 10;
490         cmp     %g1,_0x7ff00000         ! (5_0) hx ? 0x7ff00000
491         bge,pn  %icc,.update10          ! (5_0) if ( hx >= 0x7ff00000 )
492         lda     [%i1+4]%asi,%f7         ! (6_0) ((float*)res)[1] = ((float*)px)[
493 .cont10:
494         fand    %f18,DC3,%f8            ! (4_0) res_c = vis_fand(res_c,DC3);
495         fmuld   %f62,%f36,%f62          ! (2_0) res *= xx;

497         fmuld   %f60,%f32,%f58          ! (0_0) res *= xx;
498         cmp     %g1,_0x00100000         ! (5_0) hx ? 0x00100000
499         and     %o2,2040,%o2            ! (5_0) hx &= 0x7f8;
500         faddd   %f34,K3,%f34            ! (1_0) res += K3;

502         fmuld   %f30,%f26,%f26          ! (6_1) res = dexp_hi * res;
503         bl,pn   %icc,.update11          ! (5_0) if ( hx < 0x00100000 )
504         nop
505         fand    %f6,DC0,%f16            ! (6_0) res = vis_fand(res,DC0);
506 .cont11:
507         ldd     [%l4+8],%f60            ! (6_1) dexp_lo = ((double*)addr)[1];
508         fmuld   %f44,%f44,%f44          ! (4_0) dtmp0 = dexp_hi * dexp_hi;
509         fpadd32 %f28,DC2,%f18           ! (5_0) res_c = vis_fpadd32(res,DC2);

511         fmuld   K6,%f40,%f22            ! (3_0) res = K6 * xx;
512         add     %o2,8,%i3               ! (5_0) hx += 8;
513         fsubd   %f24,%f8,%f10           ! (4_0) xx = res - res_c;

515         fmuld   %f34,%f38,%f24          ! (1_0) res *= xx;
516         or      %g0,%o4,%i0

518         cmp     counter,7
519         bl,pn   %icc,.tail
520         faddd   %f62,K4,%f34            ! (2_0) res += K4;

522         ba      .main_loop
523         sub     counter,7,counter       ! counter
```

```
525         .align  16
526 .main_loop:
527         add     %o7,1534,%o7            ! (5_0) iexp += 0x5fe;
528         and     %i3,-16,%i3             ! (5_1) hx = -16;
529         lda     [%i1]%asi,%g1           ! (6_1) hx = *(int*)px;
530         faddd   %f58,K1,%f58            ! (0_1) res += K1;

532         add     %i3,TBL,%i3             ! (5_1) addr = (char*)arr + hx;
533         sllx    %o7,52,%o7              ! (5_1) iexp << 52;
534         stx     %o7,[%fp+tmp0]          ! (5_1) dlexp = *(double*)lexp;
535         faddd   %f26,%f60,%f8           ! (6_2) res += dexp_lo;

537         faddd   %f22,K5,%f62            ! (3_1) res += K5;
538         add     %i1,stridex,%l6         ! px += stridex
539         ldd     [%i3],%f22              ! (5_1) dtmp0 = ((double*)addr)[0];
540         fmuld   %f10,%f44,%f60          ! (4_1) xx *= dtmp0;

542         faddd   %f24,K2,%f26            ! (1_1) res += K2;
543         add     %i0,stridey,%i1         ! px += stridey
544         ldd     [%l2],%f24              ! (0_1) dexp_hi = ((double*)addr)[0];
545         fmuld   %f34,%f36,%f34          ! (2_1) res *= xx;

547         fmuld   %f58,%f32,%f58          ! (0_1) res *= xx;
548         sra     %g1,21,%o7              ! (6_1) iexp = hx >> 21;
549         lda     [%l6]%asi,%f0           ! (0_0) ((float*)res)[0] = ((float*)px)[
550         for     %f16,DC1,%f44           ! (6_1) res = vis_for(res,DC1);

552         lda     [%l6+4]%asi,%f1         ! (0_0) ((float*)res)[1] = ((float*)px)[
553         sra     %g1,10,%o2              ! (6_1) hx >>= 10;
554         fmuld   %f22,%f22,%f10          ! (5_1) dtmp0 = dexp_hi * dexp_hi;
555         faddd   %f8,%f30,%f30           ! (6_2) res += dexp_hi;

557         fmuld   %f62,%f40,%f32          ! (3_1) res *= xx;
558         cmp     %g1,_0x7ff00000         ! (6_1) hx ? 0x7ff00000
559         ldd     [%fp+tmp1],%f62         ! (6_2) dlexp = *(double*)lexp;
560         fand    %f18,DC3,%f8            ! (5_1) res_c = vis_fand(res_c,DC3);

562         fmuld   %f26,%f38,%f26          ! (1_1) res *= xx;
563         bge,pn  %icc,.update12          ! (6_1) if ( hx >= 0x7ff00000 )
564         and     %o2,2040,%o2            ! (6_1) hx &= 0x7f8;
565         faddd   %f34,K3,%f34            ! (2_1) res += K3;
566 .cont12:
567         fmuld   %f24,%f58,%f58          ! (0_1) res = dexp_hi * res;
568         cmp     %g1,_0x00100000         ! (6_1) hx ? 0x00100000
569         sub     %g0,%o7,%o7             ! (6_1) iexp = -iexp;
570         fand    %f0,DC0,%f16            ! (0_0) res = vis_fand(res,DC0);

572         fmuld   %f30,%f62,%f2           ! (6_2) res *= dlexp;
573         bl,pn   %icc,.update13          ! (6_1) if ( hx < 0x00100000 )
574         ldd     [%l2+8],%f30            ! (0_1) dexp_lo = ((double*)addr)[1];
575         fpadd32 %f44,DC2,%f18           ! (6_1) res_c = vis_fpadd32(res,DC2);
576 .cont13:
577         fmuld   K6,%f60,%f62            ! (4_1) res = K6 * xx;
578         add     %o2,8,%l4               ! (6_1) hx += 8;
579         st      %f2,[%i0]               ! (6_2) ((float*)py)[0] = ((float*)res)[
580         fsubd   %f28,%f8,%f6            ! (5_1) xx = res - res_c;

582         fmuld   %f34,%f36,%f28          ! (2_1) res *= xx;
583         add     %o7,1534,%o7            ! (6_1) iexp += 0x5fe;
584         st      %f3,[%i0+4]             ! (6_2) ((float*)py)[1] = ((float*)res)[
585         faddd   %f32,K4,%f32            ! (3_1) res += K4;

587         lda     [%l6]%asi,%g1           ! (0_0) hx = *(int*)px;
588         sllx    %o7,52,%o7              ! (6_1) iexp << 52;
589         and     %l4,-16,%l4             ! (6_1) hx = -16;
```



```
590         faddd   %f26,K1,%f26            ! (1_1) res += K1;

592         add     %i1,stridey,%i0         ! px += stridey
593         add     %l4,TBL,%l4             ! (6_1) addr = (char*)arr + hx;
594         stx     %o7,[%fp+tmp1]          ! (6_1) dlexp = *(double*)lexp;
595         faddd   %f58,%f30,%f8           ! (0_1) res += dexp_lo;

597         fmuld   %f6,%f10,%f58           ! (5_1) xx *= dtmp0;
598         add     %l6,stridex,%l6         ! px += stridex
599         ldd     [%l4],%f30              ! (6_1) dtmp0 = ((double*)addr)[0];
600         faddd   %f62,K5,%f62            ! (4_1) res += K5;

602         fmuld   %f32,%f40,%f34          ! (3_1) res *= xx;
603         sra     %g1,10,%o2              ! (0_0) hx >>= 10;
604         ldd     [%i2],%f4               ! (1_1) dexp_hi = ((double*)addr)[0];
605         faddd   %f28,K2,%f32            ! (2_1) res += K2;

607         fmuld   %f26,%f38,%f26          ! (1_1) res *= xx;
608         sra     %g1,21,%o7              ! (0_0) iexp = hx >> 21;
609         lda     [%l6]%asi,%f6           ! (1_0) ((float*)res)[0] = ((float*)px)[
610         for     %f16,DC1,%f28           ! (0_0) res = vis_for(res,DC1);

612         fmuld   %f30,%f30,%f30          ! (6_1) dtmp0 = dexp_hi * dexp_hi;
613         sub     %g0,%o7,%o7             ! (0_0) iexp = -iexp;
614         lda     [%l6+4]%asi,%f7         ! (1_0) ((float*)res)[1] = ((float*)px)[
615         faddd   %f8,%f24,%f24           ! (0_1) res += dexp_hi;

617         fmuld   %f62,%f60,%f38          ! (4_1) res *= xx;
618         cmp     %g1,_0x7ff00000         ! (0_0) hx ? 0x7ff00000
619         ldd     [%fp+tmp2],%f62         ! (0_1) dlexp = *(double*)lexp;
620         fand    %f18,DC3,%f8            ! (6_1) res_c = vis_fand(res_c,DC3);

622         fmuld   %f32,%f36,%f32          ! (2_1) res *= xx;
623         bge,pn  %icc,.update14          ! (0_0) if ( hx >= 0x7ff00000 )
624         and     %o2,2040,%o2            ! (0_0) hx &= 0x7f8;
625         faddd   %f34,K3,%f34            ! (3_1) res += K3;
626 .cont14:
627         fmuld   %f4,%f26,%f26           ! (1_1) res = dexp_hi * res;
628         cmp     %g1,_0x00100000         ! (0_0) hx ? 0x00100000
629         add     %o7,1534,%o7            ! (0_0) iexp += 0x5fe;
630         fand    %f6,DC0,%f16            ! (1_0) res = vis_fand(res,DC0);

632         fmuld   %f24,%f62,%f2           ! (0_1) res *= dlexp;
633         bl,pn   %icc,.update15          ! (0_0) if ( hx < 0x00100000 )
634         ldd     [%i2+8],%f24            ! (1_1) dexp_lo = ((double*)addr)[1];
635         fpadd32 %f28,DC2,%f18           ! (0_0) res_c = vis_fpadd32(res,DC2);
636 .cont15:
637         fmuld   K6,%f58,%f62            ! (5_1) res = K6 * xx;
638         add     %o2,8,%l2               ! (0_0) hx += 8;
639         st      %f2,[%i1]               ! (0_1) ((float*)py)[0] = ((float*)res)[
640         fsubd   %f44,%f8,%f10           ! (6_1) xx = res - res_c;

642         fmuld   %f34,%f40,%f44          ! (3_1) res *= xx;
643         nop
644         st      %f3,[%i1+4]             ! (0_1) ((float*)py)[1] = ((float*)res)[
645         faddd   %f38,K4,%f38            ! (4_1) res += K4;

647         lda     [%l6]%asi,%g1           ! (1_0) hx = *(int*)px;
648         sllx    %o7,52,%o7              ! (0_0) iexp << 52;
649         and     %l2,-16,%l2             ! (0_0) hx = -16;
650         faddd   %f32,K1,%f32            ! (2_1) res += K1;

652         add     %l2,TBL,%l2             ! (0_0) addr = (char*)arr + hx;
653         add     %l6,stridex,%l6         ! px += stridex
654         stx     %o7,[%fp+tmp2]          ! (0_0) dlexp = *(double*)lexp;
655         faddd   %f26,%f24,%f8           ! (1_1) res += dexp_lo;
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```
657         fmuld   %f10,%f30,%f26          ! (6_1) xx *= dtmp0;
658         add     %i0,stridey,%i1         ! px += stridey
659         ldd     [%l2],%f30              ! (0_0) dtmp0 = ((double*)addr)[0];
660         faddd   %f62,K5,%f62            ! (5_1) res += K5;

662         fmuld   %f38,%f60,%f34          ! (4_1) res *= xx;
663         sra     %g1,10,%o2              ! (1_0) hx >>= 10;
664         ldd     [%i4],%f24              ! (2_1) dexp_hi = ((double*)addr)[0];
665         faddd   %f44,K2,%f38            ! (3_1) res += K2;

667         fmuld   %f32,%f36,%f32          ! (2_1) res *= xx;
668         sra     %g1,21,%o7              ! (1_0) iexp = hx >> 21;
669         lda     [%l6]%asi,%f0           ! (2_0) ((float*)res)[0] = ((float*)px)[
670         for     %f16,DC1,%f44           ! (1_0) res = vis_for(res,DC1);

672         fmuld   %f30,%f30,%f30          ! (0_0) dtmp0 = dexp_hi * dexp_hi;
673         cmp     %g1,_0x7ff00000         ! (1_0) hx ? 0x7ff00000
674         lda     [%l6+4]%asi,%f1         ! (2_0) ((float*)res)[1] = ((float*)px)[
675         faddd   %f8,%f4,%f4             ! (1_1) res += dexp_hi;

677         fmuld   %f62,%f58,%f36          ! (5_1) res *= xx;
678         bge,pn  %icc,.update16          ! (1_0) if ( hx >= 0x7ff00000 )
679         ldd     [%fp+tmp3],%f62         ! (1_1) dlexp = *(double*)lexp;
680         fand    %f18,DC3,%f8            ! (0_0) res_c = vis_fand(res_c,DC3);
681 .cont16:
682         fmuld   %f38,%f40,%f38          ! (3_1) res *= xx;
683         cmp     %g1,_0x00100000         ! (1_0) hx ? 0x00100000
684         and     %o2,2040,%o2            ! (1_0) hx &= 0x7f8;
685         faddd   %f34,K3,%f34            ! (4_1) res += K3;

687         fmuld   %f24,%f32,%f32          ! (2_1) res = dexp_hi * res;
688         bl,pn   %icc,.update17          ! (1_0) if ( hx < 0x00100000 )
689         sub     %g0,%o7,%o7             ! (1_0) iexp = -iexp;
690         fand    %f0,DC0,%f16            ! (2_0) res = vis_fand(res,DC0);
691 .cont17:
692         fmuld   %f4,%f62,%f2            ! (1_1) res *= dlexp;
693         add     %o7,1534,%o7            ! (1_0) iexp += 0x5fe;
694         ldd     [%i4+8],%f4             ! (2_1) dexp_lo = ((double*)addr)[1];
695         fpadd32 %f44,DC2,%f18           ! (1_0) res_c = vis_fpadd32(res,DC2);

697         fmuld   K6,%f26,%f62            ! (6_1) res = K6 * xx;
698         add     %o2,8,%i2               ! (1_0) hx += 8;
699         st      %f2,[%i0]               ! (1_1) ((float*)py)[0] = ((float*)res)[
700         fsubd   %f28,%f8,%f6            ! (0_0) xx = res - res_c;

702         fmuld   %f34,%f60,%f28          ! (4_1) res *= xx;
703         nop
704         st      %f3,[%i0+4]             ! (1_1) ((float*)py)[1] = ((float*)res)[
705         faddd   %f36,K4,%f36            ! (5_1) res += K4;

707         lda     [%l6]%asi,%g1           ! (2_0) hx = *(int*)px;
708         sllx    %o7,52,%o7              ! (1_0) iexp << 52;
709         and     %i2,-16,%i2             ! (1_0) hx = -16;
710         faddd   %f38,K1,%f38            ! (3_1) res += K1;

712         add     %i1,stridey,%i0         ! px += stridey
713         add     %i2,TBL,%i2             ! (1_0) addr = (char*)arr + hx;
714         stx     %o7,[%fp+tmp3]          ! (1_0) dlexp = *(double*)lexp;
715         faddd   %f32,%f4,%f8            ! (2_1) res += dexp_lo;

717         fmuld   %f6,%f30,%f32           ! (0_0) xx *= dtmp0;
718         add     %l6,stridex,%l6         ! px += stridex
719         ldd     [%i2],%f30              ! (1_0) dtmp0 = ((double*)addr)[0];
720         faddd   %f62,K5,%f62            ! (6_1) res += K5;
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722         fmuld   %f36,%f58,%f34          ! (5_1) res *= xx;
723         sra     %g1,10,%o2              ! (2_0) hx >>= 10;
724         ldd     [%i5],%f4               ! (3_1) dexp_hi = ((double*)addr)[0];
725         faddd   %f28,K2,%f36            ! (4_1) res += K2;

727         fmuld   %f38,%f40,%f38          ! (3_1) res *= xx;
728         sra     %g1,21,%o7              ! (2_0) iexp = hx >> 21;
729         lda     [%l6]%asi,%f6           ! (3_0) ((float*)res)[0] = ((float*)px)[
730         for     %f16,DC1,%f28           ! (2_0) res = vis_for(res,DC1);

732         fmuld   %f30,%f30,%f30          ! (1_0) dtmp0 = dexp_hi * dexp_hi;
733         cmp     %g1,_0x7ff00000         ! (2_0) hx ? 0x7ff00000
734         lda     [%l6+4]%asi,%f7         ! (3_0) ((float*)res)[1] = ((float*)px)[
735         faddd   %f8,%f24,%f24           ! (2_1) res += dexp_hi;

737         fmuld   %f62,%f26,%f40          ! (6_1) res *= xx;
738         bge,pn  %icc,.update18          ! (2_0) if ( hx >= 0x7ff00000 )
739         ldd     [%fp+tmp4],%f62         ! (2_1) dlexp = *(double*)lexp;
740         fand    %f18,DC3,%f8            ! (1_0) res_c = vis_fand(res_c,DC3);
741 .cont18:
742         fmuld   %f36,%f60,%f36          ! (4_1) res *= xx;
743         cmp     %g1,_0x00100000         ! (2_0) hx ? 0x00100000
744         and     %o2,2040,%o2            ! (2_0) hx &= 0x7f8;
745         faddd   %f34,K3,%f34            ! (5_1) res += K3;

747         fmuld   %f4,%f38,%f38           ! (3_1) res = dexp_hi * res;
748         bl,pn   %icc,.update19          ! (2_0) if ( hx < 0x00100000 )
749         sub     %g0,%o7,%o7             ! (2_0) iexp = -iexp;
750         fand    %f6,DC0,%f16            ! (3_0) res = vis_fand(res,DC0);
751 .cont19:
752         fmuld   %f24,%f62,%f2           ! (2_1) res *= dlexp;
753         add     %o7,1534,%o7            ! (2_0) iexp += 0x5fe;
754         ldd     [%i5+8],%f24            ! (3_1) dexp_lo = ((double*)addr)[1];
755         fpadd32 %f28,DC2,%f18           ! (2_0) res_c = vis_fpadd32(res,DC2);

757         fmuld   K6,%f32,%f62            ! (0_0) res = K6 * xx;
758         add     %o2,8,%i4               ! (2_0) hx += 8;
759         st      %f2,[%i1]               ! (2_1) ((float*)py)[0] = ((float*)res)[
760         fsubd   %f44,%f8,%f10           ! (1_0) xx = res - res_c;

762         fmuld   %f34,%f58,%f44          ! (5_1) res *= xx;
763         nop
764         st      %f3,[%i1+4]             ! (2_1) ((float*)py)[1] = ((float*)res)[
765         faddd   %f40,K4,%f40            ! (6_1) res += K4;

767         lda     [%l6]%asi,%g1           ! (3_0) hx = *(int*)px;
768         sllx    %o7,52,%o7              ! (2_0) iexp << 52;
769         and     %i4,-16,%i4             ! (2_0) hx = -16;
770         faddd   %f36,K1,%f36            ! (4_1) res += K1;

772         add     %l6,stridex,%l6         ! px += stridex
773         add     %i4,TBL,%i4             ! (2_0) addr = (char*)arr + hx;
774         stx     %o7,[%fp+tmp4]          ! (2_0) dlexp = *(double*)lexp;
775         faddd   %f38,%f24,%f8           ! (3_1) res += dexp_lo;

777         fmuld   %f10,%f30,%f38          ! (1_0) xx *= dtmp0;
778         add     %i0,stridey,%i1         ! px += stridey
779         ldd     [%i4],%f24              ! (2_0) dtmp0 = ((double*)addr)[0];
780         faddd   %f62,K5,%f62            ! (0_0) res += K5;

782         fmuld   %f40,%f26,%f34          ! (6_1) res *= xx;
783         sra     %g1,10,%o2              ! (3_0) hx >>= 10;
784         ldd     [%l1],%f30              ! (4_1) dexp_hi = ((double*)addr)[0];
785         faddd   %f44,K2,%f40            ! (5_1) res += K2;

787         fmuld   %f36,%f60,%f36          ! (4_1) res *= xx;
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788         sra     %g1,21,%o7              ! (3_0) iexp = hx >> 21;
789         lda     [%l6]%asi,%f0           ! (4_0) ((float*)res)[0] = ((float*)px)[
790         for     %f16,DC1,%f44           ! (3_0) res = vis_for(res,DC1);

792         fmuld   %f24,%f24,%f24          ! (2_0) dtmp0 = dexp_hi * dexp_hi;
793         cmp     %g1,_0x7ff00000         ! (3_0) hx ? 0x7ff00000
794         lda     [%l6+4]%asi,%f1         ! (4_0) ((float*)res)[1] = ((float*)px)[
795         faddd   %f8,%f4,%f8             ! (3_1) res += dexp_hi;

797         fmuld   %f62,%f32,%f60          ! (0_0) res *= xx;
798         bge,pn  %icc,.update20          ! (3_0) if ( hx >= 0x7ff00000 )
799         ldd     [%fp+tmp5],%f62         ! (3_1) dlexp = *(double*)lexp;
800         fand    %f18,DC3,%f4            ! (2_0) res_c = vis_fand(res_c,DC3);
801 .cont20:
802         fmuld   %f40,%f58,%f40          ! (5_1) res *= xx;
803         cmp     %g1,_0x00100000         ! (3_0) hx ? 0x00100000
804         and     %o2,2040,%o2            ! (3_0) hx &= 0x7f8;
805         faddd   %f34,K3,%f10            ! (6_1) res += K3;

807         fmuld   %f30,%f36,%f36          ! (4_1) res = dexp_hi * res;
808         bl,pn   %icc,.update21          ! (3_0) if ( hx < 0x00100000 )
809         sub     %g0,%o7,%o7             ! (3_0) iexp = -iexp;
810         fand    %f0,DC0,%f16            ! (4_0) res = vis_fand(res,DC0);
811 .cont21:
812         fmuld   %f8,%f62,%f8            ! (3_1) res *= dlexp;
813         add     %o7,1534,%o7            ! (3_0) iexp += 0x5fe;
814         ldd     [%l1+8],%f34            ! (4_1) dexp_lo = ((double*)addr)[1];
815         fpadd32 %f44,DC2,%f18           ! (3_0) res_c = vis_fpadd32(res,DC2);

817         fmuld   K6,%f38,%f62            ! (1_0) res = K6 * xx;
818         add     %o2,8,%i5               ! (3_0) hx += 8;
819         st      %f8,[%i0]               ! (3_1) ((float*)py)[0] = ((float*)res)[
820         fsubd   %f28,%f4,%f28           ! (2_0) xx = res - res_c;

822         fmuld   %f10,%f26,%f4           ! (6_1) res *= xx;
823         nop
824         st      %f9,[%i0+4]             ! (3_1) ((float*)py)[1] = ((float*)res)[
825         faddd   %f60,K4,%f60            ! (0_0) res += K4;

827         lda     [%l6]%asi,%g1           ! (4_0) hx = *(int*)px;
828         sllx    %o7,52,%o7              ! (3_0) iexp << 52;
829         and     %i5,-16,%i5             ! (3_0) hx = -16;
830         faddd   %f40,K1,%f40            ! (5_1) res += K1;

832         add     %l6,stridex,%i0         ! px += stridex
833         add     %i5,TBL,%i5             ! (3_0) addr = (char*)arr + hx;
834         stx     %o7,[%fp+tmp5]          ! (3_0) dlexp = *(double*)lexp;
835         faddd   %f36,%f34,%f8           ! (4_1) res += dexp_lo;

837         fmuld   %f28,%f24,%f36          ! (2_0) xx *= dtmp0;
838         add     %i1,stridey,%l6         ! px += stridey
839         ldd     [%i5],%f28              ! (3_0) dtmp0 = ((double*)addr)[0];
840         faddd   %f62,K5,%f62            ! (1_0) res += K5;

842         faddd   %f4,K2,%f10             ! (6_1) res += K2;
843         sra     %g1,10,%o2              ! (4_0) hx >>= 10;
844         nop
845         fmuld   %f60,%f32,%f34          ! (0_0) res *= xx;

847         fmuld   %f40,%f58,%f40          ! (5_1) res *= xx;
848         sra     %g1,21,%o7              ! (4_0) iexp = hx >> 21;
849         lda     [%i0]%asi,%f6           ! (5_0) ((float*)res)[0] = ((float*)px)[
850         for     %f16,DC1,%f24           ! (4_0) res = vis_for(res,DC1);

852         fmuld   %f28,%f28,%f28          ! (3_0) dtmp0 = dexp_hi * dexp_hi;
853         cmp     %g1,_0x7ff00000         ! (4_0) hx ? 0x7ff00000
```



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854         lda     [%i0+4]%asi,%f7         ! (5_0) ((float*)res)[1] = ((float*)px)[
855         faddd   %f8,%f30,%f30           ! (4_1) res += dexp_hi;

857         fand    %f18,DC3,%f8            ! (3_0) res_c = vis_fand(res_c,DC3);
858         bge,pn  %icc,.update22          ! (4_0) if ( hx >= 0x7ff00000 )
859         ldd     [%fp+tmp6],%f18         ! (4_1) dlexp = *(double*)lexp;
860         fmuld   %f62,%f38,%f62          ! (1_0) res *= xx;
861 .cont22:
862         fmuld   %f10,%f26,%f58          ! (6_1) res *= xx;
863         cmp     %g1,_0x00100000         ! (4_0) hx ? 0x00100000
864         and     %o2,2040,%o2            ! (4_0) hx &= 0x7f8;
865         faddd   %f34,K3,%f60            ! (0_0) res += K3;

867         fmuld   %f22,%f40,%f40          ! (5_1) res = dexp_hi * res;
868         bl,pn   %icc,.update23          ! (4_0) if ( hx < 0x00100000 )
869         sub     %g0,%o7,%o7             ! (4_0) iexp = -iexp;
870         fand    %f6,DC0,%f16            ! (5_0) res = vis_fand(res,DC0);
871 .cont23:
872         fmuld   %f30,%f18,%f6           ! (4_1) res *= dlexp;
873         add     %o7,1534,%o7            ! (4_0) iexp += 0x5fe;
874         ldd     [%i3+8],%f34            ! (5_1) dexp_lo = ((double*)addr)[1];
875         fpadd32 %f24,DC2,%f18           ! (4_0) res_c = vis_fpadd32(res,DC2);

877         fmuld   K6,%f36,%f30            ! (2_0) res = K6 * xx;
878         add     %o2,8,%l1               ! (4_0) hx += 8;
879         st      %f6,[%i1]               ! (4_1) ((float*)py)[0] = ((float*)res)[
880         fsubd   %f44,%f8,%f44           ! (3_0) xx = res - res_c;

882         fmuld   %f60,%f32,%f60          ! (0_0) res *= xx;
883         sllx    %o7,52,%o7              ! (4_0) iexp << 52;
884         st      %f7,[%i1+4]             ! (4_1) ((float*)py)[1] = ((float*)res)[
885         faddd   %f62,K4,%f6             ! (1_0) res += K4;

887         lda     [%i0]%asi,%g1           ! (5_0) hx = *(int*)px;
888         add     %i0,stridex,%i1         ! px += stridex
889         and     %l1,-16,%l1             ! (4_0) hx = -16;
890         faddd   %f58,K1,%f58            ! (6_1) res += K1;

892         add     %l1,TBL,%l1             ! (4_0) addr = (char*)arr + hx;
893         add     %l6,stridey,%i0         ! px += stridey
894         stx     %o7,[%fp+tmp6]          ! (4_0) dlexp = *(double*)lexp;
895         faddd   %f40,%f34,%f8           ! (5_1) res += dexp_lo;

897         fmuld   %f44,%f28,%f40          ! (3_0) xx *= dtmp0;
898         nop
899         ldd     [%l1],%f44              ! (4_0) dtmp0 = ((double*)addr)[0];
900         faddd   %f30,K5,%f62            ! (2_0) res += K5;

902         fmuld   %f6,%f38,%f34           ! (1_0) res *= xx;
903         sra     %g1,21,%o7              ! (5_0) iexp = hx >> 21;
904         ldd     [%l4],%f30              ! (6_1) dexp_hi = ((double*)addr)[0];
905         faddd   %f60,K2,%f60            ! (0_0) res += K2;

907         for     %f16,DC1,%f28           ! (5_0) res = vis_for(res,DC1);
908         sub     %g0,%o7,%o7             ! (5_0) iexp = -iexp;
909         lda     [%i1]%asi,%f6           ! (6_0) ((float*)res)[0] = ((float*)px)[
910         fmuld   %f58,%f26,%f26          ! (6_1) res *= xx;

912         fmuld   %f44,%f44,%f44          ! (4_0) dtmp0 = dexp_hi * dexp_hi;
913         cmp     %g1,_0x7ff00000         ! (5_0) hx ? 0x7ff00000
914         lda     [%i1+4]%asi,%f7         ! (6_0) ((float*)res)[1] = ((float*)px)[
915         faddd   %f8,%f22,%f22           ! (5_1) res += dexp_hi;

917         fand    %f18,DC3,%f8            ! (4_0) res_c = vis_fand(res_c,DC3);
918         bge,pn  %icc,.update24          ! (5_0) if ( hx >= 0x7ff00000 )
919         ldd     [%fp+tmp0],%f18         ! (5_1) dlexp = *(double*)lexp;
```

```
        fmuld   %f62,%f36,%f62          ! (2_0) res *= xx;
.cont24:
        fmuld   %f60,%f32,%f58          ! (0_0) res *= xx;
        sra     %g1,10,%o2              ! (5_0) hx >>= 10;
        cmp     %g1,_0x00100000         ! (5_0) hx ? 0x00100000
        faddd   %f34,K3,%f34            ! (1_0) res += K3;

        fmuld   %f30,%f26,%f26          ! (6_1) res = dexp_hi * res;
        bl,pn   %icc,.update25          ! (5_0) if ( hx < 0x00100000 )
        and     %o2,2040,%o2            ! (5_0) hx &= 0x7f8;
        fand    %f6,DC0,%f16            ! (6_0) res = vis_fand(res,DC0);
.cont25:
        fmuld   %f22,%f18,%f2           ! (5_1) res *= dlexp;
        subcc   counter,7,counter       ! counter -= 7;
        ldd     [%l4+8],%f60            ! (6_1) dexp_lo = ((double*)addr)[1];
        fpadd32 %f28,DC2,%f18           ! (5_0) res_c = vis_fpadd32(res,DC2);

        fmuld   K6,%f40,%f22            ! (3_0) res = K6 * xx;
        add     %o2,8,%i3               ! (5_0) hx += 8;
        st      %f2,[%l6]               ! (5_1) ((float*)py)[0] = ((float*)res)[
        fsubd   %f24,%f8,%f10           ! (4_0) xx = res - res_c;

        fmuld   %f34,%f38,%f24          ! (1_0) res *= xx;
        st      %f3,[%l6+4]             ! (5_1) ((float*)py)[1] = ((float*)res)[
        bpos,pt %icc,.main_loop
        faddd   %f62,K4,%f34            ! (2_0) res += K4;

        add     counter,7,counter
.tail:
        add     %o7,1534,%o7            ! (5_0) iexp += 0x5fe;
        subcc   counter,1,counter
        bneg,a  .begin
        mov     %i0,%o4

        faddd   %f58,K1,%f58            ! (0_1) res += K1;

        faddd   %f26,%f60,%f8           ! (6_2) res += dexp_lo;

        faddd   %f22,K5,%f62            ! (3_1) res += K5;
        fmuld   %f10,%f44,%f60          ! (4_1) xx *= dtmp0;

        faddd   %f24,K2,%f26            ! (1_1) res += K2;
        add     %i1,stridex,%l6         ! px += stridex
        ldd     [%l2],%f24              ! (0_1) dexp_hi = ((double*)addr)[0];
        fmuld   %f34,%f36,%f34          ! (2_1) res *= xx;

        fmuld   %f58,%f32,%f58          ! (0_1) res *= xx;

        add     %i0,stridey,%i1         ! px += stridey
        faddd   %f8,%f30,%f30           ! (6_2) res += dexp_hi;

        fmuld   %f62,%f40,%f32          ! (3_1) res *= xx;
        ldd     [%fp+tmp1],%f62         ! (6_2) dlexp = *(double*)lexp;

        fmuld   %f26,%f38,%f26          ! (1_1) res *= xx;
        faddd   %f34,K3,%f34            ! (2_1) res += K3;

        fmuld   %f24,%f58,%f58          ! (0_1) res = dexp_hi * res;

        fmuld   %f30,%f62,%f2           ! (6_2) res *= dlexp;
        ldd     [%l2+8],%f30            ! (0_1) dexp_lo = ((double*)addr)[1];

        fmuld   K6,%f60,%f62            ! (4_1) res = K6 * xx;
        st      %f2,[%i0]               ! (6_2) ((float*)py)[0] = ((float*)res)[

        fmuld   %f34,%f36,%f28          ! (2_1) res *= xx;
```



```
        st      %f3,[%i0+4]             ! (6_2) ((float*)py)[1] = ((float*)res)[
        faddd   %f32,K4,%f32            ! (3_1) res += K4;

        subcc   counter,1,counter
        bneg,a  .begin
        mov     %i1,%o4

        faddd   %f26,K1,%f26            ! (1_1) res += K1;

        faddd   %f58,%f30,%f8           ! (0_1) res += dexp_lo;

        add     %l6,stridex,%l6         ! px += stridex
        faddd   %f62,K5,%f62            ! (4_1) res += K5;

        fmuld   %f32,%f40,%f34          ! (3_1) res *= xx;
        add     %i1,stridey,%i0         ! px += stridey
        ldd     [%i2],%f22              ! (1_1) dexp_hi = ((double*)addr)[0];
        faddd   %f28,K2,%f32            ! (2_1) res += K2;

        fmuld   %f26,%f38,%f26          ! (1_1) res *= xx;

        faddd   %f8,%f24,%f24           ! (0_1) res += dexp_hi;

        fmuld   %f62,%f60,%f38          ! (4_1) res *= xx;
        ldd     [%fp+tmp2],%f62         ! (0_1) dlexp = *(double*)lexp;

        fmuld   %f32,%f36,%f32          ! (2_1) res *= xx;
        faddd   %f34,K3,%f34            ! (3_1) res += K3;

        fmuld   %f22,%f26,%f26          ! (1_1) res = dexp_hi * res;

        fmuld   %f24,%f62,%f2           ! (0_1) res *= dlexp;
        ldd     [%i2+8],%f24            ! (1_1) dexp_lo = ((double*)addr)[1];

        st      %f2,[%i1]               ! (0_1) ((float*)py)[0] = ((float*)res)[

        fmuld   %f34,%f40,%f44          ! (3_1) res *= xx;
        st      %f3,[%i1+4]             ! (0_1) ((float*)py)[1] = ((float*)res)[
        faddd   %f38,K4,%f38            ! (4_1) res += K4;

        subcc   counter,1,counter
        bneg,a  .begin
        mov     %i0,%o4

        faddd   %f32,K1,%f32            ! (2_1) res += K1;

        add     %l6,stridex,%l6         ! px += stridex
        faddd   %f26,%f24,%f8           ! (1_1) res += dexp_lo;

        add     %i0,stridey,%i1         ! px += stridey

        fmuld   %f38,%f60,%f34          ! (4_1) res *= xx;
        ldd     [%i4],%f24              ! (2_1) dexp_hi = ((double*)addr)[0];
        faddd   %f44,K2,%f38            ! (3_1) res += K2;

        fmuld   %f32,%f36,%f32          ! (2_1) res *= xx;

        faddd   %f8,%f22,%f22           ! (1_1) res += dexp_hi;

        ldd     [%fp+tmp3],%f62         ! (1_1) dlexp = *(double*)lexp;

        fmuld   %f38,%f40,%f38          ! (3_1) res *= xx;
        faddd   %f34,K3,%f34            ! (4_1) res += K3;

        fmuld   %f24,%f32,%f32          ! (2_1) res = dexp_hi * res;
```

```
1052          fmuld   %f22,%f62,%f2            ! (1_1) res *= dlexp;
1053          ldd     [%i4+8],%f22            ! (2_1) dexp_lo = ((double*)addr)[1];

1055          st      %f2,[%i0]               ! (1_1) ((float*)py)[0] = ((float*)res)[

1057          fmuld   %f34,%f60,%f28          ! (4_1) res *= xx;
1058          st      %f3,[%i0+4]             ! (1_1) ((float*)py)[1] = ((float*)res)[

1060          subcc   counter,1,counter
1061          bneg,a  .begin
1062          mov     %i1,%o4

1064          faddd   %f38,K1,%f38            ! (3_1) res += K1;

1066          faddd   %f32,%f22,%f8           ! (2_1) res += dexp_lo;

1068          add     %l6,stridex,%l6         ! px += stridex

1070          add     %i1,stridey,%i0         ! px += stridey
1071          ldd     [%i5],%f22              ! (3_1) dexp_hi = ((double*)addr)[0];
1072          faddd   %f28,K2,%f36            ! (4_1) res += K2;

1074          fmuld   %f38,%f40,%f38          ! (3_1) res *= xx;

1076          faddd   %f8,%f24,%f24           ! (2_1) res += dexp_hi;

1078          ldd     [%fp+tmp4],%f62         ! (2_1) dlexp = *(double*)lexp;

1080          fmuld   %f36,%f60,%f36          ! (4_1) res *= xx;

1082          fmuld   %f22,%f38,%f38          ! (3_1) res = dexp_hi * res;

1084          fmuld   %f24,%f62,%f2           ! (2_1) res *= dlexp;
1085          ldd     [%i5+8],%f24            ! (3_1) dexp_lo = ((double*)addr)[1];

1087          st      %f2,[%i1]               ! (2_1) ((float*)py)[0] = ((float*)res)[

1089          st      %f3,[%i1+4]             ! (2_1) ((float*)py)[1] = ((float*)res)[

1091          subcc   counter,1,counter
1092          bneg,a  .begin
1093          mov     %i0,%o4

1095          faddd   %f36,K1,%f36            ! (4_1) res += K1;

1097          faddd   %f38,%f24,%f8           ! (3_1) res += dexp_lo;

1099          add     %i0,stridey,%i1         ! px += stridey

1101          add     %l6,stridex,%l6         ! px += stridex
1102          ldd     [%l1],%f30              ! (4_1) dexp_hi = ((double*)addr)[0];

1104          fmuld   %f36,%f60,%f36          ! (4_1) res *= xx;

1106          faddd   %f8,%f22,%f8            ! (3_1) res += dexp_hi;

1108          ldd     [%fp+tmp5],%f62         ! (3_1) dlexp = *(double*)lexp;

1110          fmuld   %f30,%f36,%f36          ! (4_1) res = dexp_hi * res;

1112          fmuld   %f8,%f62,%f8            ! (3_1) res *= dlexp;
1113          ldd     [%l1+8],%f34            ! (4_1) dexp_lo = ((double*)addr)[1];

1115          st      %f8,[%i0]               ! (3_1) ((float*)py)[0] = ((float*)res)[

1117          st      %f9,[%i0+4]             ! (3_1) ((float*)py)[1] = ((float*)res)[
```



```
1119          subcc   counter,1,counter
1120          bneg,a  .begin
1121          mov     %i1,%o4

1123          faddd   %f36,%f34,%f8           ! (4_1) res += dexp_lo;

1125          add     %l6,stridex,%i0         ! px += stridex

1127          add     %i1,stridey,%l6         ! px += stridey

1129          faddd   %f8,%f30,%f30           ! (4_1) res += dexp_hi;

1131          ldd     [%fp+tmp6],%f18         ! (4_1) dlexp = *(double*)lexp;

1133          fmuld   %f30,%f18,%f6           ! (4_1) res *= dlexp;

1135          st      %f6,[%i1]               ! (4_1) ((float*)py)[0] = ((float*)res)[

1137          st      %f7,[%i1+4]             ! (4_1) ((float*)py)[1] = ((float*)res)[

1139          ba      .begin
1140          add     %i1,stridey,%o4

1142          .align  16
1143  .spec0:
1144          fdivd   DONE,%f0,%f0            ! res = DONE / res;
1145          add     %i1,stridex,%i1         ! px += stridex
1146          st      %f0,[%o4]               ! ((float*)py)[0] = ((float*)&res)[0];
1147          st      %f1,[%o4+4]             ! ((float*)py)[1] = ((float*)&res)[1];
1148          add     %o4,stridey,%o4         ! py += stridey
1149          ba      .begin1
1150          sub     counter,1,counter

1152          .align  16
1153  .spec1:
1154          orcc    %i2,%l4,%g0
1155          bz,a    2f
1156          fdivd   DONE,%f0,%f0            ! res = DONE / res;

1158          cmp     %g1,0
1159          bl,a    2f
1160          fsqrtd  %f0,%f0                 ! res = sqrt(res);

1162          cmp     %g1,%i4
1163          bge,a   1f
1164          ldd     [%o3+0x50],%f18

1166          fxtod   %f0,%f0                 ! res = *(long long*)&res;
1167          st      %f0,[%fp+tmp0]

1169          fand    %f0,DC0,%f16            ! (6_0) res = vis_fand(res,DC0);
1170          ld      [%fp+tmp0],%g1

1172          sra     %g1,21,%o7              ! (6_1) iexp = hx >> 21;
1173          for     %f16,DC1,%f44           ! (6_1) res = vis_for(res,DC1);

1175          sra     %g1,10,%o2              ! (6_1) hx >>= 10;
1176          sub     %o7,537,%o7

1178          and     %o2,2040,%o2            ! (6_1) hx &= 0x7f8;
1179          ba      .cont_spec
1180          sub     %g0,%o7,%o7             ! (6_1) iexp = -iexp;

1182  1:
1183          fand    %f0,%f18,%f0            ! res = vis_fand(res,DC4);
```

```
1185         ldd     [%o3+0x58],%f28
1186         fxtod   %f0,%f0                 ! res = *(long long*)&res;

1188         faddd   %f0,%f28,%f0            ! res += D2ON51;
1189         st      %f0,[%fp+tmp0]

1191         fand    %f0,DC0,%f16            ! (6_0) res = vis_fand(res,DC0);
1192         ld      [%fp+tmp0],%g1

1194         sra     %g1,21,%o7              ! (6_1) iexp = hx >> 21;
1195         for     %f16,DC1,%f44           ! (6_1) res = vis_for(res,DC1);

1197         sra     %g1,10,%o2              ! (6_1) hx >>= 10;
1198         sub     %o7,537,%o7

1200         and     %o2,2040,%o2            ! (6_1) hx &= 0x7f8;
1201         ba      .cont_spec
1202         sub     %g0,%o7,%o7             ! (6_1) iexp = -iexp;

1204 2:
1205         add     %i1,stridex,%i1         ! px += stridex
1206         st      %f0,[%o4]               ! ((float*)py)[0] = ((float*)&res)[0];
1207         st      %f1,[%o4+4]             ! ((float*)py)[1] = ((float*)&res)[1];
1208         add     %o4,stridey,%o4         ! py += stridey
1209         ba      .begin1
1210         sub     counter,1,counter

1212         .align  16
1213 .update0:
1214         cmp     counter,1
1215         ble     .cont0
1216         nop

1218         sub     %l6,stridex,tmp_px
1219         sub     counter,1,tmp_counter

1221         ba      .cont0
1222         mov     1,counter

1224         .align  16
1225 .update1:
1226         cmp     counter,1
1227         ble     .cont1
1228         sub     %l6,stridex,%i1

1230         ld      [%i1+4],%i2
1231         cmp     %g1,0
1232         bl      1f

1234         orcc    %g1,%i2,%g0
1235         bz      1f
1236         sethi   %hi(0x00080000),%i3

1238         cmp     %g1,%i3
1239         bge,a   2f
1240         ldd     [%o3+0x50],%f18

1242         fxtod   %f8,%f8                 ! res = *(long long*)&res;
1243         st      %f8,[%fp+tmp7]

1245         fand    %f8,DC0,%f16            ! (0_0) res = vis_fand(res,DC0);
1246         ld      [%fp+tmp7],%g1

1248         sra     %g1,21,%o7              ! (0_0) iexp = hx >> 21;
1249         sra     %g1,10,%o2              ! (0_0) hx >>= 10;
```



```
1250         for     %f16,DC1,%f28           ! (0_0) res = vis_for(res,DC1);

1252         sub     %o7,537,%o7

1254         sub     %g0,%o7,%o7             ! (0_0) iexp = -iexp;

1256         and     %o2,2040,%o2            ! (0_0) hx &= 0x7f8;
1257         ba      .cont1
1258         add     %o7,1534,%o7            ! (0_0) iexp += 0x5fe;
1259 2:
1260         fand    %f8,%f18,%f8
1261         fxtod   %f8,%f8                 ! res = *(long long*)&res;
1262         ldd     [%o3+0x58],%f18
1263         faddd   %f8,%f18,%f8
1264         st      %f8,[%fp+tmp7]

1266         fand    %f8,DC0,%f16            ! (0_0) res = vis_fand(res,DC0);
1267         ld      [%fp+tmp7],%g1

1269         sra     %g1,21,%o7              ! (0_0) iexp = hx >> 21;
1270         sra     %g1,10,%o2              ! (0_0) hx >>= 10;
1271         for     %f16,DC1,%f28           ! (0_0) res = vis_for(res,DC1);

1273         sub     %o7,537,%o7

1275         sub     %g0,%o7,%o7             ! (0_0) iexp = -iexp;

1277         and     %o2,2040,%o2            ! (0_0) hx &= 0x7f8;
1278         ba      .cont1
1279         add     %o7,1534,%o7            ! (0_0) iexp += 0x5fe;
1280 1:
1281         sub     %l6,stridex,tmp_px
1282         sub     counter,1,tmp_counter

1284         ba      .cont1
1285         mov     1,counter

1287         .align  16
1288 .update2:
1289         cmp     counter,2
1290         ble     .cont2
1291         nop

1293         sub     %l6,stridex,tmp_px
1294         sub     counter,2,tmp_counter

1296         ba      .cont2
1297         mov     2,counter

1299         .align  16
1300 .update3:
1301         cmp     counter,2
1302         ble     .cont3
1303         sub     %l6,stridex,%i1

1305         ld      [%i1+4],%i2
1306         cmp     %g1,0
1307         bl      1f

1309         orcc    %g1,%i2,%g0
1310         bz      1f
1311         sethi   %hi(0x00080000),%i3

1313         cmp     %g1,%i3
1314         bge,a   2f
1315         ldd     [%o3+0x50],%f18
```

```
1317         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1318         st      %f0,[%fp+tmp7]

1320         fand    %f0,DC0,%f16            ! (1_0) res = vis_fand(res,DC0);
1321         ld      [%fp+tmp7],%g1

1323         sra     %g1,21,%o7              ! (1_0) iexp = hx >> 21;
1324         for     %f16,DC1,%f44           ! (1_0) res = vis_for(res,DC1);

1326         sra     %g1,10,%o2              ! (1_0) hx >>= 10;
1327         sub     %o7,537,%o7
1328         ba      .cont3
1329         and     %o2,2040,%o2            ! (1_0) hx &= 0x7f8;
1330 2:
1331         fand    %f0,%f18,%f0
1332         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1333         ldd     [%o3+0x58],%f18
1334         faddd   %f0,%f18,%f0
1335         st      %f0,[%fp+tmp7]

1337         fand    %f0,DC0,%f16            ! (1_0) res = vis_fand(res,DC0);
1338         ld      [%fp+tmp7],%g1

1340         sra     %g1,21,%o7              ! (1_0) iexp = hx >> 21;
1341         for     %f16,DC1,%f44           ! (1_0) res = vis_for(res,DC1);

1343         sra     %g1,10,%o2              ! (1_0) hx >>= 10;
1344         sub     %o7,537,%o7
1345         ba      .cont3
1346         and     %o2,2040,%o2            ! (1_0) hx &= 0x7f8;
1347 1:
1348         sub     %l6,stridex,tmp_px
1349         sub     counter,2,tmp_counter

1351         ba      .cont3
1352         mov     2,counter

1354         .align  16
1355 .update4:
1356         cmp     counter,3
1357         ble     .cont4
1358         nop

1360         sub     %l6,stridex,tmp_px
1361         sub     counter,3,tmp_counter

1363         ba      .cont4
1364         mov     3,counter

1366         .align  16
1367 .update5:
1368         cmp     counter,3
1369         ble     .cont5
1370         sub     %l6,stridex,%i1

1372         ld      [%i1+4],%i3
1373         cmp     %g1,0
1374         bl      1f

1376         orcc    %g1,%i3,%g0
1377         bz      1f
1378         sethi   %hi(0x00080000),%i4

1380         cmp     %g1,%i4
1381         bge,a   2f
```



```
1382         ldd     [%o3+0x50],%f18

1384         fxtod   %f6,%f6                 ! res = *(long long*)&res;
1385         st      %f6,[%fp+tmp7]

1387         fand    %f6,DC0,%f16            ! (2_0) res = vis_fand(res,DC0);
1388         ld      [%fp+tmp7],%g1

1390         sra     %g1,21,%o7              ! (2_0) iexp = hx >> 21;
1391         sra     %g1,10,%o2              ! (2_0) hx >>= 10;

1393         sub     %o7,537,%o7
1394         and     %o2,2040,%o2            ! (2_0) hx &= 0x7f8;
1395         ba      .cont5
1396         for     %f16,DC1,%f28           ! (2_0) res = vis_for(res,DC1);
1397 2:
1398         fand    %f6,%f18,%f6
1399         fxtod   %f6,%f6                 ! res = *(long long*)&res;
1400         ldd     [%o3+0x58],%f18
1401         faddd   %f6,%f18,%f6
1402         st      %f6,[%fp+tmp7]

1404         fand    %f6,DC0,%f16            ! (2_0) res = vis_fand(res,DC0);
1405         ld      [%fp+tmp7],%g1

1407         sra     %g1,21,%o7              ! (2_0) iexp = hx >> 21;
1408         sra     %g1,10,%o2              ! (2_0) hx >>= 10;

1410         sub     %o7,537,%o7
1411         and     %o2,2040,%o2            ! (2_0) hx &= 0x7f8;
1412         ba      .cont5
1413         for     %f16,DC1,%f28           ! (2_0) res = vis_for(res,DC1);
1414 1:
1415         sub     %l6,stridex,tmp_px
1416         sub     counter,3,tmp_counter

1418         ba      .cont5
1419         mov     3,counter

1421         .align  16
1422 .update6:
1423         cmp     counter,4
1424         ble     .cont6
1425         nop

1427         sub     %l6,stridex,tmp_px
1428         sub     counter,4,tmp_counter

1430         ba      .cont6
1431         mov     4,counter

1433         .align  16
1434 .update7:
1435         sub     %l6,stridex,%i1
1436         cmp     counter,4
1437         ble     .cont7
1438         faddd   %f34,K3,%f6             ! (6_1) res += K3;

1440         ld      [%i1+4],%i3
1441         cmp     %g1,0
1442         bl      1f

1444         orcc    %g1,%i3,%g0
1445         bz      1f
1446         sethi   %hi(0x00080000),%i5
```

```
1448         cmp     %g1,%i5
1449         bge,a   2f
1450         ldd     [%o3+0x50],%f18

1452         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1453         st      %f0,[%fp+tmp7]

1455         fand    %f0,DC0,%f16            ! (3_0) res = vis_fand(res,DC0);
1456         ld      [%fp+tmp7],%g1

1458         sra     %g1,21,%o7              ! (3_0) iexp = hx >> 21;
1459         sra     %g1,10,%o2              ! (3_0) hx >>= 10;

1461         sub     %o7,537,%o7
1462         and     %o2,2040,%o2            ! (3_0) hx &= 0x7f8;
1463         ba      .cont7
1464         for     %f16,DC1,%f44           ! (3_0) res = vis_for(res,DC1);
1465 2:
1466         fand    %f0,%f18,%f0
1467         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1468         ldd     [%o3+0x58],%f18
1469         faddd   %f0,%f18,%f0
1470         st      %f0,[%fp+tmp7]

1472         fand    %f0,DC0,%f16            ! (3_0) res = vis_fand(res,DC0);
1473         ld      [%fp+tmp7],%g1

1475         sra     %g1,21,%o7              ! (3_0) iexp = hx >> 21;
1476         sra     %g1,10,%o2              ! (3_0) hx >>= 10;

1478         sub     %o7,537,%o7
1479         and     %o2,2040,%o2            ! (3_0) hx &= 0x7f8;
1480         ba      .cont7
1481         for     %f16,DC1,%f44           ! (3_0) res = vis_for(res,DC1);
1482 1:
1483         sub     %l6,stridex,tmp_px
1484         sub     counter,4,tmp_counter

1486         ba      .cont7
1487         mov     4,counter

1489         .align  16
1490 .update8:
1491         cmp     counter,5
1492         ble     .cont8
1493         nop

1495         mov     %l6,tmp_px
1496         sub     counter,5,tmp_counter

1498         ba      .cont8
1499         mov     5,counter

1501         .align  16
1502 .update9:
1503         ld      [%l6+4],%i3
1504         cmp     counter,5
1505         ble     .cont9
1506         fand    %f0,DC0,%f16            ! (5_0) res = vis_fand(res,DC0);

1508         cmp     %g1,0
1509         bl      1f

1511         orcc    %g1,%i3,%g0
1512         bz      1f
1513         sethi   %hi(0x00080000),%i1
```



```
1515         cmp     %g1,%i1
1516         bge,a   2f
1517         ldd     [%o3+0x50],%f18

1519         fxtod   %f8,%f8                 ! res = *(long long*)&res;
1520         st      %f8,[%fp+tmp7]

1522         fand    %f8,DC0,%f24            ! (4_0) res = vis_fand(res,DC0);
1523         ld      [%fp+tmp7],%g1

1525         sra     %g1,21,%o7              ! (4_0) iexp = hx >> 21;
1526         sra     %g1,10,%o2              ! (4_0) hx >>= 10;

1528         sub     %o7,537,%o7

1530         and     %o2,2040,%o2            ! (4_0) hx &= 0x7f8;
1531         sub     %g0,%o7,%o7             ! (4_0) iexp = -iexp;
1532         ba      .cont9
1533         for     %f24,DC1,%f24           ! (4_0) res = vis_for(res,DC1);
1534 2:
1535         fand    %f8,%f18,%f8
1536         fxtod   %f8,%f8                 ! res = *(long long*)&res;
1537         ldd     [%o3+0x58],%f18
1538         faddd   %f8,%f18,%f8
1539         st      %f8,[%fp+tmp7]

1541         fand    %f8,DC0,%f24            ! (4_0) res = vis_fand(res,DC0);
1542         ld      [%fp+tmp7],%g1

1544         sra     %g1,21,%o7              ! (4_0) iexp = hx >> 21;
1545         sra     %g1,10,%o2              ! (4_0) hx >>= 10;

1547         sub     %o7,537,%o7

1549         and     %o2,2040,%o2            ! (4_0) hx &= 0x7f8;
1550         sub     %g0,%o7,%o7             ! (4_0) iexp = -iexp;
1551         ba      .cont9
1552         for     %f24,DC1,%f24           ! (4_0) res = vis_for(res,DC1);
1553 1:
1554         mov     %l6,tmp_px
1555         sub     counter,5,tmp_counter

1557         ba      .cont9
1558         mov     5,counter

1560         .align  16
1561 .update10:
1562         cmp     counter,6
1563         ble     .cont10
1564         nop

1566         mov     %i0,tmp_px
1567         sub     counter,6,tmp_counter

1569         ba      .cont10
1570         mov     6,counter

1572         .align  16
1573 .update11:
1574         ld      [%i0+4],%i3
1575         cmp     counter,6
1576         ble     .cont11
1577         fand    %f6,DC0,%f16            ! (6_0) res = vis_fand(res,DC0);

1579         cmp     %g1,0
```

```
1580         bl      1f

1582         orcc    %g1,%i3,%g0
1583         bz      1f
1584         sethi   %hi(0x00080000),%i3

1586         cmp     %g1,%i3
1587         bge,a   2f
1588         ldd     [%o3+0x50],%f18

1590         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1591         st      %f0,[%fp+tmp7]

1593         fand    %f0,DC0,%f28            ! (5_0) res = vis_fand(res,DC0);
1594         ld      [%fp+tmp7],%g1

1596         sra     %g1,21,%o7              ! (5_0) iexp = hx >> 21;
1597         sra     %g1,10,%o2              ! (5_0) hx >>= 10;

1599         sub     %o7,537,%o7

1601         sub     %g0,%o7,%o7             ! (5_0) iexp = -iexp;

1603         and     %o2,2040,%o2            ! (5_0) hx &= 0x7f8;
1604         ba      .cont11
1605         for     %f28,DC1,%f28           ! (5_0) res = vis_for(res,DC1);
1606 2:
1607         fand    %f0,%f18,%f0
1608         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1609         ldd     [%o3+0x58],%f18
1610         faddd   %f0,%f18,%f0
1611         st      %f0,[%fp+tmp7]

1613         fand    %f0,DC0,%f28            ! (5_0) res = vis_fand(res,DC0);
1614         ld      [%fp+tmp7],%g1

1616         sra     %g1,21,%o7              ! (5_0) iexp = hx >> 21;
1617         sra     %g1,10,%o2              ! (5_0) hx >>= 10;

1619         sub     %o7,537,%o7

1621         sub     %g0,%o7,%o7             ! (5_0) iexp = -iexp;

1623         and     %o2,2040,%o2            ! (5_0) hx &= 0x7f8;
1624         ba      .cont11
1625         for     %f28,DC1,%f28           ! (5_0) res = vis_for(res,DC1);
1626 1:
1627         mov     %i0,tmp_px
1628         sub     counter,6,tmp_counter

1630         ba      .cont11
1631         mov     6,counter

1633         .align  16
1634 .update12:
1635         cmp     counter,0
1636         ble     .cont12
1637         faddd   %f34,K3,%f34            ! (2_1) res += K3;

1639         sub     %l6,stridex,tmp_px
1640         sub     counter,0,tmp_counter

1642         ba      .cont12
1643         mov     0,counter

1645         .align  16
```



```
1646 .update13:
1647         sub     %l6,stridex,%l4
1648         cmp     counter,0
1649         ble     .cont13
1650         fpadd32 %f44,DC2,%f18           ! (6_1) res_c = vis_fpadd32(res,DC2);

1652         ld      [%l4+4],%l4
1653         cmp     %g1,0
1654         bl      1f

1656         orcc    %g1,%l4,%g0
1657         bz      1f
1658         sethi   %hi(0x00080000),%l4

1660         cmp     %g1,%l4
1661         bge,a   2f
1662         ldd     [%o3+0x50],%f62

1664         fxtod   %f6,%f6                 ! res = *(long long*)&res;
1665         st      %f6,[%fp+tmp7]

1667         fand    %f6,DC0,%f44            ! (6_0) res = vis_fand(res,DC0);
1668         ld      [%fp+tmp7],%g1

1670         sra     %g1,21,%o7              ! (6_1) iexp = hx >> 21;
1671         sra     %g1,10,%o2              ! (6_1) hx >>= 10;

1673         sub     %o7,537,%o7
1674         and     %o2,2040,%o2            ! (6_1) hx &= 0x7f8;
1675         for     %f44,DC1,%f44           ! (6_1) res = vis_for(res,DC1);

1677         sub     %g0,%o7,%o7             ! (6_1) iexp = -iexp;
1678         ba      .cont13
1679         fpadd32 %f44,DC2,%f18           ! (6_1) res_c = vis_fpadd32(res,DC2);
1680 2:
1681         fand    %f6,%f62,%f6
1682         fxtod   %f6,%f6                 ! res = *(long long*)&res;
1683         ldd     [%o3+0x58],%f62
1684         faddd   %f6,%f62,%f6
1685         st      %f6,[%fp+tmp7]

1687         fand    %f6,DC0,%f44            ! (6_0) res = vis_fand(res,DC0);
1688         ld      [%fp+tmp7],%g1

1690         sra     %g1,21,%o7              ! (6_1) iexp = hx >> 21;
1691         sra     %g1,10,%o2              ! (6_1) hx >>= 10;
1692         for     %f44,DC1,%f44           ! (6_1) res = vis_for(res,DC1);

1694         sub     %o7,537,%o7

1696         and     %o2,2040,%o2            ! (6_1) hx &= 0x7f8;
1697         sub     %g0,%o7,%o7             ! (6_1) iexp = -iexp;
1698         ba      .cont13
1699         fpadd32 %f44,DC2,%f18           ! (6_1) res_c = vis_fpadd32(res,DC2);
1700 1:
1701         sub     %l6,stridex,tmp_px
1702         sub     counter,0,tmp_counter

1704         ba      .cont13
1705         mov     0,counter

1707         .align  16
1708 .update14:
1709         cmp     counter,1
1710         ble     .cont14
1711         faddd   %f34,K3,%f34            ! (3_1) res += K3;
```

```
1713         sub     %l6,stridex,tmp_px
1714         sub     counter,1,tmp_counter

1716         ba      .cont14
1717         mov     1,counter

1719         .align  16
1720 .update15:
1721         sub     %l6,stridex,%l2
1722         cmp     counter,1
1723         ble     .cont15
1724         fpadd32 %f28,DC2,%f18           ! (0_0) res_c = vis_fpadd32(res,DC2);

1726         ld      [%l2+4],%l2
1727         cmp     %g1,0
1728         bl      1f

1730         orcc    %g1,%l2,%g0
1731         bz      1f
1732         sethi   %hi(0x00080000),%l2

1734         cmp     %g1,%l2
1735         bge,a   2f
1736         ldd     [%o3+0x50],%f62

1738         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1739         st      %f0,[%fp+tmp7]

1741         fand    %f0,DC0,%f18            ! (0_0) res = vis_fand(res,DC0);
1742         ld      [%fp+tmp7],%g1

1744         sra     %g1,21,%o7              ! (0_0) iexp = hx >> 21;
1745         sra     %g1,10,%o2              ! (0_0) hx >>= 10;

1747         sub     %o7,537,%o7
1748         for     %f18,DC1,%f28           ! (0_0) res = vis_for(res,DC1);

1750         sub     %g0,%o7,%o7             ! (0_0) iexp = -iexp;

1752         and     %o2,2040,%o2            ! (0_0) hx &= 0x7f8;
1753         add     %o7,1534,%o7            ! (0_0) iexp += 0x5fe;
1754         ba      .cont15
1755         fpadd32 %f28,DC2,%f18           ! (0_0) res_c = vis_fpadd32(res,DC2);
1756 2:
1757         fand    %f0,%f62,%f0
1758         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1759         ldd     [%o3+0x58],%f62
1760         faddd   %f0,%f62,%f0
1761         st      %f0,[%fp+tmp7]

1763         fand    %f0,DC0,%f18            ! (0_0) res = vis_fand(res,DC0);
1764         ld      [%fp+tmp7],%g1

1766         sra     %g1,21,%o7              ! (0_0) iexp = hx >> 21;
1767         sra     %g1,10,%o2              ! (0_0) hx >>= 10;
1768         for     %f18,DC1,%f28           ! (0_0) res = vis_for(res,DC1);

1770         sub     %o7,537,%o7

1772         sub     %g0,%o7,%o7             ! (0_0) iexp = -iexp;

1774         and     %o2,2040,%o2            ! (0_0) hx &= 0x7f8;
1775         add     %o7,1534,%o7            ! (0_0) iexp += 0x5fe;
1776         ba      .cont15
1777         fpadd32 %f28,DC2,%f18           ! (0_0) res_c = vis_fpadd32(res,DC2);
```



```
1778 1:
1779         sub     %l6,stridex,tmp_px
1780         sub     counter,1,tmp_counter

1782         ba      .cont15
1783         mov     1,counter

1785         .align  16
1786 .update16:
1787         cmp     counter,2
1788         ble     .cont16
1789         fand    %f18,DC3,%f8            ! (0_0) res_c = vis_fand(res_c,DC3);

1791         sub     %l6,stridex,tmp_px
1792         sub     counter,2,tmp_counter

1794         ba      .cont16
1795         mov     2,counter

1797         .align  16
1798 .update17:
1799         sub     %l6,stridex,%i2
1800         cmp     counter,2
1801         ble     .cont17
1802         fand    %f0,DC0,%f16            ! (2_0) res = vis_fand(res,DC0);

1804         ld      [%i2+4],%i2
1805         cmp     %g1,0
1806         bl      1f

1808         orcc    %g1,%i2,%g0
1809         bz      1f
1810         sethi   %hi(0x00080000),%i2

1812         cmp     %g1,%i2
1813         bge,a   2f
1814         ldd     [%o3+0x50],%f2

1816         fxtod   %f6,%f6                 ! res = *(long long*)&res;
1817         st      %f6,[%fp+tmp7]

1819         fand    %f6,DC0,%f44            ! (1_0) res = vis_fand(res,DC0);
1820         ld      [%fp+tmp7],%g1

1822         sra     %g1,21,%o7              ! (1_0) iexp = hx >> 21;
1823         sra     %g1,10,%o2              ! (1_0) hx >>= 10;

1825         sub     %o7,537,%o7

1827         and     %o2,2040,%o2            ! (1_0) hx &= 0x7f8;
1828         sub     %g0,%o7,%o7             ! (1_0) iexp = -iexp;
1829         ba      .cont17
1830         for     %f44,DC1,%f44           ! (1_0) res = vis_for(res,DC1);
1831 2:
1832         fand    %f6,%f2,%f6
1833         fxtod   %f6,%f6                 ! res = *(long long*)&res;
1834         ldd     [%o3+0x58],%f2
1835         faddd   %f6,%f2,%f6
1836         st      %f6,[%fp+tmp7]

1838         fand    %f6,DC0,%f44            ! (1_0) res = vis_fand(res,DC0);
1839         ld      [%fp+tmp7],%g1

1841         sra     %g1,21,%o7              ! (1_0) iexp = hx >> 21;
1842         sra     %g1,10,%o2              ! (1_0) hx >>= 10;
```

```
1844         sub     %o7,537,%o7

1846         and     %o2,2040,%o2            ! (1_0) hx &= 0x7f8;
1847         sub     %g0,%o7,%o7             ! (1_0) iexp = -iexp;
1848         ba      .cont17
1849         for     %f44,DC1,%f44           ! (1_0) res = vis_for(res,DC1);
1850 1:
1851         sub     %l6,stridex,tmp_px
1852         sub     counter,2,tmp_counter

1854         ba      .cont17
1855         mov     2,counter

1857         .align  16
1858 .update18:
1859         cmp     counter,3
1860         ble     .cont18
1861         fand    %f18,DC3,%f8            ! (1_0) res_c = vis_fand(res_c,DC3);

1863         sub     %l6,stridex,tmp_px
1864         sub     counter,3,tmp_counter

1866         ba      .cont18
1867         mov     3,counter

1869         .align  16
1870 .update19:
1871         sub     %l6,stridex,%i4
1872         cmp     counter,3
1873         ble     .cont19
1874         fand    %f6,DC0,%f16            ! (3_0) res = vis_fand(res,DC0);

1876         ld      [%i4+4],%i4
1877         cmp     %g1,0
1878         bl      1f

1880         orcc    %g1,%i4,%g0
1881         bz      1f
1882         sethi   %hi(0x00080000),%i4

1884         cmp     %g1,%i4
1885         bge,a   2f
1886         ldd     [%o3+0x50],%f2

1888         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1889         st      %f0,[%fp+tmp7]

1891         fand    %f0,DC0,%f28            ! (2_0) res = vis_fand(res,DC0);
1892         ld      [%fp+tmp7],%g1

1894         sra     %g1,21,%o7              ! (2_0) iexp = hx >> 21;

1896         sra     %g1,10,%o2              ! (2_0) hx >>= 10;
1897         sub     %o7,537,%o7

1899         and     %o2,2040,%o2            ! (2_0) hx &= 0x7f8;
1900         sub     %g0,%o7,%o7             ! (2_0) iexp = -iexp;
1901         ba      .cont19
1902         for     %f28,DC1,%f28           ! (2_0) res = vis_for(res,DC1);
1903 2:
1904         fand    %f0,%f2,%f0
1905         fxtod   %f0,%f0                 ! res = *(long long*)&res;
1906         ldd     [%o3+0x58],%f2
1907         faddd   %f0,%f2,%f0
1908         st      %f0,[%fp+tmp7]
```



```
1910         fand    %f0,DC0,%f28            ! (2_0) res = vis_fand(res,DC0);
1911         ld      [%fp+tmp7],%g1

1913         sra     %g1,21,%o7              ! (2_0) iexp = hx >> 21;

1915         sra     %g1,10,%o2              ! (2_0) hx >>= 10;
1916         sub     %o7,537,%o7

1918         and     %o2,2040,%o2            ! (2_0) hx &= 0x7f8;
1919         sub     %g0,%o7,%o7             ! (2_0) iexp = -iexp;
1920         ba      .cont19
1921         for     %f28,DC1,%f28           ! (2_0) res = vis_for(res,DC1);
1922 1:
1923         sub     %l6,stridex,tmp_px
1924         sub     counter,3,tmp_counter

1926         ba      .cont19
1927         mov     3,counter

1929         .align  16
1930 .update20:
1931         cmp     counter,4
1932         ble     .cont20
1933         fand    %f18,DC3,%f4            ! (2_0) res_c = vis_fand(res_c,DC3);

1935         sub     %l6,stridex,tmp_px
1936         sub     counter,4,tmp_counter

1938         ba      .cont20
1939         mov     4,counter

1941         .align  16
1942 .update21:
1943         sub     %l6,stridex,%i5
1944         cmp     counter,4
1945         ble     .cont21
1946         fand    %f0,DC0,%f16            ! (4_0) res = vis_fand(res,DC0);

1948         ld      [%i5+4],%i5
1949         cmp     %g1,0
1950         bl      1f

1952         orcc    %g1,%i5,%g0
1953         bz      1f
1954         sethi   %hi(0x00080000),%i5

1956         cmp     %g1,%i5
1957         bge,a   2f
1958         ldd     [%o3+0x50],%f34

1960         fxtod   %f6,%f6                 ! res = *(long long*)&res;
1961         st      %f6,[%fp+tmp7]

1963         fand    %f6,DC0,%f44            ! (3_0) res = vis_fand(res,DC0);
1964         ld      [%fp+tmp7],%g1

1966         sra     %g1,21,%o7              ! (3_0) iexp = hx >> 21;
1967         sra     %g1,10,%o2              ! (3_0) hx >>= 10;

1969         sub     %o7,537,%o7
1970         and     %o2,2040,%o2            ! (3_0) hx &= 0x7f8;

1972         sub     %g0,%o7,%o7             ! (3_0) iexp = -iexp;
1973         ba      .cont21
1974         for     %f44,DC1,%f44           ! (3_0) res = vis_for(res,DC1);
1975 2:
```

```
1976         fand    %f6,%f34,%f6
1977         fxtod   %f6,%f6                 ! res = *(long long*)&res;
1978         ldd     [%o3+0x58],%f34
1979         faddd   %f6,%f34,%f6
1980         st      %f6,[%fp+tmp7]

1982         fand    %f6,DC0,%f44            ! (3_0) res = vis_fand(res,DC0);
1983         ld      [%fp+tmp7],%g1

1985         sra     %g1,21,%o7              ! (3_0) iexp = hx >> 21;
1986         sra     %g1,10,%o2              ! (3_0) hx >>= 10;

1988         sub     %o7,537,%o7
1989         and     %o2,2040,%o2            ! (3_0) hx &= 0x7f8;

1991         sub     %g0,%o7,%o7             ! (3_0) iexp = -iexp;
1992         ba      .cont21
1993         for     %f44,DC1,%f44           ! (3_0) res = vis_for(res,DC1);
1994 1:
1995         sub     %l6,stridex,tmp_px
1996         sub     counter,4,tmp_counter

1998         ba      .cont21
1999         mov     4,counter

2001         .align  16
2002 .update22:
2003         cmp     counter,5
2004         ble     .cont22
2005         fmuld   %f62,%f38,%f62          ! (1_0) res *= xx;

2007         sub     %i0,stridex,tmp_px
2008         sub     counter,5,tmp_counter

2010         ba      .cont22
2011         mov     5,counter

2013         .align  16
2014 .update23:
2015         sub     %i0,stridex,%l1
2016         cmp     counter,5
2017         ble     .cont23
2018         fand    %f6,DC0,%f16            ! (5_0) res = vis_fand(res,DC0);

2020         ld      [%l1+4],%l1
2021         cmp     %g1,0
2022         bl      1f

2024         orcc    %g1,%l1,%g0
2025         bz      1f
2026         sethi   %hi(0x00080000),%l1

2028         cmp     %g1,%l1
2029         bge,a   2f
2030         ldd     [%o3+0x50],%f34

2032         fxtod   %f0,%f0                 ! res = *(long long*)&res;
2033         st      %f0,[%fp+tmp7]

2035         fand    %f0,DC0,%f24            ! (4_0) res = vis_fand(res,DC0);
2036         ld      [%fp+tmp7],%g1

2038         sra     %g1,21,%o7              ! (4_0) iexp = hx >> 21;

2040         sra     %g1,10,%o2              ! (4_0) hx >>= 10;
2041         sub     %o7,537,%o7
```



```
2043         and     %o2,2040,%o2            ! (4_0) hx &= 0x7f8;
2044         sub     %g0,%o7,%o7             ! (4_0) iexp = -iexp;
2045         ba      .cont23
2046         for     %f24,DC1,%f24           ! (4_0) res = vis_for(res,DC1);
2047 2:
2048         fand    %f0,%f34,%f0
2049         fxtod   %f0,%f0                 ! res = *(long long*)&res;
2050         ldd     [%o3+0x58],%f34
2051         faddd   %f0,%f34,%f0
2052         st      %f0,[%fp+tmp7]

2054         fand    %f0,DC0,%f24            ! (4_0) res = vis_fand(res,DC0);
2055         ld      [%fp+tmp7],%g1

2057         sra     %g1,21,%o7              ! (4_0) iexp = hx >> 21;

2059         sra     %g1,10,%o2              ! (4_0) hx >>= 10;
2060         sub     %o7,537,%o7

2062         and     %o2,2040,%o2            ! (4_0) hx &= 0x7f8;
2063         sub     %g0,%o7,%o7             ! (4_0) iexp = -iexp;
2064         ba      .cont23
2065         for     %f24,DC1,%f24           ! (4_0) res = vis_for(res,DC1);
2066 1:
2067         sub     %i0,stridex,tmp_px
2068         sub     counter,5,tmp_counter

2070         ba      .cont23
2071         mov     5,counter

2073         .align  16
2074 .update24:
2075         cmp     counter,6
2076         ble     .cont24
2077         fmuld   %f62,%f36,%f62          ! (2_0) res *= xx;

2079         sub     %i1,stridex,tmp_px
2080         sub     counter,6,tmp_counter

2082         ba      .cont24
2083         mov     6,counter

2085         .align  16
2086 .update25:
2087         sub     %i1,stridex,%i3
2088         cmp     counter,6
2089         ble     .cont25
2090         fand    %f6,DC0,%f16            ! (6_0) res = vis_fand(res,DC0);

2092         ld      [%i3+4],%i3
2093         cmp     %g1,0
2094         bl      1f

2096         orcc    %g1,%i3,%g0
2097         bz      1f
2098         nop

2100         sub     %i1,stridex,%i3
2101         ld      [%i3],%f10
2102         ld      [%i3+4],%f11

2104         sethi   %hi(0x00080000),%i3

2106         cmp     %g1,%i3
2107         bge,a   2f
```

```
2108         ldd     [%o3+0x50],%f60

2110         fxtod   %f10,%f10               ! res = *(long long*)&res;
2111         st      %f10,[%fp+tmp7]

2113         fand    %f10,DC0,%f28           ! (5_0) res = vis_fand(res,DC0);
2114         ld      [%fp+tmp7],%g1

2116         sra     %g1,21,%o7              ! (5_0) iexp = hx >> 21;

2118         sra     %g1,10,%o2              ! (5_0) hx >>= 10;
2119         sub     %o7,537,%o7

2121         and     %o2,2040,%o2            ! (5_0) hx &= 0x7f8;
2122         sub     %g0,%o7,%o7             ! (5_0) iexp = -iexp;

2124         ba      .cont25
2125         for     %f28,DC1,%f28           ! (5_0) res = vis_for(res,DC1);
2126 2:
2127         fand    %f10,%f60,%f10
2128         fxtod   %f10,%f10               ! res = *(long long*)&res;
2129         ldd     [%o3+0x58],%f60
2130         faddd   %f10,%f60,%f10
2131         st      %f10,[%fp+tmp7]

2133         fand    %f10,DC0,%f28           ! (5_0) res = vis_fand(res,DC0);
2134         ld      [%fp+tmp7],%g1

2136         sra     %g1,21,%o7              ! (5_0) iexp = hx >> 21;

2138         sra     %g1,10,%o2              ! (5_0) hx >>= 10;
2139         sub     %o7,537,%o7

2141         and     %o2,2040,%o2            ! (5_0) hx &= 0x7f8;
2142         sub     %g0,%o7,%o7             ! (5_0) iexp = -iexp;

2144         ba      .cont25
2145         for     %f28,DC1,%f28           ! (5_0) res = vis_for(res,DC1);
2146 1:
2147         sub     %i1,stridex,tmp_px
2148         sub     counter,6,tmp_counter

2150         ba      .cont25
2151         mov     6,counter

2153 .exit:
2154         ret
2155         restore
2156         SET_SIZE(__vrsqrt)
```

```
**********************************************************
   48617 Sat May 10 12:10:00 2014
new/usr/src/lib/libmvec/common/vis/__vrsqrtf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
 *
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 *
 * CDDL HEADER END
 */
/*
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 */
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 */

        .file   "__vrsqrtf.S"

#include "libm.h"

        RO_DATA
        .align  64

! i = [0,63]
! TBL[2*i  ] = 1 / (*(double*)&(0x3fe0000000000000ULL + (i << 46))) * 2**-24;
! TBL[2*i+1] = 1 / sqrtl(*(double*)&(0x3fe0000000000000ULL + (i << 46)));
! i = [64,127]
! TBL[2*i  ] = 1 / (*(double*)&(0x3fe0000000000000ULL + (i << 46))) * 2**-23;
! TBL[2*i+1] = 1 / sqrtl(*(double*)&(0x3fe0000000000000ULL + (i << 46)));

.CONST_TBL:
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        .word   0x3e7f81f8, 0x1f81f820, 0x3ff673e3, 0x2ef63a03,
        .word   0x3e7f07c1, 0xf07c1f08, 0x3ff6482d, 0x37a5a3d2,
        .word   0x3e7e9131, 0xabf0b767, 0x3ff61d72, 0xb7978671,
        .word   0x3e7e1e1e, 0x1e1e1e1e, 0x3ff5f3aa, 0x673fa911,
        .word   0x3e7dae60, 0x76b981db, 0x3ff5cacb, 0x7802f342,
        .word   0x3e7d41d4, 0x1d41d41d, 0x3ff5a2cd, 0x8c69d61a,
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        .word   0x3e7c71c7, 0x1c71c71c, 0x3ff55555, 0x55555555,
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```



```
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        .word   0x3e77d05f, 0x417d05f4, 0x3ff38512, 0xba21f51e,
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133         .word   0x3e7702e0, 0x5c0b8170, 0x3feb22cd, 0x56d87d7e,
134         .word   0x3e76c16c, 0x16c16c17, 0x3feafc19, 0xd8606169,
135         .word   0x3e768168, 0x16816817, 0x3fead60a, 0x1d0fb394,
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166         .word   0x3e70c971, 0x4fbcda3b, 0x3fe72d59, 0xc45f1fc5,
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168         .word   0x3e708421, 0x08421084, 0x3fe6fd4e, 0x79325467,
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170         .word   0x3e704104, 0x10410410, 0x3fe6ce69, 0x31d5858d,
171         .word   0x3e702040, 0x81020408, 0x3fe6b761, 0x2ec892f6,

173         .word   0x3fefffff, 0xfee7f18f  ! K0 =  9.99999997962321453275e-01
174         .word   0xbfdfffff, 0xfe07e52f  ! K1 = -4.99999998166077580600e-01
175         .word   0x3fd80118, 0x0ca296d9  ! K2 =  3.75066768969515586277e-01
176         .word   0xbfd400fc, 0x0bbb8e78  ! K3 = -3.12560092408808548438e-01
177         .word   0x7ffe0000, 0x7ffe0000  ! DC0
178         .word   0x3f800000, 0x40000000  ! FTWO

180 #define stridex         %l4
181 #define stridex2        %l1
182 #define stridey         %l3
183 #define stridey2        %i2
184 #define TBL             %l2
185 #define counter         %i5

187 #define K3              %f38
188 #define K2              %f36
189 #define K1              %f34
190 #define K0              %f32
191 #define DC0             %f4
192 #define FONE            %f2
193 #define FTWO            %f3
```



```
195 #define _0x00800000     %o2
196 #define _0x7f800000     %o4

198 #define tmp0            STACK_BIAS-0x30
199 #define tmp1            STACK_BIAS-0x28
200 #define tmp2            STACK_BIAS-0x20
201 #define tmp3            STACK_BIAS-0x18
202 #define tmp_counter     STACK_BIAS-0x10
203 #define tmp_px          STACK_BIAS-0x08

205 ! sizeof temp storage - must be a multiple of 16 for V9
206 #define tmps            0x30

208 !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
209 !       !!!!!   algorithm   !!!!!
210 !  ((float*)&ddx0)[0] = *px;
211 !  ax0 = *(int*)px;
212 !
213 !  ((float*)&ddx0)[1] = *(px + stridex);
214 !  ax1 = *(int*)(px + stridex);
215 !
216 !  px += stridex2;
217 !
218 !  if ( ax0 >= 0x7f800000 )
219 !  {
220 !    RETURN ( FONE / ((float*)&dres0)[0] );
221 !  }
222 !  if ( ax0 < 0x00800000 )
223 !  {
224 !    float res = ((float*)&dres0)[0];
225 !
226 !    if ( (ax0 & 0x7fffffff) == 0 )  /* |X| = zero  */
227 !    {
228 !      RETURN ( FONE / res )
229 !    }
230 !    else if ( ax0 >= 0 )  /* X = denormal  */
231 !    {
232 !      double    res0, xx0, tbl_div0, tbl_sqrt0;
233 !      float    fres0;
234 !      int    iax0, si0, iexp0;
235 !
236 !      res = *(int*)&res;
237 !      res *= FTWO;
238 !      ax0 = *(int*)&res;
239 !      iexp0 = ax0 >> 24;
240 !      iexp0 = 0x3f + 0x4b - iexp0;
241 !      iexp0 = iexp0 << 23;
242 !
243 !      si0 = (ax0 >> 13) & 0x7f0;
244 !
245 !      tbl_div0 = ((double*)((char*)__TBL_rsqrtf + si0))[0];
246 !      tbl_sqrt0 = ((double*)((char*)__TBL_rsqrtf + si0))[1];
247 !      iax0 = ax0 & 0x7ffe0000;
248 !      iax0 = ax0 - iax0;
249 !      xx0 = iax0 * tbl_div0;
250 !      res0 = tbl_sqrt0 * (((A3 * xx0 + A2) * xx0 + A1) * xx0 + A0);
251 !
252 !      fres0 = res0;
253 !      iexp0 += *(int*)&fres0;
254 !      RETURN(*(float*)&iexp0)
255 !    }
256 !    else  /* X = negative  */
257 !    {
258 !      RETURN ( sqrtf(res) )
259 !    }
```

```
!  }
!  if ( ax1 >= 0x7f800000 )
!  {
!    RETURN ( FONE / ((float*)&dres0)[1] )
!  }
!  if ( ax1 < 0x00800000 )
!  {
!    float res = ((float*)&dres0)[1];
!    if ( (ax0 & 0x7fffffff) == 0 )  /* |X| = zero  */
!    {
!      RETURN ( FONE / res )
!    }
!    else if ( ax0 >= 0 )  /* X = denormal  */
!    {
!      double    res0, xx0, tbl_div0, tbl_sqrt0;
!      float    fres0;
!      int    iax1, si0, iexp0;
!
!      res = *(int*)&res;
!      res *= FTWO;
!      ax1 = *(int*)&res;
!      iexp0 = ax1 >> 24;
!      iexp0 = 0x3f + 0x4b - iexp0;
!      iexp0 = iexp0 << 23;
!
!      si0 = (ax1 >> 13) & 0x7f0;
!
!      tbl_div0 = ((double*)((char*)__TBL_rsqrtf + si0))[0];
!      tbl_sqrt0 = ((double*)((char*)__TBL_rsqrtf + si0))[1];
!      iax1 = ax1 & 0x7ffe0000;
!      iax1 = ax1 - iax1;
!      xx0 = iax1 * tbl_div0;
!      res0 = tbl_sqrt0 * (((A3 * xx0 + A2) * xx0 + A1) * xx0 + A0);
!
!      fres0 = res0;
!      iexp0 += *(int*)&fres0;
!      RETURN(*(float*)&iexp0)
!    }
!    else  /* X = negative  */
!    {
!      RETURN ( sqrtf(res) )
!    }
!  }
!
!  iexp0 = ax0 >> 24;
!  iexp1 = ax1 >> 24;
!  iexp0 = 0x3f - iexp0;
!  iexp1 = 0x3f - iexp1;
!  iexp1 &= 0x1ff;
!  lexp0 = iexp0 << 55;
!  lexp1 = iexp1 << 23;
!
!  lexp0 |= lexp1;
!
!  fdx0 = *((double*)&lexp0);
!
!  si0 = ax0 >> 13;
!  si1 = ax1 >> 13;
!  si0 &= 0x7f0;
!  si1 &= 0x7f0;
!
!  addr0 = (char*)TBL + si0;
!  addr1 = (char*)TBL + si1;
!  tbl_div0 = ((double*)((char*)TBL + si0))[0];
!  tbl_div1 = ((double*)((char*)TBL + si1))[0];
!  tbl_sqrt0 = ((double*)addr0)[1];
```



```
!  tbl_sqrt1 = ((double*)addr1)[1];
!  dfx0 = vis_fand(ddx0,DC0);
!  dfx0 = vis_fpsub32(ddx0,dfx0);
!  dtmp0 = (double)(((int*)&dfx0)[0]);
!  dtmp1 = (double)(((int*)&dfx0)[1]);
!  xx0 = dtmp0 * tbl_div0;
!  xx1 = dtmp1 * tbl_div1;
!  res0 = K3 * xx0;
!  res1 = K3 * xx1;
!  res0 += K2;
!  res1 += K2;
!  res0 *= xx0;
!  res1 *= xx1;
!  res0 += K1;
!  res1 += K1;
!  res0 *= xx0;
!  res1 *= xx1;
!  res0 += K0;
!  res1 += K0;
!  res0 = tbl_sqrt0 * res0;
!  res1 = tbl_sqrt1 * res1;
!  ((float*)&dres0)[0] = (float)res0;
!  ((float*)&dres0)[1] = (float)res1;
!  dres0 = vis_fpadd32(dres0,fdx0);
!  *py = ((float*)&dres0)[0];
!  *(py + stridey) = ((float*)&dres0)[1];
!  py += stridey2;
!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

        ENTRY(__vrsqrtf)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,l2)

        st      %i0,[%fp+tmp_counter]
        stx     %i1,[%fp+tmp_px]

        ldd     [TBL+2048],K0
        sll     %i2,2,stridex

        ldd     [TBL+2048+8],K1
        sll     %i4,2,stridey
        mov     %i3,%i2

        ldd     [TBL+2048+16],K2
        sethi   %hi(0x7f800000),_0x7f800000
        sll     stridex,1,stridex2

        ldd     [TBL+2048+24],K3
        sethi   %hi(0x00800000),_0x00800000

        ldd     [TBL+2048+32],DC0
        add     %g0,0x3f,%l0

        ldd     [TBL+2048+40],FONE
!       ld      [TBL+2048+44],FTWO
.begin:
        ld      [%fp+tmp_counter],counter
        ldx     [%fp+tmp_px],%l7
        st      %g0,[%fp+tmp_counter]
.begin1:
        cmp     counter,0
        ble,pn  %icc,.exit

        lda     [%l7]0x82,%f14          ! (4_0) ((float*)&ddx0)[0] = *px;
```

```
393         lda     [stridex+%l7]0x82,%f15  ! (5_0) ((float*)&ddx0)[1] = *(px + stri
394         sethi   %hi(0x7ffffc00),%o0

396         lda     [%l7]0x82,%g1           ! (4_0) ax0 = *(int*)px;
397         add     %l7,stridex2,%i1        ! px += stridex2
398         add     %o0,0x3ff,%o0

400         lda     [stridex+%l7]0x82,%g5   ! (5_0) ax1 = *(int*)(px + stridex);
401         fand    %f14,DC0,%f16           ! (4_0) dfx0 = vis_fand(ddx0,DC0);

403         sra     %g1,13,%l5              ! (4_0) si0 = ax0 >> 13;
404         add     %i1,stridex2,%o5        ! px += stridex2

406         cmp     %g1,_0x7f800000         ! (4_1) ax0 ? 0x7f800000
407         bge,pn  %icc,.spec0             ! (4_1) if ( ax0 >= 0x7f800000 )
408         nop

410         cmp     %g1,_0x00800000         ! (4_1) ax0 ? 0x00800000
411         bl,pn   %icc,.spec1             ! (4_1) if ( ax0 < 0x00800000 )
412         sra     %g5,13,%l6              ! (5_0) si1 = ax1 >> 13;
413 .cont_spec:
414         and     %l5,2032,%l5            ! (4_0) si0 &= 0x7f0;

416         ldd     [%l5+TBL],%f54          ! (4_0) tbl_div0 = ((double*)((char*)TBL
417         sra     %g5,24,%l7              ! (5_0) iexp1 = ax1 >> 24;
418         and     %l6,2032,%l6            ! (5_0) si1 &= 0x7f0;
419         fpsub32 %f14,%f16,%f16          ! (4_0) dfx0 = vis_fpsub32(ddx0,dfx0);

421         ldd     [%l6+TBL],%f46          ! (5_0) tbl_div1 = ((double*)((char*)TBL
422         sra     %g1,24,%i3              ! (4_0) iexp0 = ax0 >> 24;
423         sub     %l0,%l7,%l7             ! (5_0) iexp1 = 0x3f - iexp1;

425         and     %l7,511,%l1             ! (5_0) iexp1 = 0x1ff;
426         add     %l6,TBL,%l6             ! (5_0) addr1 = (char*)TBL + si1;

428         sllx    %l1,23,%l1              ! (5_0) lexp1 = iexp1 << 23;
429         sub     %l0,%i3,%o0             ! (4_0) iexp0 = 0x3f - iexp0;
430         fitod   %f16,%f56               ! (4_0) dtmp0 = (double)(((int*)dfx0)[0]

432         sllx    %o0,55,%o0              ! (4_0) lexp0 = iexp0 << 55;
433         fitod   %f17,%f44               ! (5_0) dtmp1 = (double)(((int*)dfx0)[1]

435         or      %o0,%l1,%o0             ! (4_0) lexp0 |= lexp1;

437         stx     %o0,[%fp+tmp0]          ! (4_0) fdx0 = *((double*)lexp0);

439         fmuld   %f56,%f54,%f40          ! (4_0) xx0 = dtmp0 * tbl_div0;

441         lda     [%i1]0x82,%f18          ! (0_0) ((float*)&ddx0)[0] = *px;
442         fmuld   %f44,%f46,%f46          ! (5_1) xx1 = dtmp1 * tbl_div1;

444         lda     [stridex+%i1]0x82,%f19  ! (1_0) ((float*)&ddx0)[1] = *(px + stri

446         lda     [%i1]0x82,%g1           ! (0_0) ax0 = *(int*)px;

448         lda     [stridex+%i1]0x82,%i4   ! (1_0) ax1 = *(int*)(px + stridex);
449         cmp     %g5,_0x7f800000         ! (5_1) ax1 ? 0x7f800000
450         bge,pn  %icc,.update0           ! (5_1) if ( ax1 >= 0x7f800000 )
451         fmuld   K3,%f40,%f52            ! (4_1) res0 = K3 * xx0;
452 .cont0:
453         fmuld   K3,%f46,%f50            ! (5_1) res1 = K3 * xx1;
454         cmp     %g5,_0x00800000         ! (5_1) ax1 ? 0x00800000
455         bl,pn   %icc,.update1           ! (5_1) if ( ax1 < 0x00800000 )
456         fand    %f18,DC0,%f56           ! (0_0) dfx0 = vis_fand(ddx0,DC0);
457 .cont1:
```



```
458         sra     %g1,13,%o0              ! (0_0) si0 = ax0 >> 13;
459         cmp     %g1,_0x7f800000         ! (0_0) ax0 ? 0x7f800000

461         sra     %i4,13,%g5              ! (1_0) si1 = ax1 >> 13;
462         and     %o0,2032,%o0            ! (0_0) si0 &= 0x7f0;

464         ldd     [%o0+TBL],%f54          ! (0_0) tbl_div0 = ((double*)((char*)TBL
465         sra     %i4,24,%i1              ! (1_0) iexp1 = ax1 >> 24;
466         and     %g5,2032,%o7            ! (1_0) si1 &= 0x7f0;
467         fpsub32 %f18,%f56,%f30          ! (0_0) dfx0 = vis_fpsub32(ddx0,dfx0);

469         ldd     [%o7+TBL],%f44          ! (1_0) tbl_div1 = ((double*)((char*)TBL
470         sra     %g1,24,%i3              ! (0_0) iexp0 = ax0 >> 24;
471         sub     %l0,%i1,%i1             ! (1_0) iexp1 = 0x3f - iexp1;
472         faddd   %f52,K2,%f62            ! (4_1) res0 += K2;

474         sub     %l0,%i3,%g5             ! (0_0) iexp0 = 0x3f - iexp0;
475         bge,pn  %icc,.update2           ! (0_0) if ( ax0 >= 0x7f800000 )
476         faddd   %f50,K2,%f60            ! (5_1) res1 += K2;
477 .cont2:
478         cmp     %g1,_0x00800000         ! (0_0) ax0 ? 0x00800000
479         and     %i1,511,%i0             ! (1_0) iexp1 = 0x1ff;
480         fitod   %f30,%f56               ! (0_0) dtmp0 = (double)(((int*)dfx0)[0]

482         sllx    %i0,23,%i0              ! (1_0) lexp1 = iexp1 << 23;
483         bl,pn   %icc,.update3           ! (0_0) if ( ax0 < 0x00800000 )
484         fitod   %f31,%f50               ! (1_0) dtmp0 = (double)(((int*)dfx0)[0]
485 .cont3:
486         fmuld   %f62,%f40,%f30          ! (4_1) res0 *= xx0;
487         sllx    %g5,55,%g5              ! (0_0) lexp0 = iexp0 << 55;

489         fmuld   %f60,%f46,%f48          ! (5_1) res1 *= xx1;
490         or      %g5,%i0,%g5             ! (0_0) lexp0 |= lexp1;
491         stx     %g5,[%fp+tmp1]          ! (0_0) fdx0 = *((double*)lexp0);

493         fmuld   %f56,%f54,%f26          ! (0_0) xx0 = dtmp0 * tbl_div0;
494         sll     stridex,1,stridex2      ! stridex2 = stridex * 2;

496         lda     [%o5]0x82,%f24          ! (2_0) ((float*)&ddx0)[0] = *px;
497         add     %o7,TBL,%o7             ! (1_0) addr0 = (char*)TBL + si0;
498         fmuld   %f50,%f44,%f44          ! (1_0) xx0 = dtmp0 * tbl_div0;

500         lda     [stridex+%o5]0x82,%f25  ! (3_0) ((float*)&ddx0)[1] = *(px + stri
501         add     %l5,TBL,%l5             ! (4_1) addr0 = (char*)TBL + si0;
502         faddd   %f30,K1,%f62            ! (4_1) res0 += K1;

504         lda     [%o5]0x82,%g1           ! (2_0) ax0 = *(int*)px;
505         add     %o5,stridex2,%l7        ! px += stridex2
506         faddd   %f48,K1,%f42            ! (5_1) res1 += K1;

508         lda     [stridex+%o5]0x82,%o5   ! (3_0) ax1 = *(int*)(px + stridex);
509         cmp     %i4,_0x7f800000         ! (1_0) ax1 ? 0x7f800000
510         bge,pn  %icc,.update4           ! (1_0) if ( ax1 >= 0x7f800000 )
511         fmuld   K3,%f26,%f52            ! (0_0) res0 = K3 * xx0;
512 .cont4:
513         fmuld   K3,%f44,%f50            ! (1_0) res1 = K3 * xx1;
514         cmp     %i4,_0x00800000         ! (1_0) ax1 ? 0x00800000
515         bl,pn   %icc,.update5           ! (1_0) if ( ax1 < 0x00800000 )
516         fand    %f24,DC0,%f54           ! (2_0) dfx0 = vis_fand(ddx0,DC0);
517 .cont5:
518         fmuld   %f62,%f40,%f48          ! (4_1) res0 *= xx0;
519         sra     %g1,13,%i0              ! (2_0) si0 = ax0 >> 13;
520         cmp     %g1,_0x7f800000         ! (2_0) ax0 ? 0x7f800000

522         fmuld   %f42,%f46,%f58          ! (5_1) res1 *= xx1;
523         sra     %o5,13,%o1              ! (3_0) si1 = ax1 >> 13;
```

```
524         and     %i0,2032,%i0            ! (2_0) si0 &= 0x7f0;

526         ldd     [%i0+TBL],%f30          ! (2_0) tbl_div0 = ((double*)((char*)TBL
527         sra     %o5,24,%o3              ! (3_0) iexp1 = ax1 >> 24;
528         and     %o1,2032,%o1            ! (3_0) si1 &= 0x7f0;
529         fpsub32 %f24,%f54,%f12          ! (2_0) dfx0 = vis_fpsub32(ddx0,dfx0);

531         ldd     [%o1+TBL],%f46          ! (3_0) tbl_div1 = ((double*)((char*)TBL
532         sra     %g1,24,%i3              ! (2_0) iexp0 = ax0 >> 24;
533         sub     %l0,%o3,%o3             ! (3_0) iexp1 = 0x3f - iexp1;
534         faddd   %f52,K2,%f40            ! (0_0) res0 += K2;

536         ldd     [%l5+8],%f42            ! (4_1) tbl_sqrt0 = ((double*)addr0)[1];
537         sub     %l0,%i3,%g5             ! (2_0) iexp0 = 0x3f - iexp0;
538         and     %o3,511,%i3             ! (3_0) iexp1 &= 0x1ff;
539         faddd   %f50,K2,%f60            ! (1_0) res0 += K2;

541         ldd     [%l6+8],%f28            ! (5_1) tbl_sqrt1 = ((double*)addr1)[1];
542         sllx    %g5,55,%g5              ! (2_0) iexp0 = iexp0 << 55;
543         add     %i0,TBL,%i0             ! (2_0) addr0 = (char*)TBL + si0;
544         fitod   %f12,%f56               ! (2_0) dtmp0 = (double)(((int*)dfx0)[0]

546         sllx    %i3,23,%i3              ! (3_0) iexp1 = iexp1 << 23;
547         fitod   %f13,%f50               ! (3_0) dtmp1 = (double)(((int*)dfx0)[1]

549         fmuld   %f40,%f26,%f40          ! (0_0) res0 *= xx0;
550         or      %g5,%i3,%g5             ! (2_0) iexp0 |= iexp1;
551         faddd   %f48,K0,%f62            ! (4_1) res0 += K0;

553         fmuld   %f60,%f44,%f48          ! (1_0) res1 *= xx1;
554         add     %o1,TBL,%o1             ! (3_0) addr1 = (char*)TBL + si1;
555         stx     %g5,[%fp+tmp2]          ! (2_0) fdx0 = *((double*)iexp0);
556         faddd   %f58,K0,%f60            ! (5_1) res1 += K0;

558         fmuld   %f56,%f30,%f30          ! (2_0) xx0 = dtmp0 * tbl_div0;
559         bge,pn  %icc,.update6           ! (2_0) if ( ax0 >= 0x7f800000 )
560         lda     [%l7]0x82,%f14          ! (4_0) ((float*)&ddx0)[0] = *px;
561 .cont6:
562         cmp     %g1,_0x00800000         ! (2_0) ax0 ? 0x00800000
563         bl,pn   %icc,.update7           ! (2_0) if ( ax0 < 0x00800000 )
564         nop
565 .cont7:
566         fmuld   %f50,%f46,%f24          ! (3_0) xx1 = dtmp1 * tbl_div1;

568         lda     [stridex+%l7]0x82,%f15  ! (5_0) ((float*)&ddx0)[1] = *(px + stri
569         cmp     %o5,_0x7f800000         ! (3_0) ax1 ? 0x7f800000
570         fmuld   %f42,%f62,%f58          ! (4_1) res0 = tbl_sqrt0 * res0;
571         faddd   %f40,K1,%f46            ! (0_0) res0 += K1;

573         lda     [%l7]0x82,%g1           ! (4_0) ax0 = *(int*)px;
574         add     %l7,stridex2,%i1        ! px += stridex2
575         fmuld   %f28,%f60,%f56          ! (5_1) res1 = tbl_sqrt1 * res1;
576         faddd   %f48,K1,%f62            ! (1_0) res1 += K1;

578         lda     [stridex+%l7]0x82,%g5   ! (5_0) ax1 = *(int*)(px + stridex);
579         add     %o0,TBL,%o0             ! (0_0) addr0 = (char*)TBL + si0;
580         bge,pn  %icc,.update8           ! (3_0) if ( ax1 >= 0x7f800000 )
581         fmuld   K3,%f30,%f52            ! (2_0) res0 = K3 * xx0;
582 .cont8:
583         fmuld   K3,%f24,%f50            ! (3_0) res1 = K3 * xx1;
584         cmp     %o5,_0x00800000         ! (3_0) ax1 ? 0x00800000
585         bl,pn   %icc,.update9           ! (3_0) if ( ax1 < 0x00800000 )
586         fand    %f14,DC0,%f16           ! (4_0) dfx0 = vis_fand(ddx0,DC0);
587 .cont9:
588         fmuld   %f46,%f26,%f48          ! (0_0) res0 *= xx0;
589         sra     %g1,13,%l5              ! (4_0) si0 = ax0 >> 13;
```



```
590         add     %i1,stridex2,%o5        ! px += stridex2
591         fdtos   %f58,%f6                ! (4_1) ((float*)&dres0)[0] = (float)res

593         fmuld   %f62,%f44,%f40          ! (1_0) res1 *= xx1;
594         sra     %g5,13,%l6              ! (5_0) si1 = ax1 >> 13;
595         and     %l5,2032,%l5            ! (4_0) si0 &= 0x7f0;
596         fdtos   %f56,%f7                ! (5_1) ((float*)&dres0)[1] = (float)res

598         ldd     [%l5+TBL],%f54          ! (4_0) tbl_div0 = ((double*)((char*)TBL
599         sra     %g5,24,%l7              ! (5_0) iexp1 = ax1 >> 24;
600         and     %l6,2032,%l6            ! (5_0) si1 &= 0x7f0;
601         fpsub32 %f14,%f16,%f16          ! (4_0) dfx0 = vis_fpsub32(ddx0,dfx0);

603         ldd     [%l6+TBL],%f46          ! (5_0) tbl_div1 = ((double*)((char*)TBL
604         sra     %g1,24,%i3              ! (4_0) iexp0 = ax0 >> 24;
605         sub     %l0,%l7,%l7             ! (5_0) iexp1 = 0x3f - iexp1;
606         faddd   %f52,K2,%f58            ! (2_0) res0 += K2;

608         ldd     [%o0+8],%f42            ! (0_0) tbl_sqrt0 = ((double*)addr0)[1];
609         and     %l7,511,%l1             ! (5_0) iexp1 = 0x1ff;
610         add     %l6,TBL,%l6             ! (5_0) addr1 = (char*)TBL + si1;
611         faddd   %f50,K2,%f60            ! (3_0) res1 += K2;

613         ldd     [%o7+8],%f28            ! (1_0) tbl_sqrt1 = ((double*)addr1)[1];
614         sllx    %l1,23,%l1              ! (5_0) lexp1 = iexp1 << 23;
615         sub     %l0,%i3,%o0             ! (4_0) iexp0 = 0x3f - iexp0;
616         fitod   %f16,%f56               ! (4_0) dtmp0 = (double)(((int*)dfx0)[0]

618         ldd     [%fp+tmp0],%f52         ! (4_1) fdx0 = *((double*)lexp0);
619         sllx    %o0,55,%o0              ! (4_0) lexp0 = iexp0 << 55;
620         fitod   %f17,%f44               ! (5_0) dtmp1 = (double)(((int*)dfx0)[1]

622         fmuld   %f58,%f30,%f62          ! (2_0) res0 *= xx0;
623         or      %o0,%l1,%o0             ! (4_0) lexp0 |= lexp1;
624         faddd   %f48,K0,%f22            ! (0_0) res0 += K0;

626         fmuld   %f60,%f24,%f58          ! (3_0) res1 *= xx1;
627         stx     %o0,[%fp+tmp0]          ! (4_0) fdx0 = *((double*)lexp0);
628         faddd   %f40,K0,%f26            ! (1_0) res1 += K0;

630         fmuld   %f56,%f54,%f40          ! (4_0) xx0 = dtmp0 * tbl_div0;
631         fpadd32 %f6,%f52,%f10           ! (4_1) dres0 = vis_fpadd32(dres0,fdx0);

633         or      %g0,%i2,%l7
634         add     stridey,stridey,stridey2

636         cmp     counter,6
637         bl,pn   %icc,.tail
638         nop

640         ba      .main_loop
641         sub     counter,6,counter       ! counter

643         .align  16
644 .main_loop:
645         lda     [%i1]0x82,%f18          ! (0_0) ((float*)&ddx0)[0] = *px;
646         cmp     %g1,_0x7f800000         ! (4_1) ax0 ? 0x7f800000
647         bge,pn  %icc,.update10          ! (4_1) if ( ax0 >= 0x7f800000 )
648         fmuld   %f44,%f46,%f46          ! (5_1) xx1 = dtmp1 * tbl_div1;
649 .cont10:
650         lda     [stridex+%i1]0x82,%f19  ! (1_0) ((float*)&ddx0)[1] = *(px + stri
651         cmp     %g1,_0x00800000         ! (4_1) ax0 ? 0x00800000
652         fmuld   %f42,%f22,%f44          ! (0_1) res0 = tbl_sqrt0 * res0;
653         faddd   %f62,K1,%f42            ! (2_1) res0 += K1;

655         lda     [%i1]0x82,%g1           ! (0_0) ax0 = *(int*)px;
```

```
656         fmuld   %f28,%f26,%f60          ! (1_1) res1 = tbl_sqrt1 * res1;
657         bl,pn   %icc,.update11          ! (4_1) if ( ax0 < 0x00800000 )
658         faddd   %f58,K1,%f62            ! (3_1) res1 += K1;
659 .cont11:
660         lda     [stridex+%i1]0x82,%i4   ! (1_0) ax1 = *(int*)(px + stridex);
661         cmp     %g5,_0x7f800000         ! (5_1) ax1 ? 0x7f800000
662         bge,pn  %icc,.update12          ! (5_1) if ( ax1 >= 0x7f800000 )
663         fmuld   K3,%f40,%f52            ! (4_1) res0 = K3 * xx0;
664 .cont12:
665         fmuld   K3,%f46,%f50            ! (5_1) res1 = K3 * xx1;
666         cmp     %g5,_0x00800000         ! (5_1) ax1 ? 0x00800000
667         bl,pn   %icc,.update13          ! (5_1) if ( ax1 < 0x00800000 )
668         fand    %f18,DC0,%f56           ! (0_0) dfx0 = vis_fand(ddx0,DC0);
669 .cont13:
670         fmuld   %f42,%f30,%f48          ! (2_1) res0 *= xx0;
671         sra     %g1,13,%o0              ! (0_0) si0 = ax0 >> 13;
672         cmp     %g1,_0x7f800000         ! (0_0) ax0 ? 0x7f800000
673         fdtos   %f44,%f8                ! (0_1) ((float*)&dres0)[0] = (float)res

675         fmuld   %f62,%f24,%f58          ! (3_1) res1 *= xx1;
676         sra     %i4,13,%g5              ! (1_0) si1 = ax1 >> 13;
677         and     %o0,2032,%o0            ! (0_0) si0 &= 0x7f0;
678         fdtos   %f60,%f9                ! (1_1) ((float*)&dres0)[1] = (float)res

680         ldd     [%o0+TBL],%f54          ! (0_0) tbl_div0 = ((double*)((char*)TBL
681         sra     %i4,24,%i1              ! (1_0) iexp1 = ax1 >> 24;
682         and     %g5,2032,%o7            ! (1_0) si1 &= 0x7f0;
683         fpsub32 %f18,%f56,%f30          ! (0_0) dfx0 = vis_fpsub32(ddx0,dfx0);

685         ldd     [%o7+TBL],%f44          ! (1_0) tbl_div1 = ((double*)((char*)TBL
686         sra     %g1,24,%i3              ! (0_0) iexp0 = ax0 >> 24;
687         sub     %l0,%i1,%i1             ! (1_0) iexp1 = 0x3f - iexp1;
688         faddd   %f52,K2,%f62            ! (4_1) res0 += K2;

690         ldd     [%i0+8],%f42            ! (2_1) tbl_sqrt0 = ((double*)addr0)[1];
691         sub     %l0,%i3,%g5             ! (0_0) iexp0 = 0x3f - iexp0;
692         bge,pn  %icc,.update14          ! (0_0) if ( ax0 >= 0x7f800000 )
693         faddd   %f50,K2,%f60            ! (5_1) res1 += K2;
694 .cont14:
695         ldd     [%o1+8],%f28            ! (3_1) tbl_sqrt1 = ((double*)addr0)[1];
696         cmp     %g1,_0x00800000         ! (0_0) ax0 ? 0x00800000
697         and     %i1,511,%i0             ! (1_0) iexp1 = 0x1ff;
698         fitod   %f30,%f56               ! (0_0) dtmp0 = (double)(((int*)dfx0)[0]

700         ldd     [%fp+tmp1],%f52         ! (0_1) fdx0 = *((double*)lexp0);
701         sllx    %i0,23,%i0              ! (1_0) iexp1 = iexp1 << 23;
702         bl,pn   %icc,.update15          ! (0_0) if ( ax0 < 0x00800000 )
703         fitod   %f31,%f50               ! (1_0) dtmp0 = (double)(((int*)dfx0)[0]
704 .cont15:
705         fmuld   %f62,%f40,%f30          ! (4_1) res0 *= xx0;
706         sllx    %g5,55,%g5              ! (0_0) lexp0 = iexp0 << 55;
707         st      %f10,[%l7]              ! (4_2) *py = ((float*)&dres0)[0];
708         faddd   %f48,K0,%f62            ! (2_1) res0 += K0;

710         fmuld   %f60,%f46,%f48          ! (5_1) res1 *= xx1;
711         or      %g5,%i0,%g5             ! (0_0) lexp0 |= lexp1;
712         stx     %g5,[%fp+tmp1]          ! (0_0) fdx0 = *((double*)lexp0);
713         faddd   %f58,K0,%f60            ! (3_1) res1 += K0;

715         fmuld   %f56,%f54,%f26          ! (0_0) xx0 = dtmp0 * tbl_div0;
716         sll     stridex,1,stridex2      ! stridex2 = stridex * 2;
717         st      %f11,[stridey+%l7]      ! (5_2) *(py + stridey) = ((float*)&dres
718         fpadd32 %f8,%f52,%f10           ! (0_1) dres0 = vis_fpadd32(dres0,fdx0);

720         lda     [%o5]0x82,%f24          ! (2_0) ((float*)&ddx0)[0] = *px;
721         add     %l7,stridey2,%i1        ! py += stridey2
```



```
722         add     %o7,TBL,%o7             ! (1_0) addr0 = (char*)TBL + si0;
723         fmuld   %f50,%f44,%f44          ! (1_0) xx0 = dtmp0 * tbl_div0;

725         lda     [stridex+%o5]0x82,%f25  ! (3_0) ((float*)&ddx0)[1] = *(px + stri
726         add     %l5,TBL,%l5             ! (4_1) addr0 = (char*)TBL + si0;
727         fmuld   %f42,%f62,%f58          ! (2_1) res0 = tbl_sqrt0 * res0;
728         faddd   %f30,K1,%f62            ! (4_1) res0 += K1;

730         lda     [%o5]0x82,%g1           ! (2_0) ax0 = *(int*)px;
731         add     %o5,stridex2,%l7        ! px += stridex2
732         fmuld   %f28,%f60,%f56          ! (3_1) res1 = tbl_sqrt1 * res1;
733         faddd   %f48,K1,%f42            ! (5_1) res1 += K1;

735         lda     [stridex+%o5]0x82,%o5   ! (3_0) ax1 = *(int*)(px + stridex);
736         cmp     %i4,_0x7f800000         ! (1_0) ax1 ? 0x7f800000
737         bge,pn  %icc,.update16          ! (1_0) if ( ax1 >= 0x7f800000 )
738         fmuld   K3,%f26,%f52            ! (0_0) res0 = K3 * xx0;
739 .cont16:
740         fmuld   K3,%f44,%f50            ! (1_0) res1 = K3 * xx1;
741         cmp     %i4,_0x00800000         ! (1_0) ax1 ? 0x00800000
742         bl,pn   %icc,.update17          ! (1_0) if ( ax1 < 0x00800000 )
743         fand    %f24,DC0,%f54           ! (2_0) dfx0 = vis_fand(ddx0,DC0);
744 .cont17:
745         fmuld   %f62,%f40,%f48          ! (4_1) res0 *= xx0;
746         sra     %g1,13,%i0              ! (2_0) si0 = ax0 >> 13;
747         cmp     %g1,_0x7f800000         ! (2_0) ax0 ? 0x7f800000
748         fdtos   %f58,%f20               ! (2_1) ((float*)&dres0)[0] = (float)res

750         fmuld   %f42,%f46,%f58          ! (5_1) res1 *= xx1;
751         sra     %o5,13,%o1              ! (3_0) si1 = ax1 >> 13;
752         and     %i0,2032,%i0            ! (2_0) si0 &= 0x7f0;
753         fdtos   %f56,%f21               ! (3_1) ((float*)&dres0)[0] = (float)res

755         ldd     [%i0+TBL],%f30          ! (2_0) tbl_div0 = ((double*)((char*)TBL
756         sra     %o5,24,%o3              ! (3_0) iexp1 = ax1 >> 24;
757         and     %o1,2032,%o1            ! (3_0) si1 &= 0x7f0;
758         fpsub32 %f24,%f54,%f12          ! (2_0) dfx0 = vis_fpsub32(ddx0,dfx0);

760         ldd     [%o1+TBL],%f46          ! (3_0) tbl_div1 = ((double*)((char*)TBL
761         sra     %g1,24,%i3              ! (2_0) iexp0 = ax0 >> 24;
762         sub     %l0,%o3,%o3             ! (3_0) iexp1 = 0x3f - iexp1;
763         faddd   %f52,K2,%f40            ! (0_0) res0 += K2;

765         ldd     [%l5+8],%f42            ! (4_1) tbl_sqrt0 = ((double*)addr0)[1];
766         sub     %l0,%i3,%g5             ! (2_0) iexp0 = 0x3f - iexp0;
767         and     %o3,511,%i3             ! (3_0) iexp1 &= 0x1ff;
768         faddd   %f50,K2,%f60            ! (1_0) res0 += K2;

770         ldd     [%l6+8],%f28            ! (5_1) tbl_sqrt1 = ((double*)addr1)[1];
771         sllx    %g5,55,%g5              ! (2_0) lexp0 = iexp0 << 55;
772         add     %i0,TBL,%i0             ! (2_0) addr0 = (char*)TBL + si0;
773         fitod   %f12,%f56               ! (2_0) dtmp0 = (double)(((int*)dfx0)[0]

775         ldd     [%fp+tmp2],%f52         ! (2_1) fdx0 = *((double*)lexp0);
776         sllx    %i3,23,%i3              ! (3_0) iexp1 = iexp1 << 23;
777         add     %i1,stridey2,%o3        ! py += stridey2
778         fitod   %f13,%f50               ! (3_0) dtmp1 = (double)(((int*)dfx0)[1]

780         fmuld   %f40,%f26,%f40          ! (0_0) res0 *= xx0;
781         or      %g5,%i3,%g5             ! (2_0) lexp0 |= lexp1;
782         st      %f10,[%i1]              ! (0_1) *py = ((float*)&dres0)[0];
783         faddd   %f48,K0,%f62            ! (4_1) res0 += K0;

785         fmuld   %f60,%f44,%f48          ! (1_0) res1 *= xx1;
786         add     %o1,TBL,%o1             ! (3_0) addr1 = (char*)TBL + si1;
787         stx     %g5,[%fp+tmp2]          ! (2_0) fdx0 = *((double*)lexp0);
```

```
788         faddd   %f58,K0,%f60            ! (5_1) res1 += K0;

790         fmuld   %f56,%f30,%f30          ! (2_0) xx0 = dtmp0 * tbl_div0;
791         bge,pn  %icc,.update18          ! (2_0) if ( ax0 >= 0x7f800000 )
792         st      %f11,[stridey+%i1]      ! (1_1) *(py + stridey) = ((float*)&dres
793         fpadd32 %f20,%f52,%f0           ! (2_1) dres0 = vis_fpadd32(dres0,fdx0);
794 .cont18:
795         cmp     %g1,_0x00800000         ! (2_0) ax0 ? 0x00800000
796         bl,pn   %icc,.update19          ! (2_0) if ( ax0 < 0x00800000 )
797         lda     [%l7]0x82,%f14          ! (4_0) ((float*)&ddx0)[0] = *px;
798         fmuld   %f50,%f46,%f24          ! (3_0) xx1 = dtmp1 * tbl_div1;
799 .cont19:
800         lda     [stridex+%l7]0x82,%f15  ! (5_0) ((float*)&ddx0)[1] = *(px + stri
801         cmp     %o5,_0x7f800000         ! (3_0) ax1 ? 0x7f800000
802         fmuld   %f42,%f62,%f58          ! (4_1) res0 = tbl_sqrt0 * res0;
803         faddd   %f40,K1,%f46            ! (0_0) res0 += K1;

805         lda     [%l7]0x82,%g1           ! (4_0) ax0 = *(int*)px;
806         add     %l7,stridex2,%i1        ! px += stridex2
807         fmuld   %f28,%f60,%f56          ! (5_1) res1 = tbl_sqrt1 * res1;
808         faddd   %f48,K1,%f62            ! (1_0) res1 += K1;

810         lda     [stridex+%l7]0x82,%g5   ! (5_0) ax1 = *(int*)(px + stridex);
811         add     %o0,TBL,%o0             ! (0_0) addr0 = (char*)TBL + si0;
812         bge,pn  %icc,.update20          ! (3_0) if ( ax1 >= 0x7f800000 )
813         fmuld   K3,%f30,%f52            ! (2_0) res0 = K3 * xx0;
814 .cont20:
815         fmuld   K3,%f24,%f50            ! (3_0) res1 = K3 * xx1;
816         cmp     %o5,_0x00800000         ! (3_0) ax1 ? 0x00800000
817         bl,pn   %icc,.update21          ! (3_0) if ( ax1 < 0x00800000 )
818         fand    %f14,DC0,%f16           ! (4_0) dfx0 = vis_fand(ddx0,DC0);
819 .cont21:
820         fmuld   %f46,%f26,%f48          ! (0_0) res0 *= xx0;
821         sra     %g1,13,%l5              ! (4_0) si0 = ax0 >> 13;
822         add     %i1,stridex2,%o5        ! px += stridex2
823         fdtos   %f58,%f6                ! (4_1) ((float*)&dres0)[0] = (float)res

825         fmuld   %f62,%f44,%f40          ! (1_0) res1 *= xx1;
826         sra     %g5,13,%l6              ! (5_0) si1 = ax1 >> 13;
827         and     %l5,2032,%l5            ! (4_0) si0 &= 0x7f0;
828         fdtos   %f56,%f7                ! (5_1) ((float*)&dres0)[1] = (float)res

830         ldd     [%l5+TBL],%f54          ! (4_0) tbl_div0 = ((double*)((char*)TBL
831         sra     %g5,24,%l7              ! (5_0) iexp1 = ax1 >> 24;
832         and     %l6,2032,%l6            ! (5_0) si1 &= 0x7f0;
833         fpsub32 %f14,%f16,%f16          ! (4_0) dfx0 = vis_fpsub32(ddx0,dfx0);

835         ldd     [%l6+TBL],%f46          ! (5_0) tbl_div1 = ((double*)((char*)TBL
836         sra     %g1,24,%i3              ! (4_0) iexp0 = ax0 >> 24;
837         sub     %l0,%l7,%l7             ! (5_0) iexp1 = 0x3f - iexp1;
838         faddd   %f52,K2,%f58            ! (2_0) res0 += K2;

840         ldd     [%o0+8],%f42            ! (0_0) tbl_sqrt0 = ((double*)addr0)[1];
841         and     %l7,511,%l1             ! (5_0) iexp1 = 0x1ff;
842         add     %l6,TBL,%l6             ! (5_0) addr1 = (char*)TBL + si1;
843         faddd   %f50,K2,%f60            ! (3_0) res1 += K2;

845         ldd     [%o7+8],%f28            ! (1_0) tbl_sqrt1 = ((double*)addr1)[1];
846         sllx    %l1,23,%l1              ! (5_0) lexp1 = iexp1 << 23;
847         sub     %l0,%i3,%o0             ! (4_0) iexp0 = 0x3f - iexp0;
848         fitod   %f16,%f56               ! (4_0) dtmp0 = (double)(((int*)dfx0)[0]

850         ldd     [%fp+tmp0],%f52         ! (4_1) fdx0 = *((double*)lexp0);
851         sllx    %o0,55,%o0              ! (4_0) lexp0 = iexp0 << 55;
852         add     %o3,stridey2,%l7        ! py += stridey2
853         fitod   %f17,%f44               ! (5_0) dtmp1 = (double)(((int*)dfx0)[1]
```



```
855         fmuld   %f58,%f30,%f62          ! (2_0) res0 *= xx0;
856         or      %o0,%l1,%o0             ! (4_0) lexp0 |= lexp1;
857         st      %f0,[%o3]               ! (2_1) *py = ((float*)&dres0)[0];
858         faddd   %f48,K0,%f22            ! (0_0) res0 += K0;

860         fmuld   %f60,%f24,%f58          ! (3_0) res1 *= xx1;
861         subcc   counter,6,counter       ! counter -= 6;
862         stx     %o0,[%fp+tmp0]          ! (4_0) fdx0 = *((double*)lexp0);
863         faddd   %f40,K0,%f26            ! (1_0) res1 += K0;

865         fmuld   %f56,%f54,%f40          ! (4_0) xx0 = dtmp0 * tbl_div0;
866         st      %f1,[stridey+%o3]       ! (3_1) *(py + stridey) = ((float*)&dres
867         bpos,pt %icc,.main_loop
868         fpadd32 %f6,%f52,%f10           ! (4_1) dres0 = vis_fpadd32(dres0,fdx0);

870         add     counter,6,counter
871 .tail:
872         sll     stridex,1,stridex2
873         subcc   counter,1,counter
874         bneg,a  .begin
875         mov     %l7,%i2

877         fmuld   %f42,%f22,%f44          ! (0_1) res0 = tbl_sqrt0 * res0;
878         faddd   %f62,K1,%f42            ! (2_1) res0 += K1;

880         fmuld   %f28,%f26,%f60          ! (1_1) res1 = tbl_sqrt1 * res1;

882         fmuld   %f42,%f30,%f48          ! (2_1) res0 *= xx0;
883         fdtos   %f44,%f8                ! (0_1) ((float*)&dres0)[0] = (float)res

885         fdtos   %f60,%f9                ! (1_1) ((float*)&dres0)[1] = (float)res

887         ldd     [%i0+8],%f42            ! (2_1) tbl_sqrt0 = ((double*)addr0)[1];

889         ldd     [%fp+tmp1],%f52         ! (0_1) fdx0 = *((double*)lexp0);

891         st      %f10,[%l7]              ! (4_2) *py = ((float*)&dres0)[0];
892         subcc   counter,1,counter
893         bneg,a  .begin
894         add     %l7,stridey,%i2

896         faddd   %f48,K0,%f62            ! (2_1) res0 += K0;
897         st      %f11,[stridey+%l7]      ! (5_2) *(py + stridey) = ((float*)&dres
898         subcc   counter,1,counter
899         bneg,a  .begin
900         add     %l7,stridey2,%i2
901         fpadd32 %f8,%f52,%f10           ! (0_1) dres0 = vis_fpadd32(dres0,fdx0);

903         add     %l7,stridey2,%i1        ! py += stridey2

905         fmuld   %f42,%f62,%f58          ! (2_1) res0 = tbl_sqrt0 * res0;

907         fdtos   %f58,%f20               ! (2_1) ((float*)&dres0)[0] = (float)res

909         ldd     [%fp+tmp2],%f52         ! (2_1) fdx0 = *((double*)lexp0);
910         add     %i1,stridey2,%o3        ! py += stridey2

912         st      %f10,[%i1]              ! (0_1) *py = ((float*)&dres0)[0];
913         subcc   counter,1,counter
914         bneg,a  .begin
915         add     %i1,stridey,%i2

917         st      %f11,[stridey+%i1]      ! (1_1) *(py + stridey) = ((float*)&dres
918         subcc   counter,1,counter
919         bneg,a  .begin
```

```
920         mov     %o3,%i2
921         fpadd32 %f20,%f52,%f0           ! (2_1) dres0 = vis_fpadd32(dres0,fdx0);

923         st      %f0,[%o3]               ! (2_1) *py = ((float*)&dres0)[0];
924         ba      .begin
925         add     %o3,stridey,%i2

927         .align  16
928 .spec0:
929         fdivs   FONE,%f14,%f14          ! x0 = FONE / x0;
930         add     %l7,stridex,%l7         ! px += stridex
931         st      %f14,[%i2]              ! *py = x0;
932         sub     counter,1,counter
933         ba      .begin1
934         add     %i2,stridey,%i2         ! py += stridey

936         .align  16
937 .spec1:
938         andcc   %g1,%o0,%g0
939         bz,a    1f
940         fdivs   FONE,%f14,%f14          ! x0 = DONE / x0;

942         cmp     %g1,0
943         bl,a    1f
944         fsqrts  %f14,%f14               ! x0 = sqrtf(x0);

946         fitod   %f14,%f0
947         fdtos   %f0,%f14
948         fmuls   %f14,FTWO,%f14
949         st      %f14,[%fp+tmp3]
950         ld      [%fp+tmp3],%g1
951         sethi   %hi(0x4b000000),%o0
952         sra     %g1,13,%l5              ! (4_0) si0 = ax0 >> 13;
953         fands   %f14,DC0,%f16           ! (4_0) dfx0 = vis_fand(ddx0,DC0);
954         ba      .cont_spec
955         sub     %g1,%o0,%g1
956 1:
957         add     %l7,stridex,%l7         ! px += stridex
958         sub     counter,1,counter
959         st      %f14,[%i2]              ! *py = x0;
960         ba      .begin1
961         add     %i2,stridey,%i2         ! py += stridey

963         .align  16
964 .update0:
965         cmp     counter,1
966         ble     .cont0
967         nop

969         sub     %i1,stridex,%o1
970         stx     %o1,[%fp+tmp_px]

972         sub     counter,1,counter
973         st      counter,[%fp+tmp_counter]

975         ba      .cont0
976         mov     1,counter

978         .align  16
979 .update1:
980         sethi   %hi(0x7ffffc00),%o0
981         cmp     counter,1
982         ble     .cont1

984         add     %o0,0x3ff,%o0
```



```
986         andcc   %g5,%o0,%g0
987         bz,a    1f
988         nop

990         cmp     %g5,0
991         bl,a    1f
992         nop

994         fitod   %f15,%f0
995         fdtos   %f0,%f15
996         fmuls   %f15,FTWO,%f15
997         st      %f15,[%fp+tmp3]
998         ld      [%fp+tmp3],%g5
999         sethi   %hi(0x4b000000),%o0
1000        sub     %g5,%o0,%g5

1002        fands   %f15,DC0,%f17           ! (4_0) dfx0 = vis_fand(ddx0,DC0);

1004        sra     %g5,13,%l6              ! (5_0) si1 = ax1 >> 13;

1006        sra     %g5,24,%l7              ! (5_0) iexp1 = ax1 >> 24;
1007        and     %l6,2032,%l6            ! (5_0) si1 &= 0x7f0;

1009        fpsub32s        %f15,%f17,%f17  ! (4_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1011        ldd     [%l6+TBL],%f46          ! (5_0) tbl_div1 = ((double*)((char*)TBL
1012        sub     %l0,%l7,%l1             ! (5_0) iexp1 = 0x3f - iexp1;

1014        sll     %l1,23,%l1              ! (5_0) lexp1 = iexp1 << 23;
1015        add     %l6,TBL,%l6             ! (5_0) addr1 = (char*)TBL + si1;
1016        st      %l1,[%fp+tmp0+4]        ! (4_0) fdx0 = *((double*)lexp0);
1017        fitod   %f17,%f44               ! (5_0) dtmp1 = (double)(((int*)dfx0)[1]

1019        fmuld   %f44,%f46,%f46          ! (5_1) xx1 = dtmp1 * tbl_div1;

1021        ba      .cont1
1022        fmuld   K3,%f46,%f50            ! (5_1) res1 = K3 * xx1;
1023 1:
1024        sub     %i1,stridex,%o1
1025        stx     %o1,[%fp+tmp_px]

1027        sub     counter,1,counter
1028        st      counter,[%fp+tmp_counter]

1030        ba      .cont1
1031        mov     1,counter

1033        .align  16
1034 .update2:
1035        cmp     counter,2
1036        ble     .cont2
1037        sub     %o5,stridex,%o1

1039        sub     %o1,stridex,%o1
1040        stx     %o1,[%fp+tmp_px]

1042        sub     counter,2,counter
1043        st      counter,[%fp+tmp_counter]

1045        ba      .cont2
1046        mov     2,counter

1048        .align  16
1049 .update3:
1050        sethi   %hi(0x7ffffc00),%o1
1051        cmp     counter,2
```

```
1052         ble     .cont3

1054         add     %o1,0x3ff,%o1

1056         andcc   %g1,%o1,%g0
1057         bz,a    1f
1058         sub     %o5,stridex,%o1

1060         cmp     %g1,0
1061         bl,a    1f
1062         sub     %o5,stridex,%o1

1064         fitod   %f18,%f0
1065         fdtos   %f0,%f18
1066         fmuls   %f18,FTWO,%f18
1067         st      %f18,[%fp+tmp3]
1068         ld      [%fp+tmp3],%g1
1069         sethi   %hi(0x4b000000),%o1
1070         sub     %g1,%o1,%g1

1072         fand    %f18,DC0,%f56           ! (0_0) dfx0 = vis_fand(ddx0,DC0);
1073         sra     %g1,13,%o0              ! (0_0) si0 = ax0 >> 13;

1075         and     %o0,2032,%o0            ! (0_0) si0 &= 0x7f0;

1077         ldd     [%o0+TBL],%f54          ! (0_0) tbl_div0 = ((double*)((char*)TBL
1078         fpsub32 %f18,%f56,%f30          ! (0_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1080         sra     %g1,24,%i3              ! (0_0) iexp0 = ax0 >> 24;
1081         sub     %l0,%i3,%g5             ! (0_0) iexp0 = 0x3f - iexp0;
1082         ba      .cont3
1083         fitod   %f30,%f56               ! (0_0) dtmp0 = (double)(((int*)dfx0)[0]
1084 1:
1085         sub     %o1,stridex,%o1
1086         stx     %o1,[%fp+tmp_px]

1088         sub     counter,2,counter
1089         st      counter,[%fp+tmp_counter]

1091         ba      .cont3
1092         mov     2,counter

1094         .align  16
1095 .update4:
1096         cmp     counter,3
1097         ble     .cont4
1098         sub     %l7,stridex2,%o1

1100         sub     %o1,stridex,%o1
1101         stx     %o1,[%fp+tmp_px]

1103         sub     counter,3,counter
1104         st      counter,[%fp+tmp_counter]

1106         ba      .cont4
1107         mov     3,counter

1109         .align  16
1110 .update5:
1111         sethi   %hi(0x7ffffc00),%o1
1112         cmp     counter,3
1113         ble     .cont5

1115         add     %o1,0x3ff,%o1

1117         andcc   %i4,%o1,%g0
```



```
1118         bz,a    1f
1119         sub     %l7,stridex2,%o1

1121         cmp     %i4,0
1122         bl,a    1f
1123         sub     %l7,stridex2,%o1

1125         fitod   %f19,%f0
1126         fdtos   %f0,%f19
1127         fmuls   %f19,FTWO,%f19
1128         st      %f19,[%fp+tmp3]
1129         ld      [%fp+tmp3],%i4
1130         sethi   %hi(0x4b000000),%o1
1131         sub     %i4,%o1,%i4

1133         fands   %f19,DC0,%f0            ! (0_0) dfx0 = vis_fand(ddx0,DC0);

1135         sra     %i4,13,%g5              ! (1_0) si1 = ax1 >> 13;

1137         sra     %i4,24,%i1              ! (1_0) iexp1 = ax1 >> 24;
1138         and     %g5,2032,%o7            ! (1_0) si1 &= 0x7f0;
1139         fpsub32s        %f19,%f0,%f31   ! (0_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1141         ldd     [%o7+TBL],%f44          ! (1_0) tbl_div1 = ((double*)((char*)TBL
1142         sub     %l0,%i1,%i0             ! (1_0) iexp1 = 0x3f - iexp1;

1144         sll     %i0,23,%i0              ! (1_0) lexp1 = iexp1 << 23;
1145         fitod   %f31,%f50               ! (1_0) dtmp0 = (double)(((int*)dfx0)[0]

1147         st      %i0,[%fp+tmp1+4]        ! (0_0) fdx0 = *((double*)lexp0);

1149         add     %o7,TBL,%o7             ! (1_0) addr0 = (char*)TBL + si0;
1150         fmuld   %f50,%f44,%f44          ! (1_0) xx0 = dtmp0 * tbl_div0;

1152         ba      .cont5
1153         fmuld   K3,%f44,%f50            ! (1_0) res1 = K3 * xx1;
1154 1:
1155         sub     %o1,stridex,%o1
1156         stx     %o1,[%fp+tmp_px]

1158         sub     counter,3,counter
1159         st      counter,[%fp+tmp_counter]

1161         ba      .cont5
1162         mov     3,counter

1164         .align  16
1165 .update6:
1166         cmp     counter,4
1167         ble     .cont6
1168         sub     %l7,stridex,%o3

1170         sub     %o3,stridex,%o3
1171         stx     %o3,[%fp+tmp_px]

1173         sub     counter,4,counter
1174         st      counter,[%fp+tmp_counter]

1176         ba      .cont6
1177         mov     4,counter

1179         .align  16
1180 .update7:
1181         sethi   %hi(0x7ffffc00),%o3
1182         cmp     counter,4
1183         ble     .cont7
```

```
1185         add     %o3,0x3ff,%o3

1187         andcc   %g1,%o3,%g0
1188         bz,a    1f
1189         sub     %l7,stridex,%o3

1191         cmp     %g1,0
1192         bl,a    1f
1193         sub     %l7,stridex,%o3

1195         fitod   %f24,%f0
1196         fdtos   %f0,%f24
1197         fmuls   %f24,FTWO,%f24
1198         st      %f24,[%fp+tmp3]
1199         ld      [%fp+tmp3],%g1
1200         sethi   %hi(0x4b000000),%o3
1201         sub     %g1,%o3,%g1

1203         fands   %f24,DC0,%f0            ! (2_0) dfx0 = vis_fand(ddx0,DC0);
1204         sra     %g1,13,%i0              ! (2_0) si0 = ax0 >> 13;

1206         and     %i0,2032,%i0            ! (2_0) si0 &= 0x7f0;

1208         ldd     [%i0+TBL],%f30          ! (2_0) tbl_div0 = ((double*)((char*)TBL
1209         fpsub32s        %f24,%f0,%f12   ! (2_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1211         sra     %g1,24,%i3              ! (2_0) iexp0 = ax0 >> 24;

1213         sub     %l0,%i3,%g5             ! (2_0) iexp0 = 0x3f - iexp0;

1215         sll     %g5,23,%g5              ! (2_0) lexp0 = iexp0 << 55;
1216         add     %i0,TBL,%i0             ! (2_0) addr0 = (char*)TBL + si0;
1217         fitod   %f12,%f56               ! (2_0) dtmp0 = (double)(((int*)dfx0)[0]

1219         st      %g5,[%fp+tmp2]          ! (2_0) fdx0 = *((double*)lexp0);
1220         ba      .cont7
1221         fmuld   %f56,%f30,%f30          ! (2_0) xx0 = dtmp0 * tbl_div0;
1222 1:
1223         sub     %o3,stridex,%o3
1224         stx     %o3,[%fp+tmp_px]

1226         sub     counter,4,counter
1227         st      counter,[%fp+tmp_counter]

1229         ba      .cont7
1230         mov     4,counter

1232         .align  16
1233 .update8:
1234         cmp     counter,5
1235         ble     .cont8
1236         nop

1238         sub     %l7,stridex,%o3
1239         stx     %o3,[%fp+tmp_px]

1241         sub     counter,5,counter
1242         st      counter,[%fp+tmp_counter]

1244         ba      .cont8
1245         mov     5,counter

1247         .align  16
1248 .update9:
1249         sethi   %hi(0x7ffffc00),%o3
```



```
1250         cmp     counter,5
1251         ble     .cont9
1252         sub     %l7,stridex,%i3

1254         add     %o3,0x3ff,%o3

1256         andcc   %o5,%o3,%g0
1257         bz      1f
1258         ld      [%i3],%f0

1260         cmp     %o5,0
1261         bl,a    1f
1262         nop

1264         fitod   %f0,%f0
1265         fdtos   %f0,%f0
1266         fmuls   %f0,FTWO,%f0
1267         st      %f0,[%fp+tmp3]
1268         ld      [%fp+tmp3],%o5
1269         sethi   %hi(0x4b000000),%o3
1270         sub     %o5,%o3,%o5

1272         fands   %f0,DC0,%f8             ! (2_0) dfx0 = vis_fand(ddx0,DC0);

1274         sra     %o5,13,%o1              ! (3_0) si1 = ax1 >> 13;

1276         sra     %o5,24,%o3              ! (3_0) iexp1 = ax1 >> 24;
1277         and     %o1,2032,%o1            ! (3_0) si1 &= 0x7f0;
1278         fpsub32s        %f0,%f8,%f0     ! (2_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1280         ldd     [%o1+TBL],%f8           ! (3_0) tbl_div1 = ((double*)((char*)TBL
1281         sub     %l0,%o3,%i3             ! (3_0) iexp1 = 0x3f - iexp1;

1283         sllx    %i3,23,%i3              ! (3_0) lexp1 = iexp1 << 23;
1284         fitod   %f0,%f50                ! (3_0) dtmp1 = (double)(((int*)dfx0)[1]

1286         add     %o1,TBL,%o1             ! (3_0) addr1 = (char*)TBL + si1;
1287         st      %i3,[%fp+tmp2+4]        ! (2_0) fdx0 = *((double*)lexp0);

1289         fmuld   %f50,%f8,%f24           ! (3_0) xx1 = dtmp1 * tbl_div1;

1291         ba      .cont9
1292         fmuld   K3,%f24,%f50            ! (3_0) res1 = K3 * xx1;
1293 1:
1294         stx     %i3,[%fp+tmp_px]

1296         sub     counter,5,counter
1297         st      counter,[%fp+tmp_counter]

1299         ba      .cont9
1300         mov     5,counter

1302         .align  16
1303 .update10:
1304         cmp     counter,0
1305         ble     .cont10
1306         sub     %i1,stridex,%o3

1308         sub     %o3,stridex,%o3
1309         stx     %o3,[%fp+tmp_px]

1311         st      counter,[%fp+tmp_counter]

1313         ba      .cont10
1314         mov     0,counter
```

```
1316         .align  16
1317 .update11:
1318         sethi   %hi(0x7ffffc00),%i4
1319         cmp     counter,0
1320         ble     .cont11
1321         sub     %i1,stridex,%o3

1323         sub     %o3,stridex,%o3
1324         add     %i4,0x3ff,%i4
1325         ld      [%o3],%i3

1327         andcc   %i3,%i4,%g0
1328         bz      1f

1330         cmp     %i3,0
1331         bl,a    1f
1332         nop

1334         fitod   %f14,%f0
1335         fdtos   %f0,%f14
1336         fmuls   %f14,FTWO,%f14
1337         st      %f14,[%fp+tmp3]
1338         ld      [%fp+tmp3],%i3
1339         sethi   %hi(0x4b000000),%o3
1340         sub     %i3,%o3,%i3

1342         fands   %f14,DC0,%f16           ! (4_0) dfx0 = vis_fand(ddx0,DC0);
1343         sra     %i3,13,%l5              ! (4_0) si0 = ax0 >> 13;

1345         and     %l5,2032,%l5            ! (4_0) si0 &= 0x7f0;

1347         ldd     [%l5+TBL],%f54          ! (4_0) tbl_div0 = ((double*)((char*)TBL
1348         fpsub32s        %f14,%f16,%f16  ! (4_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1350         sra     %i3,24,%i3              ! (4_0) iexp0 = ax0 >> 24;

1352         sub     %l0,%i3,%o0             ! (4_0) iexp0 = 0x3f - iexp0;
1353         fitod   %f16,%f56               ! (4_0) dtmp0 = (double)(((int*)dfx0)[0]

1355         sllx    %o0,23,%o0              ! (4_0) lexp0 = iexp0 << 55;

1357         st      %o0,[%fp+tmp0]          ! (4_0) fdx0 = *((double*)lexp0);

1359         ba      .cont11
1360         fmuld   %f56,%f54,%f40          ! (4_0) xx0 = dtmp0 * tbl_div0;
1361 1:
1362         stx     %o3,[%fp+tmp_px]

1364         st      counter,[%fp+tmp_counter]

1366         ba      .cont11
1367         mov     0,counter

1369         .align  16
1370 .update12:
1371         cmp     counter,1
1372         ble     .cont12
1373         nop

1375         sub     %i1,stridex,%i1
1376         stx     %i1,[%fp+tmp_px]

1378         sub     counter,1,counter
1379         st      counter,[%fp+tmp_counter]

1381         ba      .cont12
```



```
1382         mov     1,counter

1384         .align  16
1385 .update13:
1386         sethi   %hi(0x7ffffc00),%o3
1387         cmp     counter,1
1388         ble     .cont13

1390         add     %o3,0x3ff,%o3

1392         andcc   %g5,%o3,%g0
1393         bz      1f

1395         cmp     %g5,0
1396         bl,a    1f
1397         nop

1399         fitod   %f15,%f0
1400         fdtos   %f0,%f15
1401         fmuls   %f15,FTWO,%f15
1402         st      %f15,[%fp+tmp3]
1403         ld      [%fp+tmp3],%g5
1404         sethi   %hi(0x4b000000),%o3
1405         sub     %g5,%o3,%g5

1407         fands   %f15,DC0,%f17           ! (4_0) dfx0 = vis_fand(ddx0,DC0);

1409         sra     %g5,13,%l6              ! (5_0) si1 = ax1 >> 13;
1410         sra     %g5,24,%o3              ! (5_0) iexp1 = ax1 >> 24;
1411         and     %l6,2032,%l6            ! (5_0) si1 &= 0x7f0;
1412         fpsub32s        %f15,%f17,%f17  ! (4_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1414         ldd     [%l6+TBL],%f46          ! (5_0) tbl_div1 = ((double*)((char*)TBL
1415         sub     %l0,%o3,%l1             ! (5_0) iexp1 = 0x3f - iexp1;

1417         add     %l6,TBL,%l6             ! (5_0) addr1 = (char*)TBL + si1;

1419         sllx    %l1,23,%l1              ! (5_0) lexp1 = iexp1 << 23;
1420         st      %l1,[%fp+tmp0+4]        ! (4_0) fdx0 = *((double*)lexp0);

1422         fitod   %f17,%f0                ! (5_0) dtmp1 = (double)(((int*)dfx0)[1]

1424         fmuld   %f0,%f46,%f46           ! (5_1) xx1 = dtmp1 * tbl_div1;
1425         ba      .cont13
1426         fmuld   K3,%f46,%f50            ! (5_1) res1 = K3 * xx1;
1427 1:
1428         sub     %i1,stridex,%i1
1429         stx     %i1,[%fp+tmp_px]

1431         sub     counter,1,counter
1432         st      counter,[%fp+tmp_counter]

1434         ba      .cont13
1435         mov     1,counter

1437         .align  16
1438 .update14:
1439         cmp     counter,2
1440         ble     .cont14
1441         sub     %o5,stridex,%o3

1443         sub     %o3,stridex,%o3
1444         stx     %o3,[%fp+tmp_px]

1446         sub     counter,2,counter
1447         st      counter,[%fp+tmp_counter]
```

```
1449         ba      .cont14
1450         mov     2,counter

1452         .align  16
1453 .update15:
1454         sethi   %hi(0x7ffffc00),%i3
1455         cmp     counter,2
1456         ble     .cont15
1457         sub     %o5,stridex,%o3

1459         add     %i3,0x3ff,%i3

1461         andcc   %g1,%i3,%g0
1462         bz      1f
1463         sub     %o3,stridex,%o3

1465         cmp     %g1,0
1466         bl,a    1f
1467         nop

1469         fitod   %f18,%f0
1470         fdtos   %f0,%f18
1471         fmuls   %f18,FTWO,%f18
1472         st      %f18,[%fp+tmp3]
1473         ld      [%fp+tmp3],%g1
1474         sethi   %hi(0x4b000000),%o3
1475         sub     %g1,%o3,%g1

1477         fands   %f18,DC0,%f0            ! (0_0) dfx0 = vis_fand(ddx0,DC0);
1478         sra     %g1,13,%o0              ! (0_0) si0 = ax0 >> 13;
1479         and     %o0,2032,%o0            ! (0_0) si0 &= 0x7f0;

1481         ldd     [%o0+TBL],%f54          ! (0_0) tbl_div0 = ((double*)((char*)TBL
1482         fpsub32s        %f18,%f0,%f30   ! (0_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1484         sra     %g1,24,%i3              ! (0_0) iexp0 = ax0 >> 24;

1486         sub     %l0,%i3,%g5             ! (0_0) iexp0 = 0x3f - iexp0;

1488         ba      .cont15
1489         fitod   %f30,%f56               ! (0_0) dtmp0 = (double)(((int*)dfx0)[0]
1490 1:
1491         stx     %o3,[%fp+tmp_px]

1493         sub     counter,2,counter
1494         st      counter,[%fp+tmp_counter]

1496         ba      .cont15
1497         mov     2,counter

1499         .align  16
1500 .update16:
1501         cmp     counter,3
1502         ble     .cont16
1503         sub     %l7,stridex2,%o3

1505         sub     %o3,stridex,%o3
1506         stx     %o3,[%fp+tmp_px]

1508         sub     counter,3,counter
1509         st      counter,[%fp+tmp_counter]

1511         ba      .cont16
1512         mov     3,counter
```



```
1514         .align  16
1515 .update17:
1516         sethi   %hi(0x7ffffc00),%i3
1517         cmp     counter,3
1518         ble     .cont17
1519         sub     %l7,stridex2,%o3

1521         add     %i3,0x3ff,%i3

1523         andcc   %i4,%i3,%g0
1524         bz      1f
1525         sub     %o3,stridex,%o3

1527         cmp     %i4,0
1528         bl,a    1f
1529         nop

1531         fitod   %f19,%f0
1532         fdtos   %f0,%f19
1533         fmuls   %f19,FTWO,%f19
1534         st      %f19,[%fp+tmp3]
1535         ld      [%fp+tmp3],%i4
1536         sethi   %hi(0x4b000000),%o3
1537         sub     %i4,%o3,%i4

1539         fands   %f19,DC0,%f0            ! (0_0) dfx0 = vis_fand(ddx0,DC0);

1541         sra     %i4,13,%g5              ! (1_0) si1 = ax1 >> 13;

1543         sra     %i4,24,%i0              ! (1_0) iexp1 = ax1 >> 24;
1544         and     %g5,2032,%o7            ! (1_0) si1 &= 0x7f0;
1545         fpsub32s        %f19,%f0,%f31   ! (0_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1547         ldd     [%o7+TBL],%f44          ! (1_0) tbl_div1 = ((double*)((char*)TBL
1548         sub     %l0,%i0,%i0             ! (1_0) iexp1 = 0x3f - iexp1;

1550         sllx    %i0,23,%i0              ! (1_0) lexp1 = iexp1 << 23;
1551         fitod   %f31,%f50               ! (1_0) dtmp0 = (double)(((int*)dfx0)[0]

1553         st      %i0,[%fp+tmp1+4]        ! (0_0) fdx0 = *((double*)lexp0);

1555         add     %o7,TBL,%o7             ! (1_0) addr0 = (char*)TBL + si0;
1556         fmuld   %f50,%f44,%f44          ! (1_0) xx0 = dtmp0 * tbl_div0;

1558         ba      .cont17
1559         fmuld   K3,%f44,%f50            ! (1_0) res1 = K3 * xx1;
1560 1:
1561         stx     %o3,[%fp+tmp_px]

1563         sub     counter,3,counter
1564         st      counter,[%fp+tmp_counter]

1566         ba      .cont17
1567         mov     3,counter

1569         .align  16
1570 .update18:
1571         cmp     counter,4
1572         ble     .cont18
1573         fpadd32 %f20,%f52,%f0           ! (2_1) dres0 = vis_fpadd32(dres0,fdx0);

1575         sub     %l7,stridex2,%i3
1576         stx     %i3,[%fp+tmp_px]

1578         sub     counter,4,counter
1579         st      counter,[%fp+tmp_counter]
```

```
1581         ba      .cont18
1582         mov     4,counter

1584         .align  16
1585 .update19:
1586         sethi   %hi(0x7ffffc00),%i3
1587         cmp     counter,4
1588         ble,a   .cont19
1589         fmuld   %f50,%f46,%f24          ! (3_0) xx1 = dtmp1 * tbl_div1;

1591         add     %i3,0x3ff,%i3

1593         andcc   %g1,%i3,%g0
1594         bz      1f
1595         nop

1597         cmp     %g1,0
1598         bl,a    1f
1599         nop

1601         fitod   %f24,%f24
1602         fdtos   %f24,%f24
1603         fmuls   %f24,FTWO,%f24
1604         st      %f24,[%fp+tmp3]
1605         ld      [%fp+tmp3],%g1
1606         sethi   %hi(0x4b000000),%i3
1607         sub     %g1,%i3,%g1

1609         fands   %f24,DC0,%f8            ! (2_0) dfx0 = vis_fand(ddx0,DC0);
1610         sra     %g1,13,%i0              ! (2_0) si0 = ax0 >> 13;

1612         and     %i0,2032,%i0            ! (2_0) si0 &= 0x7f0;

1614         ldd     [%i0+TBL],%f30          ! (2_0) tbl_div0 = ((double*)((char*)TBL
1615         fpsub32s        %f24,%f8,%f12   ! (2_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1617         sra     %g1,24,%i3              ! (2_0) iexp0 = ax0 >> 24;

1619         sub     %l0,%i3,%g5             ! (2_0) iexp0 = 0x3f - iexp0;

1621         sllx    %g5,23,%g5              ! (2_0) lexp0 = iexp0 << 55;
1622         add     %i0,TBL,%i0             ! (2_0) addr0 = (char*)TBL + si0;
1623         fitod   %f12,%f56               ! (2_0) dtmp0 = (double)(((int*)dfx0)[0]

1625         st      %g5,[%fp+tmp2]          ! (2_0) fdx0 = *((double*)lexp0);
1626         fmuld   %f56,%f30,%f30          ! (2_0) xx0 = dtmp0 * tbl_div0;

1628         ba      .cont19
1629         fmuld   %f50,%f46,%f24          ! (3_0) xx1 = dtmp1 * tbl_div1;
1630 1:
1631         sub     %l7,stridex2,%i3
1632         stx     %i3,[%fp+tmp_px]

1634         sub     counter,4,counter
1635         st      counter,[%fp+tmp_counter]

1637         mov     4,counter
1638         ba      .cont19
1639         fmuld   %f50,%f46,%f24          ! (3_0) xx1 = dtmp1 * tbl_div1;

1641         .align  16
1642 .update20:
1643         cmp     counter,5
1644         ble     .cont20
1645         nop
```



```
1647         sub     %l7,stridex,%i3
1648         stx     %i3,[%fp+tmp_px]

1650         sub     counter,5,counter
1651         st      counter,[%fp+tmp_counter]

1653         ba      .cont20
1654         mov     5,counter

1656         .align  16
1657 .update21:
1658         sethi   %hi(0x7ffffc00),%i3
1659         cmp     counter,5
1660         ble,a   .cont21
1661         nop

1663         sub     %l7,stridex,%i4
1664         add     %i3,0x3ff,%i3

1666         andcc   %o5,%i3,%g0
1667         bz      1f
1668         ld      [%i4],%f8

1670         cmp     %o5,0
1671         bl,a    1f
1672         nop

1674         fitod   %f8,%f8
1675         fdtos   %f8,%f8
1676         fmuls   %f8,FTWO,%f8
1677         st      %f8,[%fp+tmp3]
1678         ld      [%fp+tmp3],%o5
1679         sethi   %hi(0x4b000000),%i3
1680         sub     %o5,%i3,%o5

1682         fands   %f8,DC0,%f24            ! (2_0) dfx0 = vis_fand(ddx0,DC0);

1684         sra     %o5,13,%o1              ! (3_0) si1 = ax1 >> 13;

1686         sra     %o5,24,%i3              ! (3_0) iexp1 = ax1 >> 24;
1687         and     %o1,2032,%o1            ! (3_0) si1 &= 0x7f0;
1688         fpsub32s        %f8,%f24,%f24   ! (2_0) dfx0 = vis_fpsub32(ddx0,dfx0);

1690         ldd     [%o1+TBL],%f8           ! (3_0) tbl_div1 = ((double*)((char*)TBL
1691         sub     %l0,%i3,%i3             ! (3_0) iexp1 = 0x3f - iexp1;

1693         sllx    %i3,23,%i3              ! (3_0) lexp1 = iexp1 << 23;
1694         fitod   %f24,%f50               ! (3_0) dtmp1 = (double)(((int*)dfx0)[1]

1696         add     %o1,TBL,%o1             ! (3_0) addr1 = (char*)TBL + si1;
1697         st      %i3,[%fp+tmp2+4]        ! (2_0) fdx0 = *((double*)lexp0);

1699         fmuld   %f50,%f8,%f24           ! (3_0) xx1 = dtmp1 * tbl_div1;

1701         ba      .cont21
1702         fmuld   K3,%f24,%f50            ! (3_0) res1 = K3 * xx1;
1703 1:
1704         sub     %l7,stridex,%i3
1705         stx     %i3,[%fp+tmp_px]

1707         sub     counter,5,counter
1708         st      counter,[%fp+tmp_counter]

1710         ba      .cont21
1711         mov     5,counter
```

```
1713         .align  16
1714 .exit:
1715         ret
1716         restore

1718         SET_SIZE(__vrsqrtf)
```

```
**********************************************************
   46997 Sat May 10 12:10:02 2014
new/usr/src/lib/libmvec/common/vis/__vsin.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */
/*
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 */

        .file   "__vsin.S"

#include "libm.h"

        RO_DATA
        .align  64
constants:
        .word   0x3ec718e3,0xa6972785
        .word   0x3ef9fd39,0x94293940
        .word   0xbf2a019f,0x75ee4be1
        .word   0xbf56c16b,0xba552569
        .word   0x3f811111,0x1108c703
        .word   0x3fa55555,0x554f5b35
        .word   0xbfc55555,0x555554d0
        .word   0xbfdfffff,0xffffff85
        .word   0x3ff00000,0x00000000
        .word   0xbfc55555,0x5551fc28
        .word   0x3f811107,0x62eacc9d
        .word   0xbfdfffff,0xffff6328
        .word   0x3fa55551,0x5f7acf0c
        .word   0x3fe45f30,0x6dc9c883
        .word   0x43380000,0x00000000
        .word   0x3ff921fb,0x54400000
        .word   0x3dd0b461,0x1a600000
        .word   0x3ba3198a,0x2e000000
        .word   0x397b839a,0x252049c1
        .word   0x80000000,0x00004000
        .word   0xffff8000,0x00000000   ! N.B.: low-order words used
        .word   0x3fc90000,0x80000000   ! for sign bit hacking; see
        .word   0x3fc40000,0x00000000   ! references to "thresh" below

#define p4              0x0
#define q4              0x08
```



```
#define p3              0x10
#define q3              0x18
#define p2              0x20
#define q2              0x28
#define p1              0x30
#define q1              0x38
#define one             0x40
#define pp1             0x48
#define pp2             0x50
#define qq1             0x58
#define qq2             0x60
#define invpio2         0x68
#define round           0x70
#define pio2_1          0x78
#define pio2_2          0x80
#define pio2_3          0x88
#define pio2_3t         0x90
#define f30val          0x98
#define mask            0xa0
#define thresh          0xa8

! local storage indices

#define xsave           STACK_BIAS-0x8
#define ysave           STACK_BIAS-0x10
#define nsave           STACK_BIAS-0x14
#define sxsave          STACK_BIAS-0x18
#define sysave          STACK_BIAS-0x1c
#define biguns          STACK_BIAS-0x20
#define n2              STACK_BIAS-0x24
#define n1              STACK_BIAS-0x28
#define n0              STACK_BIAS-0x2c
#define x2_1            STACK_BIAS-0x40
#define x1_1            STACK_BIAS-0x50
#define x0_1            STACK_BIAS-0x60
#define y2_0            STACK_BIAS-0x70
#define y1_0            STACK_BIAS-0x80
#define y0_0            STACK_BIAS-0x90
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x90

!--------------------------------------------------------------
!       Some defines to keep code more readable
#define LIM_l6          %l6
!       in primary range, contains |x| upper limit when cos(x)=1.
!       in transferring to medium range, denotes what loop was active.
!--------------------------------------------------------------

        ENTRY(__vsin)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(g5)
        PIC_SET(g5,__vlibm_TBL_sincos_hi,l3)
        PIC_SET(g5,__vlibm_TBL_sincos_lo,l4)
        PIC_SET(g5,constants,l5)
        mov     %l5,%g1
        wr      %g0,0x82,%asi           ! set %asi for non-faulting loads

! ========== primary range ==========

! register use

! i0  n
! i1  x
! i2  stridex
! i3  y
! i4  stridey
```

```
! i5  0x80000000

! l0  hx0
! l1  hx1
! l2  hx2
! l3  __vlibm_TBL_sincos_hi
! l4  __vlibm_TBL_sincos_lo
! l5  0x3fc90000
! l6  0x3e400000
! l7  0x3fe921fb

! the following are 64-bit registers in both V8+ and V9

! g1  scratch
! g5

! o0  py0
! o1  py1
! o2  py2
! o3  oy0
! o4  oy1
! o5  oy2
! o7  scratch

! f0  x0
! f2
! f4
! f6
! f8  scratch for table base
! f9  signbit0
! f10 x1
! f12
! f14
! f16
! f18 scratch for table base
! f19 signbit1
! f20 x2
! f22
! f24
! f26
! f28 scratch for table base
! f29 signbit2
! f30 0x80000000
! f31 0x4000
! f32
! f34
! f36
! f38
! f40
! f42
! f44 0xffff800000000000
! f46 p1
! f48 p2
! f50 p3
! f52 p4
! f54 one
! f56 pp1
! f58 pp2
! f60 qq1
! f62 qq2

#ifdef __sparcv9
        stx     %i1,[%fp+xsave]         ! save arguments
        stx     %i3,[%fp+ysave]
#else
        st      %i1,[%fp+xsave]         ! save arguments
```



```
        st      %i3,[%fp+ysave]
#endif
        st      %i0,[%fp+nsave]
        st      %i2,[%fp+sxsave]
        st      %i4,[%fp+sysave]
        sethi   %hi(0x80000000),%i5     ! load/set up constants
        sethi   %hi(0x3fc90000),%l5
        sethi   %hi(0x3e400000),LIM_l6
        sethi   %hi(0x3fe921fb),%l7
        or      %l7,%lo(0x3fe921fb),%l7
        ldd     [%g1+f30val],%f30
        ldd     [%g1+mask],%f44
        ldd     [%g1+p1],%f46
        ldd     [%g1+p2],%f48
        ldd     [%g1+p3],%f50
        ldd     [%g1+p4],%f52
        ldd     [%g1+one],%f54
        ldd     [%g1+pp1],%f56
        ldd     [%g1+pp2],%f58
        ldd     [%g1+qq1],%f60
        ldd     [%g1+qq2],%f62
        sll     %i2,3,%i2               ! scale strides
        sll     %i4,3,%i4
        add     %fp,x0_1,%o3            ! precondition loop
        add     %fp,x0_1,%o4
        add     %fp,x0_1,%o5
        ld      [%i1],%l0               ! hx = *x
        ld      [%i1],%f0
        ld      [%i1+4],%f1
        andn    %l0,%i5,%l0             ! hx &= ~0x80000000
        add     %i1,%i2,%i1             ! x += stridex

        ba,pt   %icc,.loop0
! delay slot
        nop

        .align 32
.loop0:
        lda     [%i1]%asi,%l1           ! preload next argument
        sub     %l0,LIM_l6,%g1
        sub     %l7,%l0,%o7
        fands   %f0,%f30,%f9            ! save signbit

        lda     [%i1]%asi,%f10
        orcc    %o7,%g1,%g0
        mov     %i3,%o0                 ! py0 = y
        bl,pn   %icc,.range0            ! if hx < 0x3e400000 or > 0x3fe921fb

! delay slot
        lda     [%i1+4]%asi,%f11
        addcc   %i0,-1,%i0
        add     %i3,%i4,%i3             ! y += stridey
        ble,pn  %icc,.endloop1

! delay slot
        andn    %l1,%i5,%l1
        add     %i1,%i2,%i1             ! x += stridex
        fabsd   %f0,%f0
        fmuld   %f54,%f54,%f54          ! one*one; a nop for alignment only

.loop1:
        lda     [%i1]%asi,%l2           ! preload next argument
        sub     %l1,LIM_l6,%g1
        sub     %l7,%l1,%o7
        fands   %f10,%f30,%f19          ! save signbit
```

```
260         lda     [%i1]%asi,%f20
261         orcc    %o7,%g1,%g0
262         mov     %i3,%o1                 ! py1 = y
263         bl,pn   %icc,.range1            ! if hx < 0x3e400000 or > 0x3fe921fb

265 ! delay slot
266         lda     [%i1+4]%asi,%f21
267         addcc   %i0,-1,%i0
268         add     %i3,%i4,%i3             ! y += stridey
269         ble,pn  %icc,.endloop2

271 ! delay slot
272         andn    %l2,%i5,%l2
273         add     %i1,%i2,%i1             ! x += stridex
274         fabsd   %f10,%f10
275         fmuld   %f54,%f54,%f54          ! one*one; a nop for alignment only

277 .loop2:
278         st      %f6,[%o3]
279         sub     %l2,LIM_l6,%g1
280         sub     %l7,%l2,%o7
281         fands   %f20,%f30,%f29          ! save signbit

283         st      %f7,[%o3+4]
284         orcc    %g1,%o7,%g0
285         mov     %i3,%o2                 ! py2 = y
286         bl,pn   %icc,.range2            ! if hx < 0x3e400000 or > 0x3fe921fb

288 ! delay slot
289         add     %i3,%i4,%i3             ! y += stridey
290         cmp     %l0,%l5
291         fabsd   %f20,%f20
292         bl,pn   %icc,.case4

294 ! delay slot
295         st      %f16,[%o4]
296         cmp     %l1,%l5
297         fpadd32s %f0,%f31,%f8
298         bl,pn   %icc,.case2

300 ! delay slot
301         st      %f17,[%o4+4]
302         cmp     %l2,%l5
303         fpadd32s %f10,%f31,%f18
304         bl,pn   %icc,.case1

306 ! delay slot
307         st      %f26,[%o5]
308         mov     %o0,%o3
309         sethi   %hi(0x3fc3c000),%o7
310         fpadd32s %f20,%f31,%f28

312         st      %f27,[%o5+4]
313         fand    %f8,%f44,%f2
314         mov     %o1,%o4

316         fand    %f18,%f44,%f12
317         mov     %o2,%o5
318         sub     %l0,%o7,%l0

320         fand    %f28,%f44,%f22
321         sub     %l1,%o7,%l1
322         sub     %l2,%o7,%l2

324         fsubd   %f0,%f2,%f0
325         srl     %l0,10,%l0
```



```
326         add     %l3,8,%g1

328         fsubd   %f10,%f12,%f10
329         srl     %l1,10,%l1

331         fsubd   %f20,%f22,%f20
332         srl     %l2,10,%l2

334         fmuld   %f0,%f0,%f2
335         andn    %l0,0x1f,%l0

337         fmuld   %f10,%f10,%f12
338         andn    %l1,0x1f,%l1

340         fmuld   %f20,%f20,%f22
341         andn    %l2,0x1f,%l2

343         fmuld   %f2,%f58,%f6
344         ldd     [%l3+%l0],%f32

346         fmuld   %f12,%f58,%f16
347         ldd     [%l3+%l1],%f36

349         fmuld   %f22,%f58,%f26
350         ldd     [%l3+%l2],%f40

352         faddd   %f6,%f56,%f6
353         fmuld   %f2,%f62,%f4
354         ldd     [%g1+%l0],%f34

356         faddd   %f16,%f56,%f16
357         fmuld   %f12,%f62,%f14
358         ldd     [%g1+%l1],%f38

360         faddd   %f26,%f56,%f26
361         fmuld   %f22,%f62,%f24
362         ldd     [%g1+%l2],%f42

364         fmuld   %f2,%f6,%f6
365         faddd   %f4,%f60,%f4

367         fmuld   %f12,%f16,%f16
368         faddd   %f14,%f60,%f14

370         fmuld   %f22,%f26,%f26
371         faddd   %f24,%f60,%f24

373         faddd   %f6,%f54,%f6
374         fmuld   %f2,%f4,%f4

376         faddd   %f16,%f54,%f16
377         fmuld   %f12,%f14,%f14

379         faddd   %f26,%f54,%f26
380         fmuld   %f22,%f24,%f24

382         fmuld   %f0,%f6,%f6
383         ldd     [%l4+%l0],%f2

385         fmuld   %f10,%f16,%f16
386         ldd     [%l4+%l1],%f12

388         fmuld   %f20,%f26,%f26
389         ldd     [%l4+%l2],%f22

391         fmuld   %f4,%f32,%f4
```

```
392         lda     [%i1]%asi,%l0           ! preload next argument

394         fmuld   %f14,%f36,%f14
395         lda     [%i1]%asi,%f0

397         fmuld   %f24,%f40,%f24
398         lda     [%i1+4]%asi,%f1

400         fmuld   %f6,%f34,%f6
401         add     %i1,%i2,%i1             ! x += stridex

403         fmuld   %f16,%f38,%f16

405         fmuld   %f26,%f42,%f26

407         faddd   %f6,%f4,%f6

409         faddd   %f16,%f14,%f16

411         faddd   %f26,%f24,%f26

413         faddd   %f6,%f2,%f6

415         faddd   %f16,%f12,%f16

417         faddd   %f26,%f22,%f26

419         faddd   %f6,%f32,%f6

421         faddd   %f16,%f36,%f16

423         faddd   %f26,%f40,%f26
424         andn    %l0,%i5,%l0             ! hx &= ~0x80000000

426         fors    %f6,%f9,%f6
427         addcc   %i0,-1,%i0

429         fors    %f16,%f19,%f16
430         bg,pt   %icc,.loop0

432 ! delay slot
433         fors    %f26,%f29,%f26

435         ba,pt   %icc,.endloop0
436 ! delay slot
437         nop

439         .align  32
440 .case1:
441         st      %f27,[%o5+4]
442         sethi   %hi(0x3fc3c000),%o7
443         add     %l3,8,%g1
444         fand    %f8,%f44,%f2

446         sub     %l0,%o7,%l0
447         sub     %l1,%o7,%l1
448         fand    %f18,%f44,%f12
449         fmuld   %f20,%f20,%f22

451         fsubd   %f0,%f2,%f0
452         srl     %l0,10,%l0
453         mov     %o0,%o3

455         fsubd   %f10,%f12,%f10
456         srl     %l1,10,%l1
457         mov     %o1,%o4
```



```
459         fmuld   %f22,%f52,%f24
460         mov     %o2,%o5

462         fmuld   %f0,%f0,%f2
463         andn    %l0,0x1f,%l0

465         fmuld   %f10,%f10,%f12
466         andn    %l1,0x1f,%l1

468         faddd   %f24,%f50,%f24

470         fmuld   %f2,%f58,%f6
471         ldd     [%l3+%l0],%f32

473         fmuld   %f12,%f58,%f16
474         ldd     [%l3+%l1],%f36

476         fmuld   %f22,%f24,%f24

478         faddd   %f6,%f56,%f6
479         fmuld   %f2,%f62,%f4
480         ldd     [%g1+%l0],%f34

482         faddd   %f16,%f56,%f16
483         fmuld   %f12,%f62,%f14
484         ldd     [%g1+%l1],%f38

486         faddd   %f24,%f48,%f24

488         fmuld   %f2,%f6,%f6
489         faddd   %f4,%f60,%f4

491         fmuld   %f12,%f16,%f16
492         faddd   %f14,%f60,%f14

494         fmuld   %f22,%f24,%f24

496         faddd   %f6,%f54,%f6
497         fmuld   %f2,%f4,%f4

499         faddd   %f16,%f54,%f16
500         fmuld   %f12,%f14,%f14

502         faddd   %f24,%f46,%f24

504         fmuld   %f0,%f6,%f6
505         ldd     [%l4+%l0],%f2

507         fmuld   %f10,%f16,%f16
508         ldd     [%l4+%l1],%f12

510         fmuld   %f4,%f32,%f4
511         lda     [%i1]%asi,%l0           ! preload next argument

513         fmuld   %f14,%f36,%f14
514         lda     [%i1]%asi,%f0

516         fmuld   %f6,%f34,%f6
517         lda     [%i1+4]%asi,%f1

519         fmuld   %f16,%f38,%f16
520         add     %i1,%i2,%i1             ! x += stridex

522         fmuld   %f22,%f24,%f24
```

```
524         faddd   %f6,%f4,%f6

526         faddd   %f16,%f14,%f16

528         fmuld   %f20,%f24,%f24

530         faddd   %f6,%f2,%f6

532         faddd   %f16,%f12,%f16

534         faddd   %f20,%f24,%f26

536         faddd   %f6,%f32,%f6

538         faddd   %f16,%f36,%f16
539         andn    %l0,%i5,%l0             ! hx &= ~0x80000000

541         fors    %f26,%f29,%f26
542         addcc   %i0,-1,%i0

544         fors    %f6,%f9,%f6
545         bg,pt   %icc,.loop0

547 ! delay slot
548         fors    %f16,%f19,%f16

550         ba,pt   %icc,.endloop0
551 ! delay slot
552         nop

554         .align  32
555 .case2:
556         st      %f26,[%o5]
557         cmp     %l2,%l5
558         fpadd32s %f20,%f31,%f28
559         bl,pn   %icc,.case3

561 ! delay slot
562         st      %f27,[%o5+4]
563         sethi   %hi(0x3fc3c000),%o7
564         add     %l3,8,%g1
565         fand    %f8,%f44,%f2

567         sub     %l0,%o7,%l0
568         sub     %l2,%o7,%l2
569         fand    %f28,%f44,%f22
570         fmuld   %f10,%f10,%f12

572         fsubd   %f0,%f2,%f0
573         srl     %l0,10,%l0
574         mov     %o0,%o3

576         fsubd   %f20,%f22,%f20
577         srl     %l2,10,%l2
578         mov     %o2,%o5

580         fmuld   %f12,%f52,%f14
581         mov     %o1,%o4

583         fmuld   %f0,%f0,%f2
584         andn    %l0,0x1f,%l0

586         fmuld   %f20,%f20,%f22
587         andn    %l2,0x1f,%l2

589         faddd   %f14,%f50,%f14
```



```
591         fmuld   %f2,%f58,%f6
592         ldd     [%l3+%l0],%f32

594         fmuld   %f22,%f58,%f26
595         ldd     [%l3+%l2],%f40

597         fmuld   %f12,%f14,%f14

599         faddd   %f6,%f56,%f6
600         fmuld   %f2,%f62,%f4
601         ldd     [%g1+%l0],%f34

603         faddd   %f26,%f56,%f26
604         fmuld   %f22,%f62,%f24
605         ldd     [%g1+%l2],%f42

607         faddd   %f14,%f48,%f14

609         fmuld   %f2,%f6,%f6
610         faddd   %f4,%f60,%f4

612         fmuld   %f22,%f26,%f26
613         faddd   %f24,%f60,%f24

615         fmuld   %f12,%f14,%f14

617         faddd   %f6,%f54,%f6
618         fmuld   %f2,%f4,%f4

620         faddd   %f26,%f54,%f26
621         fmuld   %f22,%f24,%f24

623         faddd   %f14,%f46,%f14

625         fmuld   %f0,%f6,%f6
626         ldd     [%l4+%l0],%f2

628         fmuld   %f20,%f26,%f26
629         ldd     [%l4+%l2],%f22

631         fmuld   %f4,%f32,%f4
632         lda     [%i1]%asi,%l0           ! preload next argument

634         fmuld   %f24,%f40,%f24
635         lda     [%i1]%asi,%f0

637         fmuld   %f6,%f34,%f6
638         lda     [%i1+4]%asi,%f1

640         fmuld   %f26,%f42,%f26
641         add     %i1,%i2,%i1             ! x += stridex

643         fmuld   %f12,%f14,%f14

645         faddd   %f6,%f4,%f6

647         faddd   %f26,%f24,%f26

649         fmuld   %f10,%f14,%f14

651         faddd   %f6,%f2,%f6

653         faddd   %f26,%f22,%f26

655         faddd   %f10,%f14,%f16
```

```
657         faddd   %f6,%f32,%f6

659         faddd   %f26,%f40,%f26
660         andn    %l0,%i5,%l0             ! hx &= ~0x80000000

662         fors    %f16,%f19,%f16
663         addcc   %i0,-1,%i0

665         fors    %f6,%f9,%f6
666         bg,pt   %icc,.loop0

668 ! delay slot
669         fors    %f26,%f29,%f26

671         ba,pt   %icc,.endloop0
672 ! delay slot
673         nop

675         .align  32
676 .case3:
677         sethi   %hi(0x3fc3c000),%o7
678         add     %l3,8,%g1
679         fand    %f8,%f44,%f2
680         fmuld   %f10,%f10,%f12

682         sub     %l0,%o7,%l0
683         fmuld   %f20,%f20,%f22

685         fsubd   %f0,%f2,%f0
686         srl     %l0,10,%l0
687         mov     %o0,%o3

689         fmuld   %f12,%f52,%f14
690         mov     %o1,%o4

692         fmuld   %f22,%f52,%f24
693         mov     %o2,%o5

695         fmuld   %f0,%f0,%f2
696         andn    %l0,0x1f,%l0

698         faddd   %f14,%f50,%f14

700         faddd   %f24,%f50,%f24

702         fmuld   %f2,%f58,%f6
703         ldd     [%l3+%l0],%f32

705         fmuld   %f12,%f14,%f14

707         fmuld   %f22,%f24,%f24

709         faddd   %f6,%f56,%f6
710         fmuld   %f2,%f62,%f4
711         ldd     [%g1+%l0],%f34

713         faddd   %f14,%f48,%f14

715         faddd   %f24,%f48,%f24

717         fmuld   %f2,%f6,%f6
718         faddd   %f4,%f60,%f4

720         fmuld   %f12,%f14,%f14
```



```
722         fmuld   %f22,%f24,%f24

724         faddd   %f6,%f54,%f6
725         fmuld   %f2,%f4,%f4

727         faddd   %f14,%f46,%f14

729         faddd   %f24,%f46,%f24

731         fmuld   %f0,%f6,%f6
732         ldd     [%l4+%l0],%f2

734         fmuld   %f4,%f32,%f4
735         lda     [%i1]%asi,%l0           ! preload next argument

737         fmuld   %f12,%f14,%f14
738         lda     [%i1]%asi,%f0

740         fmuld   %f6,%f34,%f6
741         lda     [%i1+4]%asi,%f1

743         fmuld   %f22,%f24,%f24
744         add     %i1,%i2,%i1             ! x += stridex

746         fmuld   %f10,%f14,%f14

748         faddd   %f6,%f4,%f6

750         fmuld   %f20,%f24,%f24

752         faddd   %f10,%f14,%f16

754         faddd   %f6,%f2,%f6

756         faddd   %f20,%f24,%f26

758         fors    %f16,%f19,%f16
759         andn    %l0,%i5,%l0             ! hx &= ~0x80000000

761         faddd   %f6,%f32,%f6
762         addcc   %i0,-1,%i0

764         fors    %f26,%f29,%f26
765         bg,pt   %icc,.loop0

767 ! delay slot
768         fors    %f6,%f9,%f6

770         ba,pt   %icc,.endloop0
771 ! delay slot
772         nop

774         .align  32
775 .case4:
776         st      %f17,[%o4+4]
777         cmp     %l1,%l5
778         fpadd32s %f10,%f31,%f18
779         bl,pn   %icc,.case6

781 ! delay slot
782         st      %f26,[%o5]
783         cmp     %l2,%l5
784         fpadd32s %f20,%f31,%f28
785         bl,pn   %icc,.case5

787 ! delay slot
```

```
788         st      %f27,[%o5+4]
789         sethi   %hi(0x3fc3c000),%o7
790         add     %l3,8,%g1
791         fand    %f18,%f44,%f12

793         sub     %l1,%o7,%l1
794         sub     %l2,%o7,%l2
795         fand    %f28,%f44,%f22
796         fmuld   %f0,%f0,%f2

798         fsubd   %f10,%f12,%f10
799         srl     %l1,10,%l1
800         mov     %o1,%o4

802         fsubd   %f20,%f22,%f20
803         srl     %l2,10,%l2
804         mov     %o2,%o5

806         fmovd   %f0,%f6
807         fmuld   %f2,%f52,%f4
808         mov     %o0,%o3

810         fmuld   %f10,%f10,%f12
811         andn    %l1,0x1f,%l1

813         fmuld   %f20,%f20,%f22
814         andn    %l2,0x1f,%l2

816         faddd   %f4,%f50,%f4

818         fmuld   %f12,%f58,%f16
819         ldd     [%l3+%l1],%f36

821         fmuld   %f22,%f58,%f26
822         ldd     [%l3+%l2],%f40

824         fmuld   %f2,%f4,%f4

826         faddd   %f16,%f56,%f16
827         fmuld   %f12,%f62,%f14
828         ldd     [%g1+%l1],%f38

830         faddd   %f26,%f56,%f26
831         fmuld   %f22,%f62,%f24
832         ldd     [%g1+%l2],%f42

834         faddd   %f4,%f48,%f4

836         fmuld   %f12,%f16,%f16
837         faddd   %f14,%f60,%f14

839         fmuld   %f22,%f26,%f26
840         faddd   %f24,%f60,%f24

842         fmuld   %f2,%f4,%f4

844         faddd   %f16,%f54,%f16
845         fmuld   %f12,%f14,%f14

847         faddd   %f26,%f54,%f26
848         fmuld   %f22,%f24,%f24

850         faddd   %f4,%f46,%f4

852         fmuld   %f10,%f16,%f16
853         ldd     [%l4+%l1],%f12
```



```
855         fmuld   %f20,%f26,%f26
856         ldd     [%l4+%l2],%f22

858         fmuld   %f14,%f36,%f14
859         lda     [%i1]%asi,%l0           ! preload next argument

861         fmuld   %f24,%f40,%f24
862         lda     [%i1]%asi,%f0

864         fmuld   %f16,%f38,%f16
865         lda     [%i1+4]%asi,%f1

867         fmuld   %f26,%f42,%f26
868         add     %i1,%i2,%i1             ! x += stridex

870         fmuld   %f2,%f4,%f4

872         faddd   %f16,%f14,%f16

874         faddd   %f26,%f24,%f26

876         fmuld   %f6,%f4,%f4

878         faddd   %f16,%f12,%f16

880         faddd   %f26,%f22,%f26

882         faddd   %f6,%f4,%f6

884         faddd   %f16,%f36,%f16

886         faddd   %f26,%f40,%f26
887         andn    %l0,%i5,%l0             ! hx &= ~0x80000000

889         fors    %f6,%f9,%f6
890         addcc   %i0,-1,%i0

892         fors    %f16,%f19,%f16
893         bg,pt   %icc,.loop0

895 ! delay slot
896         fors    %f26,%f29,%f26

898         ba,pt   %icc,.endloop0
899 ! delay slot
900         nop

902         .align  32
903 .case5:
904         sethi   %hi(0x3fc3c000),%o7
905         add     %l3,8,%g1
906         fand    %f18,%f44,%f12
907         fmuld   %f0,%f0,%f2

909         sub     %l1,%o7,%l1
910         fmuld   %f20,%f20,%f22

912         fsubd   %f10,%f12,%f10
913         srl     %l1,10,%l1
914         mov     %o1,%o4

916         fmovd   %f0,%f6
917         fmuld   %f2,%f52,%f4
918         mov     %o0,%o3
```

```
 920         fmuld   %f22,%f52,%f24
 921         mov     %o2,%o5

 923         fmuld   %f10,%f10,%f12
 924         andn    %l1,0x1f,%l1

 926         faddd   %f4,%f50,%f4

 928         faddd   %f24,%f50,%f24

 930         fmuld   %f12,%f58,%f16
 931         ldd     [%l3+%l1],%f36

 933         fmuld   %f2,%f4,%f4

 935         fmuld   %f22,%f24,%f24

 937         faddd   %f16,%f56,%f16
 938         fmuld   %f12,%f62,%f14
 939         ldd     [%g1+%l1],%f38

 941         faddd   %f4,%f48,%f4

 943         faddd   %f24,%f48,%f24

 945         fmuld   %f12,%f16,%f16
 946         faddd   %f14,%f60,%f14

 948         fmuld   %f2,%f4,%f4

 950         fmuld   %f22,%f24,%f24

 952         faddd   %f16,%f54,%f16
 953         fmuld   %f12,%f14,%f14

 955         faddd   %f4,%f46,%f4

 957         faddd   %f24,%f46,%f24

 959         fmuld   %f10,%f16,%f16
 960         ldd     [%l4+%l1],%f12

 962         fmuld   %f14,%f36,%f14
 963         lda     [%i1]%asi,%l0           ! preload next argument

 965         fmuld   %f2,%f4,%f4
 966         lda     [%i1]%asi,%f0

 968         fmuld   %f16,%f38,%f16
 969         lda     [%i1+4]%asi,%f1

 971         fmuld   %f22,%f24,%f24
 972         add     %i1,%i2,%i1             ! x += stridex

 974         fmuld   %f6,%f4,%f4

 976         faddd   %f16,%f14,%f16

 978         fmuld   %f20,%f24,%f24

 980         faddd   %f6,%f4,%f6

 982         faddd   %f16,%f12,%f16

 984         faddd   %f20,%f24,%f26
```



```
 986         fors    %f6,%f9,%f6
 987         andn    %l0,%i5,%l0             ! hx &= ~0x80000000

 989         faddd   %f16,%f36,%f16
 990         addcc   %i0,-1,%i0

 992         fors    %f26,%f29,%f26
 993         bg,pt   %icc,.loop0

 995 ! delay slot
 996         fors    %f16,%f19,%f16

 998         ba,pt   %icc,.endloop0
 999 ! delay slot
1000         nop

1002         .align  32
1003 .case6:
1004         st      %f27,[%o5+4]
1005         cmp     %l2,%l5
1006         fpadd32s %f20,%f31,%f28
1007         bl,pn   %icc,.case7

1009 ! delay slot
1010         sethi   %hi(0x3fc3c000),%o7
1011         add     %l3,8,%g1
1012         fand    %f28,%f44,%f22
1013         fmuld   %f0,%f0,%f2

1015         sub     %l2,%o7,%l2
1016         fmuld   %f10,%f10,%f12

1018         fsubd   %f20,%f22,%f20
1019         srl     %l2,10,%l2
1020         mov     %o2,%o5

1022         fmovd   %f0,%f6
1023         fmuld   %f2,%f52,%f4
1024         mov     %o0,%o3

1026         fmuld   %f12,%f52,%f14
1027         mov     %o1,%o4

1029         fmuld   %f20,%f20,%f22
1030         andn    %l2,0x1f,%l2

1032         faddd   %f4,%f50,%f4

1034         faddd   %f14,%f50,%f14

1036         fmuld   %f22,%f58,%f26
1037         ldd     [%l3+%l2],%f40

1039         fmuld   %f2,%f4,%f4

1041         fmuld   %f12,%f14,%f14

1043         faddd   %f26,%f56,%f26
1044         fmuld   %f22,%f62,%f24
1045         ldd     [%g1+%l2],%f42

1047         faddd   %f4,%f48,%f4

1049         faddd   %f14,%f48,%f14

1051         fmuld   %f22,%f26,%f26
```

```
1052         faddd   %f24,%f60,%f24

1054         fmuld   %f2,%f4,%f4

1056         fmuld   %f12,%f14,%f14

1058         faddd   %f26,%f54,%f26
1059         fmuld   %f22,%f24,%f24

1061         faddd   %f4,%f46,%f4

1063         faddd   %f14,%f46,%f14

1065         fmuld   %f20,%f26,%f26
1066         ldd     [%l4+%l2],%f22

1068         fmuld   %f24,%f40,%f24
1069         lda     [%i1]%asi,%l0           ! preload next argument

1071         fmuld   %f2,%f4,%f4
1072         lda     [%i1]%asi,%f0

1074         fmuld   %f26,%f42,%f26
1075         lda     [%i1+4]%asi,%f1

1077         fmuld   %f12,%f14,%f14
1078         add     %i1,%i2,%i1             ! x += stridex

1080         fmuld   %f6,%f4,%f4

1082         faddd   %f26,%f24,%f26

1084         fmuld   %f10,%f14,%f14

1086         faddd   %f6,%f4,%f6

1088         faddd   %f26,%f22,%f26

1090         faddd   %f10,%f14,%f16

1092         fors    %f6,%f9,%f6
1093         andn    %l0,%i5,%l0             ! hx &= ~0x80000000

1095         faddd   %f26,%f40,%f26
1096         addcc   %i0,-1,%i0

1098         fors    %f16,%f19,%f16
1099         bg,pt   %icc,.loop0

1101 ! delay slot
1102         fors    %f26,%f29,%f26

1104         ba,pt   %icc,.endloop0
1105 ! delay slot
1106         nop

1108         .align  32
1109 .case7:
1110         fmuld   %f0,%f0,%f2
1111         fmovd   %f0,%f6
1112         mov     %o0,%o3

1114         fmuld   %f10,%f10,%f12
1115         mov     %o1,%o4

1117         fmuld   %f20,%f20,%f22
```



```
1118         mov     %o2,%o5

1120         fmuld   %f2,%f52,%f4
1121         lda     [%i1]%asi,%l0           ! preload next argument

1123         fmuld   %f12,%f52,%f14
1124         lda     [%i1]%asi,%f0

1126         fmuld   %f22,%f52,%f24
1127         lda     [%i1+4]%asi,%f1

1129         faddd   %f4,%f50,%f4
1130         add     %i1,%i2,%i1             ! x += stridex

1132         faddd   %f14,%f50,%f14

1134         faddd   %f24,%f50,%f24

1136         fmuld   %f2,%f4,%f4

1138         fmuld   %f12,%f14,%f14

1140         fmuld   %f22,%f24,%f24

1142         faddd   %f4,%f48,%f4

1144         faddd   %f14,%f48,%f14

1146         faddd   %f24,%f48,%f24

1148         fmuld   %f2,%f4,%f4

1150         fmuld   %f12,%f14,%f14

1152         fmuld   %f22,%f24,%f24

1154         faddd   %f4,%f46,%f4

1156         faddd   %f14,%f46,%f14

1158         faddd   %f24,%f46,%f24

1160         fmuld   %f2,%f4,%f4

1162         fmuld   %f12,%f14,%f14

1164         fmuld   %f22,%f24,%f24

1166         fmuld   %f6,%f4,%f4

1168         fmuld   %f10,%f14,%f14

1170         fmuld   %f20,%f24,%f24

1172         faddd   %f6,%f4,%f6

1174         faddd   %f10,%f14,%f16

1176         faddd   %f20,%f24,%f26
1177         andn    %l0,%i5,%l0             ! hx &= ~0x80000000

1179         fors    %f6,%f9,%f6
1180         addcc   %i0,-1,%i0

1182         fors    %f16,%f19,%f16
1183         bg,pt   %icc,.loop0
```

```
! delay slot
        fors    %f26,%f29,%f26

        ba,pt   %icc,.endloop0
! delay slot
        nop


        .align  32
.endloop2:
        cmp     %l1,%l5
        bl,pn   %icc,1f
! delay slot
        fabsd   %f10,%f10
        sethi   %hi(0x3fc3c000),%o7
        fpadd32s %f10,%f31,%f18
        add     %l3,8,%g1
        fand    %f18,%f44,%f12
        sub     %l1,%o7,%l1
        fsubd   %f10,%f12,%f10
        srl     %l1,10,%l1
        fmuld   %f10,%f10,%f12
        andn    %l1,0x1f,%l1
        fmuld   %f12,%f58,%f20
        ldd     [%l3+%l1],%f36
        faddd   %f20,%f56,%f20
        fmuld   %f12,%f62,%f14
        ldd     [%g1+%l1],%f38
        fmuld   %f12,%f20,%f20
        faddd   %f14,%f60,%f14
        faddd   %f20,%f54,%f20
        fmuld   %f12,%f14,%f14
        fmuld   %f10,%f20,%f20
        ldd     [%l4+%l1],%f12
        fmuld   %f14,%f36,%f14
        fmuld   %f20,%f38,%f20
        faddd   %f20,%f14,%f20
        faddd   %f20,%f12,%f20
        ba,pt   %icc,2f
! delay slot
        faddd   %f20,%f36,%f20
1:
        fmuld   %f10,%f10,%f12
        fmuld   %f12,%f52,%f14
        faddd   %f14,%f50,%f14
        fmuld   %f12,%f14,%f14
        faddd   %f14,%f48,%f14
        fmuld   %f12,%f14,%f14
        faddd   %f14,%f46,%f14
        fmuld   %f12,%f14,%f14
        fmuld   %f10,%f14,%f14
        faddd   %f10,%f14,%f20
2:
        fors    %f20,%f19,%f20
        st      %f20,[%o1]
        st      %f21,[%o1+4]

.endloop1:
        cmp     %l0,%l5
        bl,pn   %icc,1f
! delay slot
        fabsd   %f0,%f0
        sethi   %hi(0x3fc3c000),%o7
        fpadd32s %f0,%f31,%f8
        add     %l3,8,%g1
```



```
        fand    %f8,%f44,%f2
        sub     %l0,%o7,%l0
        fsubd   %f0,%f2,%f0
        srl     %l0,10,%l0
        fmuld   %f0,%f0,%f2
        andn    %l0,0x1f,%l0
        fmuld   %f2,%f58,%f20
        ldd     [%l3+%l0],%f32
        faddd   %f20,%f56,%f20
        fmuld   %f2,%f62,%f4
        ldd     [%g1+%l0],%f34
        fmuld   %f2,%f20,%f20
        faddd   %f4,%f60,%f4
        faddd   %f20,%f54,%f20
        fmuld   %f2,%f4,%f4
        fmuld   %f0,%f20,%f20
        ldd     [%l4+%l0],%f2
        fmuld   %f4,%f32,%f4
        fmuld   %f20,%f34,%f20
        faddd   %f20,%f4,%f20
        faddd   %f20,%f2,%f20
        ba,pt   %icc,2f
! delay slot
        faddd   %f20,%f32,%f20
1:
        fmuld   %f0,%f0,%f2
        fmuld   %f2,%f52,%f4
        faddd   %f4,%f50,%f4
        fmuld   %f2,%f4,%f4
        faddd   %f4,%f48,%f4
        fmuld   %f2,%f4,%f4
        faddd   %f4,%f46,%f4
        fmuld   %f2,%f4,%f4
        fmuld   %f0,%f4,%f4
        faddd   %f0,%f4,%f20
2:
        fors    %f20,%f9,%f20
        st      %f20,[%o0]
        st      %f21,[%o0+4]

.endloop0:
        st      %f6,[%o3]
        st      %f7,[%o3+4]
        st      %f16,[%o4]
        st      %f17,[%o4+4]
        st      %f26,[%o5]
        st      %f27,[%o5+4]

! return.  finished off with only primary range arguments.

        ret
        restore


        .align  32
.range0:
        cmp     %l0,LIM_l6
        bg,a,pt %icc,.MEDIUM            ! branch if x is not tiny
! delay slot, annulled if branch not taken
        mov     0x1,LIM_l6              ! set "processing loop0"
        st      %f0,[%o0]               ! *y = *x with inexact if x nonzero
        st      %f1,[%o0+4]
        fdtoi   %f0,%f2
        addcc   %i0,-1,%i0
        ble,pn  %icc,.endloop0
! delay slot, harmless if branch taken
```

```
1316         add     %i3,%i4,%i3             ! y += stridey
1317         andn    %l1,%i5,%l0             ! hx &= ~0x80000000
1318         fmovd   %f10,%f0
1319         ba,pt   %icc,.loop0
1320 ! delay slot
1321         add     %i1,%i2,%i1             ! x += stridex


1324         .align  32
1325 .range1:
1326         cmp     %l1,LIM_l6
1327         bg,a,pt %icc,.MEDIUM            ! branch if x is not tiny
1328 ! delay slot, annulled if branch not taken
1329         mov     0x2,LIM_l6              ! set "processing loop1"
1330         st      %f10,[%o1]              ! *y = *x with inexact if x nonzero
1331         st      %f11,[%o1+4]
1332         fdtoi   %f10,%f12
1333         addcc   %i0,-1,%i0
1334         ble,pn  %icc,.endloop1
1335 ! delay slot, harmless if branch taken
1336         add     %i3,%i4,%i3             ! y += stridey
1337         andn    %l2,%i5,%l1             ! hx &= ~0x80000000
1338         fmovd   %f20,%f10
1339         ba,pt   %icc,.loop1
1340 ! delay slot
1341         add     %i1,%i2,%i1             ! x += stridex


1344         .align  32
1345 .range2:
1346         cmp     %l2,LIM_l6
1347         bg,a,pt %icc,.MEDIUM            ! branch if x is not tiny
1348 ! delay slot, annulled if branch not taken
1349         mov     0x3,LIM_l6              ! set "processing loop2"
1350         st      %f20,[%o2]              ! *y = *x with inexact if x nonzero
1351         st      %f21,[%o2+4]
1352         fdtoi   %f20,%f22
1353 1:
1354         addcc   %i0,-1,%i0
1355         ble,pn  %icc,.endloop2
1356 ! delay slot
1357         nop
1358         ld      [%i1],%l2
1359         ld      [%i1],%f20
1360         ld      [%i1+4],%f21
1361         andn    %l2,%i5,%l2             ! hx &= ~0x80000000
1362         ba,pt   %icc,.loop2
1363 ! delay slot
1364         add     %i1,%i2,%i1             ! x += stridex


1367         .align  32
1368 .MEDIUM:

1370 ! ========== medium range ==========

1372 ! register use

1374 ! i0  n
1375 ! i1  x
1376 ! i2  stridex
1377 ! i3  y
1378 ! i4  stridey
1379 ! i5  0x80000000

1381 ! l0  hx0
```



```
1382 ! l1  hx1
1383 ! l2  hx2
1384 ! l3  __vlibm_TBL_sincos_hi
1385 ! l4  __vlibm_TBL_sincos_lo
1386 ! l5  constants
1387 ! l6  in transition from pri-range and here, use for biguns
1388 ! l7  0x413921fb

1390 ! the following are 64-bit registers in both V8+ and V9

1392 ! g1  scratch
1393 ! g5

1395 ! o0  py0
1396 ! o1  py1
1397 ! o2  py2
1398 ! o3  n0
1399 ! o4  n1
1400 ! o5  n2
1401 ! o7  scratch

1403 ! f0  x0
1404 ! f2  n0,y0
1405 ! f4
1406 ! f6
1407 ! f8  scratch for table base
1408 ! f9  signbit0
1409 ! f10 x1
1410 ! f12 n1,y1
1411 ! f14
1412 ! f16
1413 ! f18 scratch for table base
1414 ! f19 signbit1
1415 ! f20 x2
1416 ! f22 n2,y2
1417 ! f24
1418 ! f26
1419 ! f28 scratch for table base
1420 ! f29 signbit2
1421 ! f30 0x80000000
1422 ! f31 0x4000
1423 ! f32
1424 ! f34
1425 ! f36
1426 ! f38
1427 ! f40 invpio2
1428 ! f42 round
1429 ! f44 0xffff800000000000
1430 ! f46 pio2_1
1431 ! f48 pio2_2
1432 ! f50 pio2_3
1433 ! f52 pio2_3t
1434 ! f54 one
1435 ! f56 pp1
1436 ! f58 pp2
1437 ! f60 qq1
1438 ! f62 qq2

1440         PIC_SET(g5,constants,l5)

1442         ! %o3,%o4,%o5 need to be stored
1443         st      %f6,[%o3]
1444         sethi   %hi(0x413921fb),%l7
1445         st      %f7,[%o3+4]
1446         or      %l7,%lo(0x413921fb),%l7
1447         st      %f16,[%o4]
```

```
1448         st      %f17,[%o4+4]
1449         st      %f26,[%o5]
1450         st      %f27,[%o5+4]
1451         ldd     [%l5+invpio2],%f40
1452         ldd     [%l5+round],%f42
1453         ldd     [%l5+pio2_1],%f46
1454         ldd     [%l5+pio2_2],%f48
1455         ldd     [%l5+pio2_3],%f50
1456         ldd     [%l5+pio2_3t],%f52
1457         std     %f54,[%fp+x0_1+8]       ! set up stack data
1458         std     %f54,[%fp+x1_1+8]
1459         std     %f54,[%fp+x2_1+8]
1460         stx     %g0,[%fp+y0_0+8]
1461         stx     %g0,[%fp+y1_0+8]
1462         stx     %g0,[%fp+y2_0+8]

1464 !       branched here in the middle of the array.  Need to adjust
1465 !       for the members of the triple that were selected in the primary
1466 !       loop.

1468 !       no adjustment since all three selected here
1469         subcc   LIM_l6,0x1,%g0          ! continue in LOOP0?
1470         bz,a    %icc,.LOOP0
1471         mov     0x0,LIM_l6              ! delay slot set biguns=0

1473 !       ajust 1st triple since 2d and 3d done here
1474         subcc   LIM_l6,0x2,%g0          ! continue in LOOP1?
1475         fors    %f0,%f9,%f0             ! restore sign bit
1476         fmuld   %f0,%f40,%f2            ! adj LOOP0
1477         bz,a    %icc,.LOOP1
1478         mov     0x0,LIM_l6              ! delay slot set biguns=0

1480 !       ajust 1st and 2d triple since 3d done here
1481         subcc   LIM_l6,0x3,%g0          ! continue in LOOP2?
1482         !done fmuld     %f0,%f40,%f2            ! adj LOOP0
1483         sub     %i3,%i4,%i3             ! adjust to not double increment
1484         fors    %f10,%f19,%f10          ! restore sign bit
1485         fmuld   %f10,%f40,%f12          ! adj LOOP1
1486         faddd   %f2,%f42,%f2            ! adj LOOP1
1487         bz,a    %icc,.LOOP2
1488         mov     0x0,LIM_l6              ! delay slot set biguns=0

1490         .align 32
1491 .LOOP0:
1492         lda     [%i1]%asi,%l1           ! preload next argument
1493         mov     %i3,%o0                 ! py0 = y
1494         lda     [%i1]%asi,%f10
1495         cmp     %l0,%l7
1496         add     %i3,%i4,%i3             ! y += stridey
1497         bg,pn   %icc,.BIG0              ! if hx > 0x413921fb

1499 ! delay slot
1500         lda     [%i1+4]%asi,%f11
1501         addcc   %i0,-1,%i0
1502         add     %i1,%i2,%i1             ! x += stridex
1503         ble,pn  %icc,.ENDLOOP1

1505 ! delay slot
1506         andn    %l1,%i5,%l1
1507         nop
1508         fmuld   %f0,%f40,%f2
1509         fabsd   %f54,%f54               ! a nop for alignment only

1511 .LOOP1:
1512         lda     [%i1]%asi,%l2           ! preload next argument
1513         mov     %i3,%o1                 ! py1 = y
```



```
1515         lda     [%i1]%asi,%f20
1516         cmp     %l1,%l7
1517         add     %i3,%i4,%i3             ! y += stridey
1518         bg,pn   %icc,.BIG1              ! if hx > 0x413921fb

1520 ! delay slot
1521         lda     [%i1+4]%asi,%f21
1522         addcc   %i0,-1,%i0
1523         add     %i1,%i2,%i1             ! x += stridex
1524         ble,pn  %icc,.ENDLOOP2

1526 ! delay slot
1527         andn    %l2,%i5,%l2
1528         nop
1529         fmuld   %f10,%f40,%f12
1530         faddd   %f2,%f42,%f2

1532 .LOOP2:
1533         st      %f3,[%fp+n0]
1534         mov     %i3,%o2                 ! py2 = y

1536         cmp     %l2,%l7
1537         add     %i3,%i4,%i3             ! y += stridey
1538         fmuld   %f20,%f40,%f22
1539         bg,pn   %icc,.BIG2              ! if hx > 0x413921fb

1541 ! delay slot
1542         add     %l5,thresh+4,%o7
1543         faddd   %f12,%f42,%f12
1544         st      %f13,[%fp+n1]

1546 ! -

1548         add     %l5,thresh,%g1
1549         faddd   %f22,%f42,%f22
1550         st      %f23,[%fp+n2]

1552         fsubd   %f2,%f42,%f2            ! n

1554         fsubd   %f12,%f42,%f12          ! n

1556         fsubd   %f22,%f42,%f22          ! n

1558         fmuld   %f2,%f46,%f4

1560         fmuld   %f12,%f46,%f14

1562         fmuld   %f22,%f46,%f24

1564         fsubd   %f0,%f4,%f4
1565         fmuld   %f2,%f48,%f6

1567         fsubd   %f10,%f14,%f14
1568         fmuld   %f12,%f48,%f16

1570         fsubd   %f20,%f24,%f24
1571         fmuld   %f22,%f48,%f26

1573         fsubd   %f4,%f6,%f0
1574         ld      [%fp+n0],%o3

1576         fsubd   %f14,%f16,%f10
1577         ld      [%fp+n1],%o4

1579         fsubd   %f24,%f26,%f20
```

```
1580         ld      [%fp+n2],%o5

1582         fsubd   %f4,%f0,%f32
1583         and     %o3,1,%o3

1585         fsubd   %f14,%f10,%f34
1586         and     %o4,1,%o4

1588         fsubd   %f24,%f20,%f36
1589         and     %o5,1,%o5

1591         fsubd   %f32,%f6,%f32
1592         fmuld   %f2,%f50,%f8
1593         sll     %o3,3,%o3

1595         fsubd   %f34,%f16,%f34
1596         fmuld   %f12,%f50,%f18
1597         sll     %o4,3,%o4

1599         fsubd   %f36,%f26,%f36
1600         fmuld   %f22,%f50,%f28
1601         sll     %o5,3,%o5

1603         fsubd   %f8,%f32,%f8
1604         ld      [%g1+%o3],%f6

1606         fsubd   %f18,%f34,%f18
1607         ld      [%g1+%o4],%f16

1609         fsubd   %f28,%f36,%f28
1610         ld      [%g1+%o5],%f26

1612         fsubd   %f0,%f8,%f4

1614         fsubd   %f10,%f18,%f14

1616         fsubd   %f20,%f28,%f24

1618         fsubd   %f0,%f4,%f32

1620         fsubd   %f10,%f14,%f34

1622         fsubd   %f20,%f24,%f36

1624         fsubd   %f32,%f8,%f32
1625         fmuld   %f2,%f52,%f2

1627         fsubd   %f34,%f18,%f34
1628         fmuld   %f12,%f52,%f12

1630         fsubd   %f36,%f28,%f36
1631         fmuld   %f22,%f52,%f22

1633         fsubd   %f2,%f32,%f2
1634         ld      [%o7+%o3],%f8

1636         fsubd   %f12,%f34,%f12
1637         ld      [%o7+%o4],%f18

1639         fsubd   %f22,%f36,%f22
1640         ld      [%o7+%o5],%f28

1642         fsubd   %f4,%f2,%f0             ! x

1644         fsubd   %f14,%f12,%f10          ! x
```



```
1646         fsubd   %f24,%f22,%f20          ! x

1648         fsubd   %f4,%f0,%f4

1650         fsubd   %f14,%f10,%f14

1652         fsubd   %f24,%f20,%f24

1654         fands   %f0,%f30,%f9            ! save signbit

1656         fands   %f10,%f30,%f19          ! save signbit

1658         fands   %f20,%f30,%f29          ! save signbit

1660         fabsd   %f0,%f0
1661         std     %f0,[%fp+x0_1]

1663         fabsd   %f10,%f10
1664         std     %f10,[%fp+x1_1]

1666         fabsd   %f20,%f20
1667         std     %f20,[%fp+x2_1]

1669         fsubd   %f4,%f2,%f2             ! y

1671         fsubd   %f14,%f12,%f12          ! y

1673         fsubd   %f24,%f22,%f22          ! y

1675         fcmpgt32 %f6,%f0,%l0

1677         fcmpgt32 %f16,%f10,%l1

1679         fcmpgt32 %f26,%f20,%l2

1681 ! -- 16 byte aligned
1682         fxors   %f2,%f9,%f2

1684         fxors   %f12,%f19,%f12

1686         fxors   %f22,%f29,%f22

1688         fands   %f9,%f8,%f9             ! if (n & 1) clear sign bit
1689         andcc   %l0,2,%g0
1690         bne,pn  %icc,.CASE4

1692 ! delay slot
1693         fands   %f19,%f18,%f19          ! if (n & 1) clear sign bit
1694         andcc   %l1,2,%g0
1695         bne,pn  %icc,.CASE2

1697 ! delay slot
1698         fands   %f29,%f28,%f29          ! if (n & 1) clear sign bit
1699         andcc   %l2,2,%g0
1700         bne,pn  %icc,.CASE1

1702 ! delay slot
1703         fpadd32s %f0,%f31,%f8
1704         sethi   %hi(0x3fc3c000),%o7
1705         ld      [%fp+x0_1],%l0

1707         fpadd32s %f10,%f31,%f18
1708         add     %l3,8,%g1
1709         ld      [%fp+x1_1],%l1

1711         fpadd32s %f20,%f31,%f28
```

```
1712          ld      [%fp+x2_1],%l2

1714          fand    %f8,%f44,%f4
1715          sub     %l0,%o7,%l0

1717          fand    %f18,%f44,%f14
1718          sub     %l1,%o7,%l1

1720          fand    %f28,%f44,%f24
1721          sub     %l2,%o7,%l2

1723          fsubd   %f0,%f4,%f0
1724          srl     %l0,10,%l0

1726          fsubd   %f10,%f14,%f10
1727          srl     %l1,10,%l1

1729          fsubd   %f20,%f24,%f20
1730          srl     %l2,10,%l2

1732          faddd   %f0,%f2,%f0
1733          andn    %l0,0x1f,%l0

1735          faddd   %f10,%f12,%f10
1736          andn    %l1,0x1f,%l1

1738          faddd   %f20,%f22,%f20
1739          andn    %l2,0x1f,%l2

1741          fmuld   %f0,%f0,%f2
1742          add     %l0,%o3,%l0

1744          fmuld   %f10,%f10,%f12
1745          add     %l1,%o4,%l1

1747          fmuld   %f20,%f20,%f22
1748          add     %l2,%o5,%l2

1750          fmuld   %f2,%f58,%f6
1751          ldd     [%l3+%l0],%f32

1753          fmuld   %f12,%f58,%f16
1754          ldd     [%l3+%l1],%f34

1756          fmuld   %f22,%f58,%f26
1757          ldd     [%l3+%l2],%f36

1759          faddd   %f6,%f56,%f6
1760          fmuld   %f2,%f62,%f4

1762          faddd   %f16,%f56,%f16
1763          fmuld   %f12,%f62,%f14

1765          faddd   %f26,%f56,%f26
1766          fmuld   %f22,%f62,%f24

1768          fmuld   %f2,%f6,%f6
1769          faddd   %f4,%f60,%f4

1771          fmuld   %f12,%f16,%f16
1772          faddd   %f14,%f60,%f14

1774          fmuld   %f22,%f26,%f26
1775          faddd   %f24,%f60,%f24

1777          faddd   %f6,%f54,%f6
```



```
1778          fmuld   %f2,%f4,%f4

1780          faddd   %f16,%f54,%f16
1781          fmuld   %f12,%f14,%f14

1783          faddd   %f26,%f54,%f26
1784          fmuld   %f22,%f24,%f24

1786          fmuld   %f0,%f6,%f6
1787          ldd     [%g1+%l0],%f2

1789          fmuld   %f10,%f16,%f16
1790          ldd     [%g1+%l1],%f12

1792          fmuld   %f20,%f26,%f26
1793          ldd     [%g1+%l2],%f22

1795          fmuld   %f4,%f32,%f4
1796          ldd     [%l4+%l0],%f0

1798          fmuld   %f14,%f34,%f14
1799          ldd     [%l4+%l1],%f10

1801          fmuld   %f24,%f36,%f24
1802          ldd     [%l4+%l2],%f20

1804          fmuld   %f6,%f2,%f6

1806          fmuld   %f16,%f12,%f16

1808          fmuld   %f26,%f22,%f26

1810          faddd   %f6,%f4,%f6

1812          faddd   %f16,%f14,%f16

1814          faddd   %f26,%f24,%f26

1816          faddd   %f6,%f0,%f6

1818          faddd   %f16,%f10,%f16

1820          faddd   %f26,%f20,%f26

1822          faddd   %f6,%f32,%f6

1824          faddd   %f16,%f34,%f16

1826          faddd   %f26,%f36,%f26

1828  .FIXSIGN:
1829          ld      [%fp+n0],%o3
1830          add     %l5,thresh-4,%g1

1832          ld      [%fp+n1],%o4

1834          ld      [%fp+n2],%o5
1835          and     %o3,2,%o3

1837          sll     %o3,2,%o3
1838          and     %o4,2,%o4
1839          lda     [%i1]%asi,%l0           ! preload next argument

1841          sll     %o4,2,%o4
1842          and     %o5,2,%o5
1843          ld      [%g1+%o3],%f8
```

```
1845         sll     %o5,2,%o5
1846         ld      [%g1+%o4],%f18

1848         ld      [%g1+%o5],%f28
1849         fxors   %f9,%f8,%f9

1851         lda     [%i1]%asi,%f0
1852         fxors   %f29,%f28,%f29

1854         lda     [%i1+4]%asi,%f1
1855         fxors   %f19,%f18,%f19

1857         fors    %f6,%f9,%f6             ! tack on sign
1858         add     %i1,%i2,%i1             ! x += stridex
1859         st      %f6,[%o0]

1861         fors    %f26,%f29,%f26          ! tack on sign
1862         st      %f7,[%o0+4]

1864         fors    %f16,%f19,%f16          ! tack on sign
1865         st      %f26,[%o2]

1867         st      %f27,[%o2+4]
1868         addcc   %i0,-1,%i0

1870         st      %f16,[%o1]
1871         andn    %l0,%i5,%l0             ! hx &= ~0x80000000
1872         bg,pt   %icc,.LOOP0

1874 ! delay slot
1875         st      %f17,[%o1+4]

1877         ba,pt   %icc,.ENDLOOP0
1878 ! delay slot
1879         nop

1881         .align  32
1882 .CASE1:
1883         fpadd32s %f10,%f31,%f18
1884         sethi   %hi(0x3fc3c000),%o7
1885         ld      [%fp+x0_1],%l0

1887         fand    %f8,%f44,%f4
1888         add     %l3,8,%g1
1889         ld      [%fp+x1_1],%l1

1891         fand    %f18,%f44,%f14
1892         sub     %l0,%o7,%l0

1894         fsubd   %f0,%f4,%f0
1895         srl     %l0,10,%l0
1896         sub     %l1,%o7,%l1

1898         fsubd   %f10,%f14,%f10
1899         srl     %l1,10,%l1

1901         fmuld   %f20,%f20,%f20
1902         ldd     [%l5+%o5],%f36
1903         add     %l5,%o5,%l2

1905         faddd   %f0,%f2,%f0
1906         andn    %l0,0x1f,%l0

1908         faddd   %f10,%f12,%f10
1909         andn    %l1,0x1f,%l1
```



```
1911         fmuld   %f20,%f36,%f24
1912         ldd     [%l2+0x10],%f26
1913         add     %fp,%o5,%o5

1915         fmuld   %f0,%f0,%f2
1916         add     %l0,%o3,%l0

1918         fmuld   %f10,%f10,%f12
1919         add     %l1,%o4,%l1

1921         faddd   %f24,%f26,%f24
1922         ldd     [%l2+0x20],%f36

1924         fmuld   %f2,%f58,%f6
1925         ldd     [%l3+%l0],%f32

1927         fmuld   %f12,%f58,%f16
1928         ldd     [%l3+%l1],%f34

1930         fmuld   %f20,%f24,%f24
1931         ldd     [%l2+0x30],%f26

1933         faddd   %f6,%f56,%f6
1934         fmuld   %f2,%f62,%f4

1936         faddd   %f16,%f56,%f16
1937         fmuld   %f12,%f62,%f14

1939         faddd   %f24,%f36,%f24
1940         ldd     [%o5+x2_1],%f36

1942         fmuld   %f2,%f6,%f6
1943         faddd   %f4,%f60,%f4

1945         fmuld   %f12,%f16,%f16
1946         faddd   %f14,%f60,%f14

1948         fmuld   %f20,%f24,%f24

1950         faddd   %f6,%f54,%f6
1951         fmuld   %f2,%f4,%f4
1952         ldd     [%g1+%l0],%f2

1954         faddd   %f16,%f54,%f16
1955         fmuld   %f12,%f14,%f14
1956         ldd     [%g1+%l1],%f12

1958         faddd   %f24,%f26,%f24

1960         fmuld   %f0,%f6,%f6
1961         ldd     [%l4+%l0],%f0

1963         fmuld   %f10,%f16,%f16
1964         ldd     [%l4+%l1],%f10

1966         fmuld   %f4,%f32,%f4
1967         std     %f22,[%fp+y2_0]

1969         fmuld   %f14,%f34,%f14

1971         fmuld   %f6,%f2,%f6

1973         fmuld   %f16,%f12,%f16

1975         fmuld   %f20,%f24,%f24
```

```
1977         faddd   %f6,%f4,%f6

1979         faddd   %f16,%f14,%f16

1981         fmuld   %f36,%f24,%f24
1982         ldd     [%o5+y2_0],%f22

1984         faddd   %f6,%f0,%f6

1986         faddd   %f16,%f10,%f16

1988         faddd   %f24,%f22,%f24

1990         faddd   %f6,%f32,%f6

1992         faddd   %f16,%f34,%f16
1993         ba,pt   %icc,.FIXSIGN

1995 ! delay slot
1996         faddd   %f36,%f24,%f26

1998         .align  32
1999 .CASE2:
2000         fpadd32s %f0,%f31,%f8
2001         ld      [%fp+x0_1],%l0
2002         andcc   %l2,2,%g0
2003         bne,pn  %icc,.CASE3

2005 ! delay slot
2006         sethi   %hi(0x3fc3c000),%o7
2007         fpadd32s %f20,%f31,%f28
2008         ld      [%fp+x2_1],%l2

2010         fand    %f8,%f44,%f4
2011         sub     %l0,%o7,%l0
2012         add     %l3,8,%g1

2014         fand    %f28,%f44,%f24
2015         sub     %l2,%o7,%l2

2017         fsubd   %f0,%f4,%f0
2018         srl     %l0,10,%l0

2020         fsubd   %f20,%f24,%f20
2021         srl     %l2,10,%l2

2023         fmuld   %f10,%f10,%f10
2024         ldd     [%l5+%o4],%f34
2025         add     %l5,%o4,%l1

2027         faddd   %f0,%f2,%f0
2028         andn    %l0,0x1f,%l0

2030         faddd   %f20,%f22,%f20
2031         andn    %l2,0x1f,%l2

2033         fmuld   %f10,%f34,%f14
2034         ldd     [%l1+0x10],%f16
2035         add     %fp,%o4,%o4

2037         fmuld   %f0,%f0,%f2
2038         add     %l0,%o3,%l0

2040         fmuld   %f20,%f20,%f22
2041         add     %l2,%o5,%l2
```



```
2043         faddd   %f14,%f16,%f14
2044         ldd     [%l1+0x20],%f34

2046         fmuld   %f2,%f58,%f6
2047         ldd     [%l3+%l0],%f32

2049         fmuld   %f22,%f58,%f26
2050         ldd     [%l3+%l2],%f36

2052         fmuld   %f10,%f14,%f14
2053         ldd     [%l1+0x30],%f16

2055         faddd   %f6,%f56,%f6
2056         fmuld   %f2,%f62,%f4

2058         faddd   %f26,%f56,%f26
2059         fmuld   %f22,%f62,%f24

2061         faddd   %f14,%f34,%f14
2062         ldd     [%o4+x1_1],%f34

2064         fmuld   %f2,%f6,%f6
2065         faddd   %f4,%f60,%f4

2067         fmuld   %f22,%f26,%f26
2068         faddd   %f24,%f60,%f24

2070         fmuld   %f10,%f14,%f14

2072         faddd   %f6,%f54,%f6
2073         fmuld   %f2,%f4,%f4
2074         ldd     [%g1+%l0],%f2

2076         faddd   %f26,%f54,%f26
2077         fmuld   %f22,%f24,%f24
2078         ldd     [%g1+%l2],%f22

2080         faddd   %f14,%f16,%f14

2082         fmuld   %f0,%f6,%f6
2083         ldd     [%l4+%l0],%f0

2085         fmuld   %f20,%f26,%f26
2086         ldd     [%l4+%l2],%f20

2088         fmuld   %f4,%f32,%f4
2089         std     %f12,[%fp+y1_0]

2091         fmuld   %f24,%f36,%f24

2093         fmuld   %f6,%f2,%f6

2095         fmuld   %f26,%f22,%f26

2097         fmuld   %f10,%f14,%f14

2099         faddd   %f6,%f4,%f6

2101         faddd   %f26,%f24,%f26

2103         fmuld   %f34,%f14,%f14
2104         ldd     [%o4+y1_0],%f12

2106         faddd   %f6,%f0,%f6
```

```
2108         faddd   %f26,%f20,%f26

2110         faddd   %f14,%f12,%f14

2112         faddd   %f6,%f32,%f6

2114         faddd   %f26,%f36,%f26
2115         ba,pt   %icc,.FIXSIGN

2117 ! delay slot
2118         faddd   %f34,%f14,%f16

2120         .align  32
2121 .CASE3:
2122         fand    %f8,%f44,%f4
2123         add     %l3,8,%g1
2124         sub     %l0,%o7,%l0

2126         fmuld   %f10,%f10,%f10
2127         ldd     [%l5+%o4],%f34
2128         add     %l5,%o4,%l1

2130         fsubd   %f0,%f4,%f0
2131         srl     %l0,10,%l0

2133         fmuld   %f20,%f20,%f20
2134         ldd     [%l5+%o5],%f36
2135         add     %l5,%o5,%l2

2137         fmuld   %f10,%f34,%f14
2138         ldd     [%l1+0x10],%f16
2139         add     %fp,%o4,%o4

2141         faddd   %f0,%f2,%f0
2142         andn    %l0,0x1f,%l0

2144         fmuld   %f20,%f36,%f24
2145         ldd     [%l2+0x10],%f26
2146         add     %fp,%o5,%o5

2148         faddd   %f14,%f16,%f14
2149         ldd     [%l1+0x20],%f34

2151         fmuld   %f0,%f0,%f2
2152         add     %l0,%o3,%l0

2154         faddd   %f24,%f26,%f24
2155         ldd     [%l2+0x20],%f36

2157         fmuld   %f10,%f14,%f14
2158         ldd     [%l1+0x30],%f16

2160         fmuld   %f2,%f58,%f6
2161         ldd     [%l3+%l0],%f32

2163         fmuld   %f20,%f24,%f24
2164         ldd     [%l2+0x30],%f26

2166         faddd   %f14,%f34,%f14
2167         ldd     [%o4+x1_1],%f34

2169         faddd   %f6,%f56,%f6
2170         fmuld   %f2,%f62,%f4

2172         faddd   %f24,%f36,%f24
2173         ldd     [%o5+x2_1],%f36
```



```
2175         fmuld   %f10,%f14,%f14
2176         std     %f12,[%fp+y1_0]

2178         fmuld   %f2,%f6,%f6
2179         faddd   %f4,%f60,%f4

2181         fmuld   %f20,%f24,%f24
2182         std     %f22,[%fp+y2_0]

2184         faddd   %f14,%f16,%f14

2186         faddd   %f6,%f54,%f6
2187         fmuld   %f2,%f4,%f4
2188         ldd     [%g1+%l0],%f2

2190         faddd   %f24,%f26,%f24

2192         fmuld   %f10,%f14,%f14

2194         fmuld   %f0,%f6,%f6
2195         ldd     [%l4+%l0],%f0

2197         fmuld   %f4,%f32,%f4

2199         fmuld   %f20,%f24,%f24

2201         fmuld   %f6,%f2,%f6

2203         fmuld   %f34,%f14,%f14
2204         ldd     [%o4+y1_0],%f12

2206         fmuld   %f36,%f24,%f24
2207         ldd     [%o5+y2_0],%f22

2209         faddd   %f6,%f4,%f6

2211         faddd   %f14,%f12,%f14

2213         faddd   %f24,%f22,%f24

2215         faddd   %f6,%f0,%f6

2217         faddd   %f34,%f14,%f16

2219         faddd   %f36,%f24,%f26
2220         ba,pt   %icc,.FIXSIGN

2222 ! delay slot
2223         faddd   %f6,%f32,%f6

2225         .align  32
2226 .CASE4:
2227         fands   %f29,%f28,%f29          ! if (n & 1) clear sign bit
2228         sethi   %hi(0x3fc3c000),%o7
2229         andcc   %l1,2,%g0
2230         bne,pn  %icc,.CASE6

2232 ! delay slot
2233         andcc   %l2,2,%g0
2234         fpadd32s %f10,%f31,%f18
2235         ld      [%fp+x1_1],%l1
2236         bne,pn  %icc,.CASE5

2238 ! delay slot
2239         add     %l3,8,%g1
```

```
2240         ld      [%fp+x2_1],%l2
2241         fpadd32s %f20,%f31,%f28

2243         fand    %f18,%f44,%f14
2244         sub     %l1,%o7,%l1

2246         fand    %f28,%f44,%f24
2247         sub     %l2,%o7,%l2

2249         fsubd   %f10,%f14,%f10
2250         srl     %l1,10,%l1

2252         fsubd   %f20,%f24,%f20
2253         srl     %l2,10,%l2

2255         fmuld   %f0,%f0,%f0
2256         ldd     [%l5+%o3],%f32
2257         add     %l5,%o3,%l0

2259         faddd   %f10,%f12,%f10
2260         andn    %l1,0x1f,%l1

2262         faddd   %f20,%f22,%f20
2263         andn    %l2,0x1f,%l2

2265         fmuld   %f0,%f32,%f4
2266         ldd     [%l0+0x10],%f6
2267         add     %fp,%o3,%o3

2269         fmuld   %f10,%f10,%f12
2270         add     %l1,%o4,%l1

2272         fmuld   %f20,%f20,%f22
2273         add     %l2,%o5,%l2

2275         faddd   %f4,%f6,%f4
2276         ldd     [%l0+0x20],%f32

2278         fmuld   %f12,%f58,%f16
2279         ldd     [%l3+%l1],%f34

2281         fmuld   %f22,%f58,%f26
2282         ldd     [%l3+%l2],%f36

2284         fmuld   %f0,%f4,%f4
2285         ldd     [%l0+0x30],%f6

2287         faddd   %f16,%f56,%f16
2288         fmuld   %f12,%f62,%f14

2290         faddd   %f26,%f56,%f26
2291         fmuld   %f22,%f62,%f24

2293         faddd   %f4,%f32,%f4
2294         ldd     [%o3+x0_1],%f32

2296         fmuld   %f12,%f16,%f16
2297         faddd   %f14,%f60,%f14

2299         fmuld   %f22,%f26,%f26
2300         faddd   %f24,%f60,%f24

2302         fmuld   %f0,%f4,%f4

2304         faddd   %f16,%f54,%f16
2305         fmuld   %f12,%f14,%f14
```



```
2306         ldd     [%g1+%l1],%f12

2308         faddd   %f26,%f54,%f26
2309         fmuld   %f22,%f24,%f24
2310         ldd     [%g1+%l2],%f22

2312         faddd   %f4,%f6,%f4

2314         fmuld   %f10,%f16,%f16
2315         ldd     [%l4+%l1],%f10

2317         fmuld   %f20,%f26,%f26
2318         ldd     [%l4+%l2],%f20

2320         fmuld   %f14,%f34,%f14
2321         std     %f2,[%fp+y0_0]

2323         fmuld   %f24,%f36,%f24

2325         fmuld   %f0,%f4,%f4

2327         fmuld   %f16,%f12,%f16

2329         fmuld   %f26,%f22,%f26

2331         fmuld   %f32,%f4,%f4
2332         ldd     [%o3+y0_0],%f2

2334         faddd   %f16,%f14,%f16

2336         faddd   %f26,%f24,%f26

2338         faddd   %f4,%f2,%f4

2340         faddd   %f16,%f10,%f16

2342         faddd   %f26,%f20,%f26

2344         faddd   %f32,%f4,%f6

2346         faddd   %f16,%f34,%f16
2347         ba,pt   %icc,.FIXSIGN

2349 ! delay slot
2350         faddd   %f26,%f36,%f26

2352         .align  32
2353 .CASE5:
2354         fand    %f18,%f44,%f14
2355         sub     %l1,%o7,%l1

2357         fmuld   %f0,%f0,%f0
2358         ldd     [%l5+%o3],%f32
2359         add     %l5,%o3,%l0

2361         fsubd   %f10,%f14,%f10
2362         srl     %l1,10,%l1

2364         fmuld   %f20,%f20,%f20
2365         ldd     [%l5+%o5],%f36
2366         add     %l5,%o5,%l2

2368         fmuld   %f0,%f32,%f4
2369         ldd     [%l0+0x10],%f6
2370         add     %fp,%o3,%o3
```

```
2372          faddd   %f10,%f12,%f10
2373          andn    %l1,0x1f,%l1

2375          fmuld   %f20,%f36,%f24
2376          ldd     [%l2+0x10],%f26
2377          add     %fp,%o5,%o5

2379          faddd   %f4,%f6,%f4
2380          ldd     [%l0+0x20],%f32

2382          fmuld   %f10,%f10,%f12
2383          add     %l1,%o4,%l1

2385          faddd   %f24,%f26,%f24
2386          ldd     [%l2+0x20],%f36

2388          fmuld   %f0,%f4,%f4
2389          ldd     [%l0+0x30],%f6

2391          fmuld   %f12,%f58,%f16
2392          ldd     [%l3+%l1],%f34

2394          fmuld   %f20,%f24,%f24
2395          ldd     [%l2+0x30],%f26

2397          faddd   %f4,%f32,%f4
2398          ldd     [%o3+x0_1],%f32

2400          faddd   %f16,%f56,%f16
2401          fmuld   %f12,%f62,%f14

2403          faddd   %f24,%f36,%f24
2404          ldd     [%o5+x2_1],%f36

2406          fmuld   %f0,%f4,%f4
2407          std     %f2,[%fp+y0_0]

2409          fmuld   %f12,%f16,%f16
2410          faddd   %f14,%f60,%f14

2412          fmuld   %f20,%f24,%f24
2413          std     %f22,[%fp+y2_0]

2415          faddd   %f4,%f6,%f4

2417          faddd   %f16,%f54,%f16
2418          fmuld   %f12,%f14,%f14
2419          ldd     [%g1+%l1],%f12

2421          faddd   %f24,%f26,%f24

2423          fmuld   %f0,%f4,%f4

2425          fmuld   %f10,%f16,%f16
2426          ldd     [%l4+%l1],%f10

2428          fmuld   %f14,%f34,%f14

2430          fmuld   %f20,%f24,%f24

2432          fmuld   %f16,%f12,%f16

2434          fmuld   %f32,%f4,%f4
2435          ldd     [%o3+y0_0],%f2

2437          fmuld   %f36,%f24,%f24
```



```
2438          ldd     [%o5+y2_0],%f22

2440          faddd   %f16,%f14,%f16

2442          faddd   %f4,%f2,%f4

2444          faddd   %f24,%f22,%f24

2446          faddd   %f16,%f10,%f16

2448          faddd   %f32,%f4,%f6

2450          faddd   %f36,%f24,%f26
2451          ba,pt   %icc,.FIXSIGN

2453 ! delay slot
2454          faddd   %f16,%f34,%f16

2456          .align  32
2457 .CASE6:
2458          ld      [%fp+x2_1],%l2
2459          add     %l3,8,%g1
2460          bne,pn  %icc,.CASE7
2461 ! delay slot
2462          fpadd32s %f20,%f31,%f28

2464          fand    %f28,%f44,%f24
2465          ldd     [%l5+%o3],%f32
2466          add     %l5,%o3,%l0

2468          fmuld   %f0,%f0,%f0
2469          sub     %l2,%o7,%l2

2471          fsubd   %f20,%f24,%f20
2472          srl     %l2,10,%l2

2474          fmuld   %f10,%f10,%f10
2475          ldd     [%l5+%o4],%f34
2476          add     %l5,%o4,%l1

2478          fmuld   %f0,%f32,%f4
2479          ldd     [%l0+0x10],%f6
2480          add     %fp,%o3,%o3

2482          faddd   %f20,%f22,%f20
2483          andn    %l2,0x1f,%l2

2485          fmuld   %f10,%f34,%f14
2486          ldd     [%l1+0x10],%f16
2487          add     %fp,%o4,%o4

2489          faddd   %f4,%f6,%f4
2490          ldd     [%l0+0x20],%f32

2492          fmuld   %f20,%f20,%f22
2493          add     %l2,%o5,%l2

2495          faddd   %f14,%f16,%f14
2496          ldd     [%l1+0x20],%f34

2498          fmuld   %f0,%f4,%f4
2499          ldd     [%l0+0x30],%f6

2501          fmuld   %f22,%f58,%f26
2502          ldd     [%l3+%l2],%f36
```

```
2504          fmuld   %f10,%f14,%f14
2505          ldd     [%l1+0x30],%f16

2507          faddd   %f4,%f32,%f4
2508          ldd     [%o3+x0_1],%f32

2510          faddd   %f26,%f56,%f26
2511          fmuld   %f22,%f62,%f24

2513          faddd   %f14,%f34,%f14
2514          ldd     [%o4+x1_1],%f34

2516          fmuld   %f0,%f4,%f4
2517          std     %f2,[%fp+y0_0]

2519          fmuld   %f22,%f26,%f26
2520          faddd   %f24,%f60,%f24

2522          fmuld   %f10,%f14,%f14
2523          std     %f12,[%fp+y1_0]

2525          faddd   %f4,%f6,%f4

2527          faddd   %f26,%f54,%f26
2528          fmuld   %f22,%f24,%f24
2529          ldd     [%g1+%l2],%f22

2531          faddd   %f14,%f16,%f14

2533          fmuld   %f0,%f4,%f4

2535          fmuld   %f20,%f26,%f26
2536          ldd     [%l4+%l2],%f20

2538          fmuld   %f24,%f36,%f24

2540          fmuld   %f10,%f14,%f14

2542          fmuld   %f26,%f22,%f26

2544          fmuld   %f32,%f4,%f4
2545          ldd     [%o3+y0_0],%f2

2547          fmuld   %f34,%f14,%f14
2548          ldd     [%o4+y1_0],%f12

2550          faddd   %f26,%f24,%f26

2552          faddd   %f4,%f2,%f4

2554          faddd   %f14,%f12,%f14

2556          faddd   %f26,%f20,%f26

2558          faddd   %f32,%f4,%f6

2560          faddd   %f34,%f14,%f16
2561          ba,pt   %icc,.FIXSIGN

2563 ! delay slot
2564          faddd   %f26,%f36,%f26

2566          .align  32
2567 .CASE7:
2568          fmuld   %f0,%f0,%f0
2569          ldd     [%l5+%o3],%f32
```



```
2570          add     %l5,%o3,%l0

2572          fmuld   %f10,%f10,%f10
2573          ldd     [%l5+%o4],%f34
2574          add     %l5,%o4,%l1

2576          fmuld   %f20,%f20,%f20
2577          ldd     [%l5+%o5],%f36
2578          add     %l5,%o5,%l2

2580          fmuld   %f0,%f32,%f4
2581          ldd     [%l0+0x10],%f6
2582          add     %fp,%o3,%o3

2584          fmuld   %f10,%f34,%f14
2585          ldd     [%l1+0x10],%f16
2586          add     %fp,%o4,%o4

2588          fmuld   %f20,%f36,%f24
2589          ldd     [%l2+0x10],%f26
2590          add     %fp,%o5,%o5

2592          faddd   %f4,%f6,%f4
2593          ldd     [%l0+0x20],%f32

2595          faddd   %f14,%f16,%f14
2596          ldd     [%l1+0x20],%f34

2598          faddd   %f24,%f26,%f24
2599          ldd     [%l2+0x20],%f36

2601          fmuld   %f0,%f4,%f4
2602          ldd     [%l0+0x30],%f6

2604          fmuld   %f10,%f14,%f14
2605          ldd     [%l1+0x30],%f16

2607          fmuld   %f20,%f24,%f24
2608          ldd     [%l2+0x30],%f26

2610          faddd   %f4,%f32,%f4
2611          ldd     [%o3+x0_1],%f32

2613          faddd   %f14,%f34,%f14
2614          ldd     [%o4+x1_1],%f34

2616          faddd   %f24,%f36,%f24
2617          ldd     [%o5+x2_1],%f36

2619          fmuld   %f0,%f4,%f4
2620          std     %f2,[%fp+y0_0]

2622          fmuld   %f10,%f14,%f14
2623          std     %f12,[%fp+y1_0]

2625          fmuld   %f20,%f24,%f24
2626          std     %f22,[%fp+y2_0]

2628          faddd   %f4,%f6,%f4

2630          faddd   %f14,%f16,%f14

2632          faddd   %f24,%f26,%f24

2634          fmuld   %f0,%f4,%f4
```

```
2636         fmuld   %f10,%f14,%f14

2638         fmuld   %f20,%f24,%f24

2640         fmuld   %f32,%f4,%f4
2641         ldd     [%o3+y0_0],%f2

2643         fmuld   %f34,%f14,%f14
2644         ldd     [%o4+y1_0],%f12

2646         fmuld   %f36,%f24,%f24
2647         ldd     [%o5+y2_0],%f22

2649         faddd   %f4,%f2,%f4

2651         faddd   %f14,%f12,%f14

2653         faddd   %f24,%f22,%f24

2655         faddd   %f32,%f4,%f6

2657         faddd   %f34,%f14,%f16
2658         ba,pt   %icc,.FIXSIGN

2660 ! delay slot
2661         faddd   %f36,%f24,%f26


2664         .align  32
2665 .ENDLOOP2:
2666         fmuld   %f10,%f40,%f12
2667         add     %l5,thresh,%g1
2668         faddd   %f12,%f42,%f12
2669         st      %f13,[%fp+n1]
2670         fsubd   %f12,%f42,%f12          ! n
2671         fmuld   %f12,%f46,%f14
2672         fsubd   %f10,%f14,%f14
2673         fmuld   %f12,%f48,%f16
2674         fsubd   %f14,%f16,%f10
2675         ld      [%fp+n1],%o4
2676         fsubd   %f14,%f10,%f34
2677         and     %o4,1,%o4
2678         fsubd   %f34,%f16,%f34
2679         fmuld   %f12,%f50,%f18
2680         sll     %o4,3,%o4
2681         fsubd   %f18,%f34,%f18
2682         ld      [%g1+%o4],%f16
2683         fsubd   %f10,%f18,%f14
2684         fsubd   %f10,%f14,%f34
2685         add     %l5,thresh+4,%o7
2686         fsubd   %f34,%f18,%f34
2687         fmuld   %f12,%f52,%f12
2688         fsubd   %f12,%f34,%f12
2689         ld      [%o7+%o4],%f18
2690         fsubd   %f14,%f12,%f10          ! x
2691         fsubd   %f14,%f10,%f14
2692         fands   %f10,%f30,%f19          ! save signbit
2693         fabsd   %f10,%f10
2694         std     %f10,[%fp+x1_1]
2695         fsubd   %f14,%f12,%f12          ! y
2696         fcmpgt32 %f16,%f10,%l1
2697         fxors   %f12,%f19,%f12
2698         fands   %f19,%f18,%f19          ! if (n & 1) clear sign bit
2699         andcc   %l1,2,%g0
2700         bne,pn  %icc,1f
2701 ! delay slot
```



```
2702         nop
2703         fpadd32s %f10,%f31,%f18
2704         ld      [%fp+x1_1],%l1
2705         fand    %f18,%f44,%f14
2706         sethi   %hi(0x3fc3c000),%o7
2707         add     %l3,8,%g1
2708         fsubd   %f10,%f14,%f10
2709         sub     %l1,%o7,%l1
2710         srl     %l1,10,%l1
2711         faddd   %f10,%f12,%f10
2712         andn    %l1,0x1f,%l1
2713         fmuld   %f10,%f10,%f12
2714         add     %l1,%o4,%l1
2715         fmuld   %f12,%f58,%f16
2716         ldd     [%l3+%l1],%f34
2717         faddd   %f16,%f56,%f16
2718         fmuld   %f12,%f62,%f14
2719         fmuld   %f12,%f16,%f16
2720         faddd   %f14,%f60,%f14
2721         faddd   %f16,%f54,%f16
2722         fmuld   %f12,%f14,%f14
2723         ldd     [%g1+%l1],%f12
2724         fmuld   %f10,%f16,%f16
2725         ldd     [%l4+%l1],%f10
2726         fmuld   %f14,%f34,%f14
2727         fmuld   %f16,%f12,%f16
2728         faddd   %f16,%f14,%f16
2729         faddd   %f16,%f10,%f16
2730         ba,pt   %icc,2f
2731         faddd   %f16,%f34,%f16
2732 1:
2733         fmuld   %f10,%f10,%f10
2734         ldd     [%l5+%o4],%f34
2735         add     %l5,%o4,%l1
2736         fmuld   %f10,%f34,%f14
2737         ldd     [%l1+0x10],%f16
2738         add     %fp,%o4,%o4
2739         faddd   %f14,%f16,%f14
2740         ldd     [%l1+0x20],%f34
2741         fmuld   %f10,%f14,%f14
2742         ldd     [%l1+0x30],%f16
2743         faddd   %f14,%f34,%f14
2744         ldd     [%o4+x1_1],%f34
2745         fmuld   %f10,%f14,%f14
2746         std     %f12,[%fp+y1_0]
2747         faddd   %f14,%f16,%f14
2748         fmuld   %f10,%f14,%f14
2749         fmuld   %f34,%f14,%f14
2750         ldd     [%o4+y1_0],%f12
2751         faddd   %f14,%f12,%f14
2752         faddd   %f34,%f14,%f16
2753 2:
2754         add     %l5,thresh-4,%g1
2755         ld      [%fp+n1],%o4
2756         and     %o4,2,%o4
2757         sll     %o4,2,%o4
2758         ld      [%g1+%o4],%f18
2759         fxors   %f19,%f18,%f19
2760         fors    %f16,%f19,%f16          ! tack on sign
2761         st      %f16,[%o1]
2762         st      %f17,[%o1+4]

2764 .ENDLOOP1:
2765         fmuld   %f0,%f40,%f2
2766         add     %l5,thresh,%g1
2767         faddd   %f2,%f42,%f2
```

```
2768         st      %f3,[%fp+n0]
2769         fsubd   %f2,%f42,%f2            ! n
2770         fmuld   %f2,%f46,%f4
2771         fsubd   %f0,%f4,%f4
2772         fmuld   %f2,%f48,%f6
2773         fsubd   %f4,%f6,%f0
2774         ld      [%fp+n0],%o3
2775         fsubd   %f4,%f0,%f32
2776         and     %o3,1,%o3
2777         fsubd   %f32,%f6,%f32
2778         fmuld   %f2,%f50,%f8
2779         sll     %o3,3,%o3
2780         fsubd   %f8,%f32,%f8
2781         ld      [%g1+%o3],%f6
2782         fsubd   %f0,%f8,%f4
2783         fsubd   %f0,%f4,%f32
2784         add     %l5,thresh+4,%o7
2785         fsubd   %f32,%f8,%f32
2786         fmuld   %f2,%f52,%f2
2787         fsubd   %f2,%f32,%f2
2788         ld      [%o7+%o3],%f8
2789         fsubd   %f4,%f2,%f0             ! x
2790         fsubd   %f4,%f0,%f4
2791         fands   %f0,%f30,%f9            ! save signbit
2792         fabsd   %f0,%f0
2793         std     %f0,[%fp+x0_1]
2794         fsubd   %f4,%f2,%f2             ! y
2795         fcmpgt32 %f6,%f0,%l0
2796         fxors   %f2,%f9,%f2
2797         fands   %f9,%f8,%f9             ! if (n & 1) clear sign bit
2798         andcc   %l0,2,%g0
2799         bne,pn  %icc,1f
2800 ! delay slot
2801         nop
2802         fpadd32s %f0,%f31,%f8
2803         ld      [%fp+x0_1],%l0
2804         fand    %f8,%f44,%f4
2805         sethi   %hi(0x3fc3c000),%o7
2806         add     %l3,8,%g1
2807         fsubd   %f0,%f4,%f0
2808         sub     %l0,%o7,%l0
2809         srl     %l0,10,%l0
2810         faddd   %f0,%f2,%f0
2811         andn    %l0,0x1f,%l0
2812         fmuld   %f0,%f0,%f2
2813         add     %l0,%o3,%l0
2814         fmuld   %f2,%f58,%f6
2815         ldd     [%l3+%l0],%f32
2816         faddd   %f6,%f56,%f6
2817         fmuld   %f2,%f62,%f4
2818         fmuld   %f2,%f6,%f6
2819         faddd   %f4,%f60,%f4
2820         faddd   %f6,%f54,%f6
2821         fmuld   %f2,%f4,%f4
2822         ldd     [%g1+%l0],%f2
2823         fmuld   %f0,%f6,%f6
2824         ldd     [%l4+%l0],%f0
2825         fmuld   %f4,%f32,%f4
2826         fmuld   %f6,%f2,%f6
2827         faddd   %f6,%f4,%f6
2828         faddd   %f6,%f0,%f6
2829         ba,pt   %icc,2f
2830         faddd   %f6,%f32,%f6
2831 1:
2832         fmuld   %f0,%f0,%f0
2833         ldd     [%l5+%o3],%f32
```



```
2834         add     %l5,%o3,%l0
2835         fmuld   %f0,%f32,%f4
2836         ldd     [%l0+0x10],%f6
2837         add     %fp,%o3,%o3
2838         faddd   %f4,%f6,%f4
2839         ldd     [%l0+0x20],%f32
2840         fmuld   %f0,%f4,%f4
2841         ldd     [%l0+0x30],%f6
2842         faddd   %f4,%f32,%f4
2843         ldd     [%o3+x0_1],%f32
2844         fmuld   %f0,%f4,%f4
2845         std     %f2,[%fp+y0_0]
2846         faddd   %f4,%f6,%f4
2847         fmuld   %f0,%f4,%f4
2848         fmuld   %f32,%f4,%f4
2849         ldd     [%o3+y0_0],%f2
2850         faddd   %f4,%f2,%f4
2851         faddd   %f32,%f4,%f6
2852 2:
2853         add     %l5,thresh-4,%g1
2854         ld      [%fp+n0],%o3
2855         and     %o3,2,%o3
2856         sll     %o3,2,%o3
2857         ld      [%g1+%o3],%f8
2858         fxors   %f9,%f8,%f9
2859         fors    %f6,%f9,%f6             ! tack on sign
2860         st      %f6,[%o0]
2861         st      %f7,[%o0+4]

2863 .ENDLOOP0:

2865 ! check for huge arguments remaining

2867         tst     LIM_l6
2868         be,pt   %icc,.exit
2869 ! delay slot
2870         nop

2872 ! ========== huge range (use C code) ==========

2874 #ifdef __sparcv9
2875         ldx     [%fp+xsave],%o1
2876         ldx     [%fp+ysave],%o3
2877 #else
2878         ld      [%fp+xsave],%o1
2879         ld      [%fp+ysave],%o3
2880 #endif
2881         ld      [%fp+nsave],%o0
2882         ld      [%fp+sxsave],%o2
2883         ld      [%fp+sysave],%o4
2884         sra     %o2,0,%o2               ! sign-extend for V9
2885         sra     %o4,0,%o4
2886         call    __vlibm_vsin_big
2887         mov     %l7,%o5                 ! delay slot

2889 .exit:
2890         ret
2891         restore


2894         .align  32
2895 .SKIP0:
2896         addcc   %i0,-1,%i0
2897         ble,pn  %icc,.ENDLOOP0
2898 ! delay slot, harmless if branch taken
2899         add     %i3,%i4,%i3             ! y += stridey
```

```
2900         andn    %l1,%i5,%l0             ! hx &= ~0x80000000
2901         fmovs   %f10,%f0
2902         ld      [%i1+4],%f1
2903         ba,pt   %icc,.LOOP0
2904 ! delay slot
2905         add     %i1,%i2,%i1             ! x += stridex


2908         .align  32
2909 .SKIP1:
2910         addcc   %i0,-1,%i0
2911         ble,pn  %icc,.ENDLOOP1
2912 ! delay slot, harmless if branch taken
2913         add     %i3,%i4,%i3             ! y += stridey
2914         andn    %l2,%i5,%l1             ! hx &= ~0x80000000
2915         fmovs   %f20,%f10
2916         ld      [%i1+4],%f11
2917         ba,pt   %icc,.LOOP1
2918 ! delay slot
2919         add     %i1,%i2,%i1             ! x += stridex


2922         .align  32
2923 .SKIP2:
2924         addcc   %i0,-1,%i0
2925         ble,pn  %icc,.ENDLOOP2
2926 ! delay slot, harmless if branch taken
2927         add     %i3,%i4,%i3             ! y += stridey
2928         ld      [%i1],%l2
2929         ld      [%i1],%f20
2930         ld      [%i1+4],%f21
2931         andn    %l2,%i5,%l2             ! hx &= ~0x80000000
2932         ba,pt   %icc,.LOOP2
2933 ! delay slot
2934         add     %i1,%i2,%i1             ! x += stridex


2937         .align  32
2938 .BIG0:
2939         sethi   %hi(0x7ff00000),%o7
2940         cmp     %l0,%o7
2941         bl,a,pt %icc,1f                 ! if hx < 0x7ff00000
2942 ! delay slot, annulled if branch not taken
2943         mov     %l7,LIM_l6              ! set biguns flag or
2944         fsubd   %f0,%f0,%f0             ! y = x - x
2945         st      %f0,[%o0]
2946         st      %f1,[%o0+4]
2947 1:
2948         addcc   %i0,-1,%i0
2949         ble,pn  %icc,.ENDLOOP0
2950 ! delay slot, harmless if branch taken
2951         andn    %l1,%i5,%l0             ! hx &= ~0x80000000
2952         fmovd   %f10,%f0
2953         ba,pt   %icc,.LOOP0
2954 ! delay slot
2955         add     %i1,%i2,%i1             ! x += stridex


2958         .align  32
2959 .BIG1:
2960         sethi   %hi(0x7ff00000),%o7
2961         cmp     %l1,%o7
2962         bl,a,pt %icc,1f                 ! if hx < 0x7ff00000
2963 ! delay slot, annulled if branch not taken
2964         mov     %l7,LIM_l6              ! set biguns flag or
2965         fsubd   %f10,%f10,%f10          ! y = x - x
```



```
2966         st      %f10,[%o1]
2967         st      %f11,[%o1+4]
2968 1:
2969         addcc   %i0,-1,%i0
2970         ble,pn  %icc,.ENDLOOP1
2971 ! delay slot, harmless if branch taken
2972         andn    %l2,%i5,%l1             ! hx &= ~0x80000000
2973         fmovd   %f20,%f10
2974         ba,pt   %icc,.LOOP1
2975 ! delay slot
2976         add     %i1,%i2,%i1             ! x += stridex


2979         .align  32
2980 .BIG2:
2981         sethi   %hi(0x7ff00000),%o7
2982         cmp     %l2,%o7
2983         bl,a,pt %icc,1f                 ! if hx < 0x7ff00000
2984 ! delay slot, annulled if branch not taken
2985         mov     %l7,LIM_l6              ! set biguns flag or
2986         fsubd   %f20,%f20,%f20          ! y = x - x
2987         st      %f20,[%o2]
2988         st      %f21,[%o2+4]
2989 1:
2990         addcc   %i0,-1,%i0
2991         ble,pn  %icc,.ENDLOOP2
2992 ! delay slot
2993         nop
2994         ld      [%i1],%l2
2995         ld      [%i1],%f20
2996         ld      [%i1+4],%f21
2997         andn    %l2,%i5,%l2             ! hx &= ~0x80000000
2998         ba,pt   %icc,.LOOP2
2999 ! delay slot
3000         add     %i1,%i2,%i1             ! x += stridex

3002         SET_SIZE(__vsin)
```

```
**********************************************************
   49944 Sat May 10 12:10:02 2014
new/usr/src/lib/libmvec/common/vis/__vsin_ultra3.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vsin_ultra3.S"

#include "libm.h"
#if defined(LIBMVEC_SO_BUILD)
        .weak   __vsin
        .type   __vsin,#function
        __vsin = __vsin_ultra3
#endif

        RO_DATA
        .align  64
constants:
        .word   0x42c80000,0x00000000   ! 3 * 2^44
        .word   0x43380000,0x00000000   ! 3 * 2^51
        .word   0x3fe45f30,0x6dc9c883   ! invpio2
        .word   0x3ff921fb,0x54442c00   ! pio2_1
        .word   0x3d318469,0x898cc400   ! pio2_2
        .word   0x3a71701b,0x839a2520   ! pio2_3
        .word   0xbfc55555,0x55555533   ! pp1
        .word   0x3f811111,0x10e7d53b   ! pp2
        .word   0xbf2a0167,0xe6b3cf9b   ! pp3
        .word   0xbfdfffff,0xffffff65   ! qq1
        .word   0x3fa55555,0x54f88ed0   ! qq2
        .word   0xbf56c12c,0xdd185f60   ! qq3

! local storage indices

#define xsave           STACK_BIAS-0x8
#define ysave           STACK_BIAS-0x10
#define nsave           STACK_BIAS-0x14
#define sxsave          STACK_BIAS-0x18
#define sysave          STACK_BIAS-0x1c
#define biguns          STACK_BIAS-0x20
```



```
#define nk3             STACK_BIAS-0x24
#define nk2             STACK_BIAS-0x28
#define nk1             STACK_BIAS-0x2c
#define nk0             STACK_BIAS-0x30
#define junk            STACK_BIAS-0x38
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x40

! register use

! i0  n
! i1  x
! i2  stridex
! i3  y
! i4  stridey
! i5  0x80000000

! l0  hx0
! l1  hx1
! l2  hx2
! l3  hx3
! l4  k0
! l5  k1
! l6  k2
! l7  k3

! the following are 64-bit registers in both V8+ and V9

! g1  __vlibm_TBL_sincos2
! g5  scratch

! o0  py0
! o1  py1
! o2  py2
! o3  py3
! o4  0x3e400000
! o5  0x3fe921fb,0x4099251e
! o7  scratch

! f0  hx0
! f2
! f4
! f6
! f8  hx1
! f10
! f12
! f14
! f16 hx2
! f18
! f20
! f22
! f24 hx3
! f26
! f28
! f30
! f32
! f34
! f36
! f38

#define c3two44 %f40
#define c3two51 %f42
#define invpio2 %f44
#define pio2_1  %f46
#define pio2_2  %f48
#define pio2_3  %f50
```

```
#define pp1     %f52
#define pp2     %f54
#define pp3     %f56
#define qq1     %f58
#define qq2     %f60
#define qq3     %f62

        ENTRY(__vsin_ultra3)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,constants,o0)
        PIC_SET(l7,__vlibm_TBL_sincos2,o1)
        mov     %o1,%g1
        wr      %g0,0x82,%asi           ! set %asi for non-faulting loads
#ifdef __sparcv9
        stx     %i1,[%fp+xsave]         ! save arguments
        stx     %i3,[%fp+ysave]
#else
        st      %i1,[%fp+xsave]         ! save arguments
        st      %i3,[%fp+ysave]
#endif
        st      %i0,[%fp+nsave]
        st      %i2,[%fp+sxsave]
        st      %i4,[%fp+sysave]
        st      %g0,[%fp+biguns]        ! biguns = 0
        ldd     [%o0+0x00],c3two44      ! load/set up constants
        ldd     [%o0+0x08],c3two51
        ldd     [%o0+0x10],invpio2
        ldd     [%o0+0x18],pio2_1
        ldd     [%o0+0x20],pio2_2
        ldd     [%o0+0x28],pio2_3
        ldd     [%o0+0x30],pp1
        ldd     [%o0+0x38],pp2
        ldd     [%o0+0x40],pp3
        ldd     [%o0+0x48],qq1
        ldd     [%o0+0x50],qq2
        ldd     [%o0+0x58],qq3
        sethi   %hi(0x80000000),%i5
        sethi   %hi(0x3e400000),%o4
        sethi   %hi(0x3fe921fb),%o5
        or      %o5,%lo(0x3fe921fb),%o5
        sllx    %o5,32,%o5
        sethi   %hi(0x4099251e),%o7
        or      %o7,%lo(0x4099251e),%o7
        or      %o5,%o7,%o5
        sll     %i2,3,%i2               ! scale strides
        sll     %i4,3,%i4
        add     %fp,junk,%o1            ! loop prologue
        add     %fp,junk,%o2
        add     %fp,junk,%o3
        ld      [%i1],%l0               ! *x
        ld      [%i1],%f0
        ld      [%i1+4],%f3
        andn    %l0,%i5,%l0             ! mask off sign
        ba      .loop0
        add     %i1,%i2,%i1             ! x += stridex

! 16-byte aligned
        .align  16
.loop0:
        lda     [%i1]%asi,%l1           ! preload next argument
        sub     %l0,%o4,%g5
        sub     %o5,%l0,%o7
        fabss   %f0,%f2

        lda     [%i1]%asi,%f8
```



```
        orcc    %o7,%g5,%g0
        mov     %i3,%o0                 ! py0 = y
        bl,pn   %icc,.range0            ! hx < 0x3e400000 or hx > 0x4099251e

! delay slot
        lda     [%i1+4]%asi,%f11
        addcc   %i0,-1,%i0
        add     %i3,%i4,%i3             ! y += stridey
        ble,pn  %icc,.last1

! delay slot
        andn    %l1,%i5,%l1
        add     %i1,%i2,%i1             ! x += stridex
        faddd   %f2,c3two44,%f4
        st      %f15,[%o1+4]

.loop1:
        lda     [%i1]%asi,%l2           ! preload next argument
        sub     %l1,%o4,%g5
        sub     %o5,%l1,%o7
        fabss   %f8,%f10

        lda     [%i1]%asi,%f16
        orcc    %o7,%g5,%g0
        mov     %i3,%o1                 ! py1 = y
        bl,pn   %icc,.range1            ! hx < 0x3e400000 or hx > 0x4099251e

! delay slot
        lda     [%i1+4]%asi,%f19
        addcc   %i0,-1,%i0
        add     %i3,%i4,%i3             ! y += stridey
        ble,pn  %icc,.last2

! delay slot
        andn    %l2,%i5,%l2
        add     %i1,%i2,%i1             ! x += stridex
        faddd   %f10,c3two44,%f12
        st      %f23,[%o2+4]

.loop2:
        lda     [%i1]%asi,%l3           ! preload next argument
        sub     %l2,%o4,%g5
        sub     %o5,%l2,%o7
        fabss   %f16,%f18

        lda     [%i1]%asi,%f24
        orcc    %o7,%g5,%g0
        mov     %i3,%o2                 ! py2 = y
        bl,pn   %icc,.range2            ! hx < 0x3e400000 or hx > 0x4099251e

! delay slot
        lda     [%i1+4]%asi,%f27
        addcc   %i0,-1,%i0
        add     %i3,%i4,%i3             ! y += stridey
        ble,pn  %icc,.last3

! delay slot
        andn    %l3,%i5,%l3
        add     %i1,%i2,%i1             ! x += stridex
        faddd   %f18,c3two44,%f20
        st      %f31,[%o3+4]

.loop3:
        sub     %l3,%o4,%g5
        sub     %o5,%l3,%o7
        fabss   %f24,%f26
```

```
260         st      %f5,[%fp+nk0]

262         orcc    %o7,%g5,%g0
263         mov     %i3,%o3                 ! py3 = y
264         bl,pn   %icc,.range3            ! hx < 0x3e400000 or > hx 0x4099251e
265 ! delay slot
266         st      %f13,[%fp+nk1]

268 !!! DONE?
269 .cont:
270         srlx    %o5,32,%o7
271         add     %i3,%i4,%i3             ! y += stridey
272         fmovs   %f3,%f1
273         st      %f21,[%fp+nk2]

275         sub     %o7,%l0,%l0
276         sub     %o7,%l1,%l1
277         faddd   %f26,c3two44,%f28
278         st      %f29,[%fp+nk3]

280         sub     %o7,%l2,%l2
281         sub     %o7,%l3,%l3
282         fmovs   %f11,%f9

284         or      %l0,%l1,%l0
285         or      %l2,%l3,%l2
286         fmovs   %f19,%f17

288         fmovs   %f27,%f25
289         fmuld   %f0,invpio2,%f6         ! x * invpio2, for medium range

291         fmuld   %f8,invpio2,%f14
292         ld      [%fp+nk0],%l4

294         fmuld   %f16,invpio2,%f22
295         ld      [%fp+nk1],%l5

297         orcc    %l0,%l2,%g0
298         bl,pn   %icc,.medium
299 ! delay slot
300         fmuld   %f24,invpio2,%f30
301         ld      [%fp+nk2],%l6

303         ld      [%fp+nk3],%l7
304         sll     %l4,5,%l4               ! k
305         fcmpd   %fcc0,%f0,pio2_3        ! x < pio2_3 iff x < 0

307         sll     %l5,5,%l5
308         ldd     [%l4+%g1],%f4
309         fcmpd   %fcc1,%f8,pio2_3

311         sll     %l6,5,%l6
312         ldd     [%l5+%g1],%f12
313         fcmpd   %fcc2,%f16,pio2_3

315         sll     %l7,5,%l7
316         ldd     [%l6+%g1],%f20
317         fcmpd   %fcc3,%f24,pio2_3

319         ldd     [%l7+%g1],%f28
320         fsubd   %f2,%f4,%f2             ! x -= __vlibm_TBL_sincos2[k]

322         fsubd   %f10,%f12,%f10

324         fsubd   %f18,%f20,%f18
```



```
326         fsubd   %f26,%f28,%f26

328         fmuld   %f2,%f2,%f0             ! z = x * x

330         fmuld   %f10,%f10,%f8

332         fmuld   %f18,%f18,%f16

334         fmuld   %f26,%f26,%f24

336         fmuld   %f0,pp3,%f6

338         fmuld   %f8,pp3,%f14

340         fmuld   %f16,pp3,%f22

342         fmuld   %f24,pp3,%f30

344         faddd   %f6,pp2,%f6
345         fmuld   %f0,qq2,%f4

347         faddd   %f14,pp2,%f14
348         fmuld   %f8,qq2,%f12

350         faddd   %f22,pp2,%f22
351         fmuld   %f16,qq2,%f20

353         faddd   %f30,pp2,%f30
354         fmuld   %f24,qq2,%f28

356         fmuld   %f0,%f6,%f6
357         faddd   %f4,qq1,%f4

359         fmuld   %f8,%f14,%f14
360         faddd   %f12,qq1,%f12

362         fmuld   %f16,%f22,%f22
363         faddd   %f20,qq1,%f20

365         fmuld   %f24,%f30,%f30
366         faddd   %f28,qq1,%f28

368         faddd   %f6,pp1,%f6
369         fmuld   %f0,%f4,%f4
370         add     %l4,%g1,%l4

372         faddd   %f14,pp1,%f14
373         fmuld   %f8,%f12,%f12
374         add     %l5,%g1,%l5

376         faddd   %f22,pp1,%f22
377         fmuld   %f16,%f20,%f20
378         add     %l6,%g1,%l6

380         faddd   %f30,pp1,%f30
381         fmuld   %f24,%f28,%f28
382         add     %l7,%g1,%l7

384         fmuld   %f0,%f6,%f6
385         ldd     [%l4+8],%f0

387         fmuld   %f8,%f14,%f14
388         ldd     [%l5+8],%f8

390         fmuld   %f16,%f22,%f22
391         ldd     [%l6+8],%f16
```

```
393         fmuld   %f24,%f30,%f30
394         ldd     [%l7+8],%f24

396         fmuld   %f2,%f6,%f6

398         fmuld   %f10,%f14,%f14

400         fmuld   %f18,%f22,%f22

402         fmuld   %f26,%f30,%f30

404         faddd   %f6,%f2,%f6
405         fmuld   %f0,%f4,%f4
406         ldd     [%l4+16],%f2

408         faddd   %f14,%f10,%f14
409         fmuld   %f8,%f12,%f12
410         ldd     [%l5+16],%f10

412         faddd   %f22,%f18,%f22
413         fmuld   %f16,%f20,%f20
414         ldd     [%l6+16],%f18

416         faddd   %f30,%f26,%f30
417         fmuld   %f24,%f28,%f28
418         ldd     [%l7+16],%f26

420         fmuld   %f2,%f6,%f6

422         fmuld   %f10,%f14,%f14

424         fmuld   %f18,%f22,%f22

426         fmuld   %f26,%f30,%f30

428         faddd   %f6,%f4,%f6

430         faddd   %f14,%f12,%f14

432         faddd   %f22,%f20,%f22

434         faddd   %f30,%f28,%f30

436         faddd   %f6,%f0,%f6

438         faddd   %f14,%f8,%f14

440         faddd   %f22,%f16,%f22

442         faddd   %f30,%f24,%f30

444         fnegd   %f6,%f4
445         lda     [%i1]%asi,%l0           ! preload next argument

447         fnegd   %f14,%f12
448         lda     [%i1]%asi,%f0

450         fnegd   %f22,%f20
451         lda     [%i1+4]%asi,%f3

453         fnegd   %f30,%f28
454         andn    %l0,%i5,%l0
455         add     %i1,%i2,%i1

457         fmovdl  %fcc0,%f4,%f6           ! (hx < -0)? -s : s
```



```
458         st      %f6,[%o0]

460         fmovdl  %fcc1,%f12,%f14
461         st      %f14,[%o1]

463         fmovdl  %fcc2,%f20,%f22
464         st      %f22,[%o2]

466         fmovdl  %fcc3,%f28,%f30
467         st      %f30,[%o3]
468         addcc   %i0,-1,%i0

470         bg,pt   %icc,.loop0
471 ! delay slot
472         st      %f7,[%o0+4]

474         ba,pt   %icc,.end
475 ! delay slot
476         nop


479         .align  16
480 .medium:
481         faddd   %f6,c3two51,%f4
482         st      %f5,[%fp+nk0]

484         faddd   %f14,c3two51,%f12
485         st      %f13,[%fp+nk1]

487         faddd   %f22,c3two51,%f20
488         st      %f21,[%fp+nk2]

490         faddd   %f30,c3two51,%f28
491         st      %f29,[%fp+nk3]

493         fsubd   %f4,c3two51,%f6

495         fsubd   %f12,c3two51,%f14

497         fsubd   %f20,c3two51,%f22

499         fsubd   %f28,c3two51,%f30

501         fmuld   %f6,pio2_1,%f2
502         ld      [%fp+nk0],%l0           ! n

504         fmuld   %f14,pio2_1,%f10
505         ld      [%fp+nk1],%l1

507         fmuld   %f22,pio2_1,%f18
508         ld      [%fp+nk2],%l2

510         fmuld   %f30,pio2_1,%f26
511         ld      [%fp+nk3],%l3

513         fsubd   %f0,%f2,%f0
514         fmuld   %f6,pio2_2,%f4

516         fsubd   %f8,%f10,%f8
517         fmuld   %f14,pio2_2,%f12

519         fsubd   %f16,%f18,%f16
520         fmuld   %f22,pio2_2,%f20

522         fsubd   %f24,%f26,%f24
523         fmuld   %f30,pio2_2,%f28
```

```
525         fsubd   %f0,%f4,%f32

527         fsubd   %f8,%f12,%f34

529         fsubd   %f16,%f20,%f36

531         fsubd   %f24,%f28,%f38

533         fsubd   %f0,%f32,%f0
534         fcmple32 %f32,pio2_3,%l4        ! x <= pio2_3 iff x < 0

536         fsubd   %f8,%f34,%f8
537         fcmple32 %f34,pio2_3,%l5

539         fsubd   %f16,%f36,%f16
540         fcmple32 %f36,pio2_3,%l6

542         fsubd   %f24,%f38,%f24
543         fcmple32 %f38,pio2_3,%l7

545         fsubd   %f0,%f4,%f0
546         fmuld   %f6,pio2_3,%f6
547         sll     %l4,30,%l4              ! if (x < 0) n = -n ^ 2

549         fsubd   %f8,%f12,%f8
550         fmuld   %f14,pio2_3,%f14
551         sll     %l5,30,%l5

553         fsubd   %f16,%f20,%f16
554         fmuld   %f22,pio2_3,%f22
555         sll     %l6,30,%l6

557         fsubd   %f24,%f28,%f24
558         fmuld   %f30,pio2_3,%f30
559         sll     %l7,30,%l7

561         fsubd   %f6,%f0,%f6
562         sra     %l4,31,%l4

564         fsubd   %f14,%f8,%f14
565         sra     %l5,31,%l5

567         fsubd   %f22,%f16,%f22
568         sra     %l6,31,%l6

570         fsubd   %f30,%f24,%f30
571         sra     %l7,31,%l7

573         fsubd   %f32,%f6,%f0            ! reduced x
574         xor     %l0,%l4,%l0

576         fsubd   %f34,%f14,%f8
577         xor     %l1,%l5,%l1

579         fsubd   %f36,%f22,%f16
580         xor     %l2,%l6,%l2

582         fsubd   %f38,%f30,%f24
583         xor     %l3,%l7,%l3

585         fabsd   %f0,%f2
586         sub     %l0,%l4,%l0

588         fabsd   %f8,%f10
589         sub     %l1,%l5,%l1
```



```
591         fabsd   %f16,%f18
592         sub     %l2,%l6,%l2

594         fabsd   %f24,%f26
595         sub     %l3,%l7,%l3

597         faddd   %f2,c3two44,%f4
598         st      %f5,[%fp+nk0]
599         and     %l4,2,%l4

601         faddd   %f10,c3two44,%f12
602         st      %f13,[%fp+nk1]
603         and     %l5,2,%l5

605         faddd   %f18,c3two44,%f20
606         st      %f21,[%fp+nk2]
607         and     %l6,2,%l6

609         faddd   %f26,c3two44,%f28
610         st      %f29,[%fp+nk3]
611         and     %l7,2,%l7

613         fsubd   %f32,%f0,%f4
614         xor     %l0,%l4,%l0

616         fsubd   %f34,%f8,%f12
617         xor     %l1,%l5,%l1

619         fsubd   %f36,%f16,%f20
620         xor     %l2,%l6,%l2

622         fsubd   %f38,%f24,%f28
623         xor     %l3,%l7,%l3

625         fzero   %f38
626         ld      [%fp+nk0],%l4

628         fsubd   %f4,%f6,%f6             ! w
629         ld      [%fp+nk1],%l5

631         fsubd   %f12,%f14,%f14
632         ld      [%fp+nk2],%l6

634         fnegd   %f38,%f38
635         ld      [%fp+nk3],%l7
636         sll     %l4,5,%l4               ! k

638         fsubd   %f20,%f22,%f22
639         sll     %l5,5,%l5

641         fsubd   %f28,%f30,%f30
642         sll     %l6,5,%l6

644         fand    %f0,%f38,%f32           ! sign bit of x
645         ldd     [%l4+%g1],%f4
646         sll     %l7,5,%l7

648         fand    %f8,%f38,%f34
649         ldd     [%l5+%g1],%f12

651         fand    %f16,%f38,%f36
652         ldd     [%l6+%g1],%f20

654         fand    %f24,%f38,%f38
655         ldd     [%l7+%g1],%f28
```

```
657         fsubd   %f2,%f4,%f2              ! x -= __vlibm_TBL_sincos2[k]

659         fsubd   %f10,%f12,%f10

661         fsubd   %f18,%f20,%f18
662         nop

664         fsubd   %f26,%f28,%f26
665         nop

667 ! 16-byte aligned
668         fmuld   %f2,%f2,%f0             ! z = x * x
669         andcc   %l0,1,%g0
670         bz,pn   %icc,.case8
671 ! delay slot
672         fxor    %f6,%f32,%f32

674         fmuld   %f10,%f10,%f8
675         andcc   %l1,1,%g0
676         bz,pn   %icc,.case4
677 ! delay slot
678         fxor    %f14,%f34,%f34

680         fmuld   %f18,%f18,%f16
681         andcc   %l2,1,%g0
682         bz,pn   %icc,.case2
683 ! delay slot
684         fxor    %f22,%f36,%f36

686         fmuld   %f26,%f26,%f24
687         andcc   %l3,1,%g0
688         bz,pn   %icc,.case1
689 ! delay slot
690         fxor    %f30,%f38,%f38

692 !.case0:
693         fmuld   %f0,qq3,%f6             ! cos(x0)

695         fmuld   %f8,qq3,%f14            ! cos(x1)

697         fmuld   %f16,qq3,%f22           ! cos(x2)

699         fmuld   %f24,qq3,%f30           ! cos(x3)

701         faddd   %f6,qq2,%f6
702         fmuld   %f0,pp2,%f4

704         faddd   %f14,qq2,%f14
705         fmuld   %f8,pp2,%f12

707         faddd   %f22,qq2,%f22
708         fmuld   %f16,pp2,%f20

710         faddd   %f30,qq2,%f30
711         fmuld   %f24,pp2,%f28

713         fmuld   %f0,%f6,%f6
714         faddd   %f4,pp1,%f4

716         fmuld   %f8,%f14,%f14
717         faddd   %f12,pp1,%f12

719         fmuld   %f16,%f22,%f22
720         faddd   %f20,pp1,%f20
```



```
722         fmuld   %f24,%f30,%f30
723         faddd   %f28,pp1,%f28

725         faddd   %f6,qq1,%f6
726         fmuld   %f0,%f4,%f4
727         add     %l4,%g1,%l4

729         faddd   %f14,qq1,%f14
730         fmuld   %f8,%f12,%f12
731         add     %l5,%g1,%l5

733         faddd   %f22,qq1,%f22
734         fmuld   %f16,%f20,%f20
735         add     %l6,%g1,%l6

737         faddd   %f30,qq1,%f30
738         fmuld   %f24,%f28,%f28
739         add     %l7,%g1,%l7

741         fmuld   %f2,%f4,%f4

743         fmuld   %f10,%f12,%f12

745         fmuld   %f18,%f20,%f20

747         fmuld   %f26,%f28,%f28

749         fmuld   %f0,%f6,%f6
750         faddd   %f4,%f32,%f4
751         ldd     [%l4+16],%f0

753         fmuld   %f8,%f14,%f14
754         faddd   %f12,%f34,%f12
755         ldd     [%l5+16],%f8

757         fmuld   %f16,%f22,%f22
758         faddd   %f20,%f36,%f20
759         ldd     [%l6+16],%f16

761         fmuld   %f24,%f30,%f30
762         faddd   %f28,%f38,%f28
763         ldd     [%l7+16],%f24

765         fmuld   %f0,%f6,%f6
766         faddd   %f4,%f2,%f4
767         ldd     [%l4+8],%f32

769         fmuld   %f8,%f14,%f14
770         faddd   %f12,%f10,%f12
771         ldd     [%l5+8],%f34

773         fmuld   %f16,%f22,%f22
774         faddd   %f20,%f18,%f20
775         ldd     [%l6+8],%f36

777         fmuld   %f24,%f30,%f30
778         faddd   %f28,%f26,%f28
779         ldd     [%l7+8],%f38

781         fmuld   %f32,%f4,%f4

783         fmuld   %f34,%f12,%f12

785         fmuld   %f36,%f20,%f20

787         fmuld   %f38,%f28,%f28
```

```
789         fsubd   %f6,%f4,%f6

791         fsubd   %f14,%f12,%f14

793         fsubd   %f22,%f20,%f22

795         fsubd   %f30,%f28,%f30

797         faddd   %f6,%f0,%f6

799         faddd   %f14,%f8,%f14

801         faddd   %f22,%f16,%f22

803         faddd   %f30,%f24,%f30
804         mov     %l0,%l4

806         fnegd   %f6,%f4
807         lda     [%i1]%asi,%l0           ! preload next argument

809         fnegd   %f14,%f12
810         lda     [%i1]%asi,%f0

812         fnegd   %f22,%f20
813         lda     [%i1+4]%asi,%f3

815         fnegd   %f30,%f28
816         andn    %l0,%i5,%l0
817         add     %i1,%i2,%i1

819         andcc   %l4,2,%g0
820         fmovdnz %icc,%f4,%f6
821         st      %f6,[%o0]

823         andcc   %l1,2,%g0
824         fmovdnz %icc,%f12,%f14
825         st      %f14,[%o1]

827         andcc   %l2,2,%g0
828         fmovdnz %icc,%f20,%f22
829         st      %f22,[%o2]

831         andcc   %l3,2,%g0
832         fmovdnz %icc,%f28,%f30
833         st      %f30,[%o3]

835         addcc   %i0,-1,%i0
836         bg,pt   %icc,.loop0
837 ! delay slot
838         st      %f7,[%o0+4]

840         ba,pt   %icc,.end
841 ! delay slot
842         nop

844         .align  16
845 .case1:
846         fmuld   %f24,pp3,%f30           ! sin(x3)

848         fmuld   %f0,qq3,%f6             ! cos(x0)

850         fmuld   %f8,qq3,%f14            ! cos(x1)

852         fmuld   %f16,qq3,%f22           ! cos(x2)
```



```
854         faddd   %f30,pp2,%f30
855         fmuld   %f24,qq2,%f28

857         faddd   %f6,qq2,%f6
858         fmuld   %f0,pp2,%f4

860         faddd   %f14,qq2,%f14
861         fmuld   %f8,pp2,%f12

863         faddd   %f22,qq2,%f22
864         fmuld   %f16,pp2,%f20

866         fmuld   %f24,%f30,%f30
867         faddd   %f28,qq1,%f28

869         fmuld   %f0,%f6,%f6
870         faddd   %f4,pp1,%f4

872         fmuld   %f8,%f14,%f14
873         faddd   %f12,pp1,%f12

875         fmuld   %f16,%f22,%f22
876         faddd   %f20,pp1,%f20

878         faddd   %f30,pp1,%f30
879         fmuld   %f24,%f28,%f28
880         add     %l7,%g1,%l7

882         faddd   %f6,qq1,%f6
883         fmuld   %f0,%f4,%f4
884         add     %l4,%g1,%l4

886         faddd   %f14,qq1,%f14
887         fmuld   %f8,%f12,%f12
888         add     %l5,%g1,%l5

890         faddd   %f22,qq1,%f22
891         fmuld   %f16,%f20,%f20
892         add     %l6,%g1,%l6

894         fmuld   %f24,%f30,%f30

896         fmuld   %f2,%f4,%f4

898         fmuld   %f10,%f12,%f12

900         fmuld   %f18,%f20,%f20

902         fmuld   %f26,%f30,%f30
903         ldd     [%l7+8],%f24

905         fmuld   %f0,%f6,%f6
906         faddd   %f4,%f32,%f4
907         ldd     [%l4+16],%f0

909         fmuld   %f8,%f14,%f14
910         faddd   %f12,%f34,%f12
911         ldd     [%l5+16],%f8

913         fmuld   %f16,%f22,%f22
914         faddd   %f20,%f36,%f20
915         ldd     [%l6+16],%f16

917         fmuld   %f24,%f28,%f28
918         faddd   %f38,%f30,%f30
```

```
 920         fmuld   %f0,%f6,%f6
 921         faddd   %f4,%f2,%f4
 922         ldd     [%l4+8],%f32

 924         fmuld   %f8,%f14,%f14
 925         faddd   %f12,%f10,%f12
 926         ldd     [%l5+8],%f34

 928         fmuld   %f16,%f22,%f22
 929         faddd   %f20,%f18,%f20
 930         ldd     [%l6+8],%f36

 932         faddd   %f26,%f30,%f30
 933         ldd     [%l7+16],%f38

 935         fmuld   %f32,%f4,%f4

 937         fmuld   %f34,%f12,%f12

 939         fmuld   %f36,%f20,%f20

 941         fmuld   %f38,%f30,%f30

 943         fsubd   %f6,%f4,%f6

 945         fsubd   %f14,%f12,%f14

 947         fsubd   %f22,%f20,%f22

 949         faddd   %f30,%f28,%f30

 951         faddd   %f6,%f0,%f6

 953         faddd   %f14,%f8,%f14

 955         faddd   %f22,%f16,%f22

 957         faddd   %f30,%f24,%f30
 958         mov     %l0,%l4

 960         fnegd   %f6,%f4
 961         lda     [%i1]%asi,%l0           ! preload next argument

 963         fnegd   %f14,%f12
 964         lda     [%i1]%asi,%f0

 966         fnegd   %f22,%f20
 967         lda     [%i1+4]%asi,%f3

 969         fnegd   %f30,%f28
 970         andn    %l0,%i5,%l0
 971         add     %i1,%i2,%i1

 973         andcc   %l4,2,%g0
 974         fmovdnz %icc,%f4,%f6
 975         st      %f6,[%o0]

 977         andcc   %l1,2,%g0
 978         fmovdnz %icc,%f12,%f14
 979         st      %f14,[%o1]

 981         andcc   %l2,2,%g0
 982         fmovdnz %icc,%f20,%f22
 983         st      %f22,[%o2]

 985         andcc   %l3,2,%g0
```



```
 986         fmovdnz %icc,%f28,%f30
 987         st      %f30,[%o3]

 989         addcc   %i0,-1,%i0
 990         bg,pt   %icc,.loop0
 991 ! delay slot
 992         st      %f7,[%o0+4]

 994         ba,pt   %icc,.end
 995 ! delay slot
 996         nop

 998         .align  16
 999 .case2:
1000         fmuld   %f26,%f26,%f24
1001         andcc   %l3,1,%g0
1002         bz,pn   %icc,.case3
1003 ! delay slot
1004         fxor    %f30,%f38,%f38

1006         fmuld   %f16,pp3,%f22           ! sin(x2)

1008         fmuld   %f0,qq3,%f6             ! cos(x0)

1010         fmuld   %f8,qq3,%f14            ! cos(x1)

1012         faddd   %f22,pp2,%f22
1013         fmuld   %f16,qq2,%f20

1015         fmuld   %f24,qq3,%f30           ! cos(x3)

1017         faddd   %f6,qq2,%f6
1018         fmuld   %f0,pp2,%f4

1020         faddd   %f14,qq2,%f14
1021         fmuld   %f8,pp2,%f12

1023         fmuld   %f16,%f22,%f22
1024         faddd   %f20,qq1,%f20

1026         faddd   %f30,qq2,%f30
1027         fmuld   %f24,pp2,%f28

1029         fmuld   %f0,%f6,%f6
1030         faddd   %f4,pp1,%f4

1032         fmuld   %f8,%f14,%f14
1033         faddd   %f12,pp1,%f12

1035         faddd   %f22,pp1,%f22
1036         fmuld   %f16,%f20,%f20
1037         add     %l6,%g1,%l6

1039         fmuld   %f24,%f30,%f30
1040         faddd   %f28,pp1,%f28

1042         faddd   %f6,qq1,%f6
1043         fmuld   %f0,%f4,%f4
1044         add     %l4,%g1,%l4

1046         faddd   %f14,qq1,%f14
1047         fmuld   %f8,%f12,%f12
1048         add     %l5,%g1,%l5

1050         fmuld   %f16,%f22,%f22
```

```
1052          faddd   %f30,qq1,%f30
1053          fmuld   %f24,%f28,%f28
1054          add     %l7,%g1,%l7

1056          fmuld   %f2,%f4,%f4

1058          fmuld   %f10,%f12,%f12

1060          fmuld   %f18,%f22,%f22
1061          ldd     [%l6+8],%f16

1063          fmuld   %f26,%f28,%f28

1065          fmuld   %f0,%f6,%f6
1066          faddd   %f4,%f32,%f4
1067          ldd     [%l4+16],%f0

1069          fmuld   %f8,%f14,%f14
1070          faddd   %f12,%f34,%f12
1071          ldd     [%l5+16],%f8

1073          fmuld   %f16,%f20,%f20
1074          faddd   %f36,%f22,%f22

1076          fmuld   %f24,%f30,%f30
1077          faddd   %f28,%f38,%f28
1078          ldd     [%l7+16],%f24

1080          fmuld   %f0,%f6,%f6
1081          faddd   %f4,%f2,%f4
1082          ldd     [%l4+8],%f32

1084          fmuld   %f8,%f14,%f14
1085          faddd   %f12,%f10,%f12
1086          ldd     [%l5+8],%f34

1088          faddd   %f18,%f22,%f22
1089          ldd     [%l6+16],%f36

1091          fmuld   %f24,%f30,%f30
1092          faddd   %f28,%f26,%f28
1093          ldd     [%l7+8],%f38

1095          fmuld   %f32,%f4,%f4

1097          fmuld   %f34,%f12,%f12

1099          fmuld   %f36,%f22,%f22

1101          fmuld   %f38,%f28,%f28

1103          fsubd   %f6,%f4,%f6

1105          fsubd   %f14,%f12,%f14

1107          faddd   %f22,%f20,%f22

1109          fsubd   %f30,%f28,%f30

1111          faddd   %f6,%f0,%f6

1113          faddd   %f14,%f8,%f14

1115          faddd   %f22,%f16,%f22

1117          faddd   %f30,%f24,%f30
```



```
1118          mov     %l0,%l4

1120          fnegd   %f6,%f4
1121          lda     [%i1]%asi,%l0           ! preload next argument

1123          fnegd   %f14,%f12
1124          lda     [%i1]%asi,%f0

1126          fnegd   %f22,%f20
1127          lda     [%i1+4]%asi,%f3

1129          fnegd   %f30,%f28
1130          andn    %l0,%i5,%l0
1131          add     %i1,%i2,%i1

1133          andcc   %l4,2,%g0
1134          fmovdnz %icc,%f4,%f6
1135          st      %f6,[%o0]

1137          andcc   %l1,2,%g0
1138          fmovdnz %icc,%f12,%f14
1139          st      %f14,[%o1]

1141          andcc   %l2,2,%g0
1142          fmovdnz %icc,%f20,%f22
1143          st      %f22,[%o2]

1145          andcc   %l3,2,%g0
1146          fmovdnz %icc,%f28,%f30
1147          st      %f30,[%o3]

1149          addcc   %i0,-1,%i0
1150          bg,pt   %icc,.loop0
1151 ! delay slot
1152          st      %f7,[%o0+4]

1154          ba,pt   %icc,.end
1155 ! delay slot
1156          nop

1158          .align  16
1159 .case3:
1160          fmuld   %f16,pp3,%f22           ! sin(x2)

1162          fmuld   %f24,pp3,%f30           ! sin(x3)

1164          fmuld   %f0,qq3,%f6             ! cos(x0)

1166          fmuld   %f8,qq3,%f14            ! cos(x1)

1168          faddd   %f22,pp2,%f22
1169          fmuld   %f16,qq2,%f20

1171          faddd   %f30,pp2,%f30
1172          fmuld   %f24,qq2,%f28

1174          faddd   %f6,qq2,%f6
1175          fmuld   %f0,pp2,%f4

1177          faddd   %f14,qq2,%f14
1178          fmuld   %f8,pp2,%f12

1180          fmuld   %f16,%f22,%f22
1181          faddd   %f20,qq1,%f20

1183          fmuld   %f24,%f30,%f30
```

```
1184          faddd   %f28,qq1,%f28

1186          fmuld   %f0,%f6,%f6
1187          faddd   %f4,pp1,%f4

1189          fmuld   %f8,%f14,%f14
1190          faddd   %f12,pp1,%f12

1192          faddd   %f22,pp1,%f22
1193          fmuld   %f16,%f20,%f20
1194          add     %l6,%g1,%l6

1196          faddd   %f30,pp1,%f30
1197          fmuld   %f24,%f28,%f28
1198          add     %l7,%g1,%l7

1200          faddd   %f6,qq1,%f6
1201          fmuld   %f0,%f4,%f4
1202          add     %l4,%g1,%l4

1204          faddd   %f14,qq1,%f14
1205          fmuld   %f8,%f12,%f12
1206          add     %l5,%g1,%l5

1208          fmuld   %f16,%f22,%f22

1210          fmuld   %f24,%f30,%f30

1212          fmuld   %f2,%f4,%f4

1214          fmuld   %f10,%f12,%f12

1216          fmuld   %f18,%f22,%f22
1217          ldd     [%l6+8],%f16

1219          fmuld   %f26,%f30,%f30
1220          ldd     [%l7+8],%f24

1222          fmuld   %f0,%f6,%f6
1223          faddd   %f4,%f32,%f4
1224          ldd     [%l4+16],%f0

1226          fmuld   %f8,%f14,%f14
1227          faddd   %f12,%f34,%f12
1228          ldd     [%l5+16],%f8

1230          fmuld   %f16,%f20,%f20
1231          faddd   %f36,%f22,%f22

1233          fmuld   %f24,%f28,%f28
1234          faddd   %f38,%f30,%f30

1236          fmuld   %f0,%f6,%f6
1237          faddd   %f4,%f2,%f4
1238          ldd     [%l4+8],%f32

1240          fmuld   %f8,%f14,%f14
1241          faddd   %f12,%f10,%f12
1242          ldd     [%l5+8],%f34

1244          faddd   %f18,%f22,%f22
1245          ldd     [%l6+16],%f36

1247          faddd   %f26,%f30,%f30
1248          ldd     [%l7+16],%f38
```



```
1250          fmuld   %f32,%f4,%f4

1252          fmuld   %f34,%f12,%f12

1254          fmuld   %f36,%f22,%f22

1256          fmuld   %f38,%f30,%f30

1258          fsubd   %f6,%f4,%f6

1260          fsubd   %f14,%f12,%f14

1262          faddd   %f22,%f20,%f22

1264          faddd   %f30,%f28,%f30

1266          faddd   %f6,%f0,%f6

1268          faddd   %f14,%f8,%f14

1270          faddd   %f22,%f16,%f22

1272          faddd   %f30,%f24,%f30
1273          mov     %l0,%l4

1275          fnegd   %f6,%f4
1276          lda     [%i1]%asi,%l0           ! preload next argument

1278          fnegd   %f14,%f12
1279          lda     [%i1]%asi,%f0

1281          fnegd   %f22,%f20
1282          lda     [%i1+4]%asi,%f3

1284          fnegd   %f30,%f28
1285          andn    %l0,%i5,%l0
1286          add     %i1,%i2,%i1

1288          andcc   %l4,2,%g0
1289          fmovdnz %icc,%f4,%f6
1290          st      %f6,[%o0]

1292          andcc   %l1,2,%g0
1293          fmovdnz %icc,%f12,%f14
1294          st      %f14,[%o1]

1296          andcc   %l2,2,%g0
1297          fmovdnz %icc,%f20,%f22
1298          st      %f22,[%o2]

1300          andcc   %l3,2,%g0
1301          fmovdnz %icc,%f28,%f30
1302          st      %f30,[%o3]

1304          addcc   %i0,-1,%i0
1305          bg,pt   %icc,.loop0
1306 ! delay slot
1307          st      %f7,[%o0+4]

1309          ba,pt   %icc,.end
1310 ! delay slot
1311          nop

1313          .align  16
1314 .case4:
1315          fmuld   %f18,%f18,%f16
```

```
1316          andcc   %l2,1,%g0
1317          bz,pn   %icc,.case6
1318 ! delay slot
1319          fxor    %f22,%f36,%f36

1321          fmuld   %f26,%f26,%f24
1322          andcc   %l3,1,%g0
1323          bz,pn   %icc,.case5
1324 ! delay slot
1325          fxor    %f30,%f38,%f38

1327          fmuld   %f8,pp3,%f14            ! sin(x1)

1329          fmuld   %f0,qq3,%f6             ! cos(x0)

1331          faddd   %f14,pp2,%f14
1332          fmuld   %f8,qq2,%f12

1334          fmuld   %f16,qq3,%f22           ! cos(x2)

1336          fmuld   %f24,qq3,%f30           ! cos(x3)

1338          faddd   %f6,qq2,%f6
1339          fmuld   %f0,pp2,%f4

1341          fmuld   %f8,%f14,%f14
1342          faddd   %f12,qq1,%f12

1344          faddd   %f22,qq2,%f22
1345          fmuld   %f16,pp2,%f20

1347          faddd   %f30,qq2,%f30
1348          fmuld   %f24,pp2,%f28

1350          fmuld   %f0,%f6,%f6
1351          faddd   %f4,pp1,%f4

1353          faddd   %f14,pp1,%f14
1354          fmuld   %f8,%f12,%f12
1355          add     %l5,%g1,%l5

1357          fmuld   %f16,%f22,%f22
1358          faddd   %f20,pp1,%f20

1360          fmuld   %f24,%f30,%f30
1361          faddd   %f28,pp1,%f28

1363          faddd   %f6,qq1,%f6
1364          fmuld   %f0,%f4,%f4
1365          add     %l4,%g1,%l4

1367          fmuld   %f8,%f14,%f14

1369          faddd   %f22,qq1,%f22
1370          fmuld   %f16,%f20,%f20
1371          add     %l6,%g1,%l6

1373          faddd   %f30,qq1,%f30
1374          fmuld   %f24,%f28,%f28
1375          add     %l7,%g1,%l7

1377          fmuld   %f2,%f4,%f4

1379          fmuld   %f10,%f14,%f14
1380          ldd     [%l5+8],%f8
```



```
1382          fmuld   %f18,%f20,%f20

1384          fmuld   %f26,%f28,%f28

1386          fmuld   %f0,%f6,%f6
1387          faddd   %f4,%f32,%f4
1388          ldd     [%l4+16],%f0

1390          fmuld   %f8,%f12,%f12
1391          faddd   %f34,%f14,%f14

1393          fmuld   %f16,%f22,%f22
1394          faddd   %f20,%f36,%f20
1395          ldd     [%l6+16],%f16

1397          fmuld   %f24,%f30,%f30
1398          faddd   %f28,%f38,%f28
1399          ldd     [%l7+16],%f24

1401          fmuld   %f0,%f6,%f6
1402          faddd   %f4,%f2,%f4
1403          ldd     [%l4+8],%f32

1405          faddd   %f10,%f14,%f14
1406          ldd     [%l5+16],%f34

1408          fmuld   %f16,%f22,%f22
1409          faddd   %f20,%f18,%f20
1410          ldd     [%l6+8],%f36

1412          fmuld   %f24,%f30,%f30
1413          faddd   %f28,%f26,%f28
1414          ldd     [%l7+8],%f38

1416          fmuld   %f32,%f4,%f4

1418          fmuld   %f34,%f14,%f14

1420          fmuld   %f36,%f20,%f20

1422          fmuld   %f38,%f28,%f28

1424          fsubd   %f6,%f4,%f6

1426          faddd   %f14,%f12,%f14

1428          fsubd   %f22,%f20,%f22

1430          fsubd   %f30,%f28,%f30

1432          faddd   %f6,%f0,%f6

1434          faddd   %f14,%f8,%f14

1436          faddd   %f22,%f16,%f22

1438          faddd   %f30,%f24,%f30
1439          mov     %l0,%l4

1441          fnegd   %f6,%f4
1442          lda     [%i1]%asi,%l0           ! preload next argument

1444          fnegd   %f14,%f12
1445          lda     [%i1]%asi,%f0

1447          fnegd   %f22,%f20
```

```
1448         lda     [%i1+4]%asi,%f3

1450         fnegd   %f30,%f28
1451         andn    %l0,%i5,%l0
1452         add     %i1,%i2,%i1

1454         andcc   %l4,2,%g0
1455         fmovdnz %icc,%f4,%f6
1456         st      %f6,[%o0]

1458         andcc   %l1,2,%g0
1459         fmovdnz %icc,%f12,%f14
1460         st      %f14,[%o1]

1462         andcc   %l2,2,%g0
1463         fmovdnz %icc,%f20,%f22
1464         st      %f22,[%o2]

1466         andcc   %l3,2,%g0
1467         fmovdnz %icc,%f28,%f30
1468         st      %f30,[%o3]

1470         addcc   %i0,-1,%i0
1471         bg,pt   %icc,.loop0
1472 ! delay slot
1473         st      %f7,[%o0+4]

1475         ba,pt   %icc,.end
1476 ! delay slot
1477         nop

1479         .align  16
1480 .case5:
1481         fmuld   %f8,pp3,%f14            ! sin(x1)

1483         fmuld   %f24,pp3,%f30           ! sin(x3)

1485         fmuld   %f0,qq3,%f6             ! cos(x0)

1487         faddd   %f14,pp2,%f14
1488         fmuld   %f8,qq2,%f12

1490         fmuld   %f16,qq3,%f22           ! cos(x2)

1492         faddd   %f30,pp2,%f30
1493         fmuld   %f24,qq2,%f28

1495         faddd   %f6,qq2,%f6
1496         fmuld   %f0,pp2,%f4

1498         fmuld   %f8,%f14,%f14
1499         faddd   %f12,qq1,%f12

1501         faddd   %f22,qq2,%f22
1502         fmuld   %f16,pp2,%f20

1504         fmuld   %f24,%f30,%f30
1505         faddd   %f28,qq1,%f28

1507         fmuld   %f0,%f6,%f6
1508         faddd   %f4,pp1,%f4

1510         faddd   %f14,pp1,%f14
1511         fmuld   %f8,%f12,%f12
1512         add     %l5,%g1,%l5
```



```
1514         fmuld   %f16,%f22,%f22
1515         faddd   %f20,pp1,%f20

1517         faddd   %f30,pp1,%f30
1518         fmuld   %f24,%f28,%f28
1519         add     %l7,%g1,%l7

1521         faddd   %f6,qq1,%f6
1522         fmuld   %f0,%f4,%f4
1523         add     %l4,%g1,%l4

1525         fmuld   %f8,%f14,%f14

1527         faddd   %f22,qq1,%f22
1528         fmuld   %f16,%f20,%f20
1529         add     %l6,%g1,%l6

1531         fmuld   %f24,%f30,%f30

1533         fmuld   %f2,%f4,%f4

1535         fmuld   %f10,%f14,%f14
1536         ldd     [%l5+8],%f8

1538         fmuld   %f18,%f20,%f20

1540         fmuld   %f26,%f30,%f30
1541         ldd     [%l7+8],%f24

1543         fmuld   %f0,%f6,%f6
1544         faddd   %f4,%f32,%f4
1545         ldd     [%l4+16],%f0

1547         fmuld   %f8,%f12,%f12
1548         faddd   %f34,%f14,%f14

1550         fmuld   %f16,%f22,%f22
1551         faddd   %f20,%f36,%f20
1552         ldd     [%l6+16],%f16

1554         fmuld   %f24,%f28,%f28
1555         faddd   %f38,%f30,%f30

1557         fmuld   %f0,%f6,%f6
1558         faddd   %f4,%f2,%f4
1559         ldd     [%l4+8],%f32

1561         faddd   %f10,%f14,%f14
1562         ldd     [%l5+16],%f34

1564         fmuld   %f16,%f22,%f22
1565         faddd   %f20,%f18,%f20
1566         ldd     [%l6+8],%f36

1568         faddd   %f26,%f30,%f30
1569         ldd     [%l7+16],%f38

1571         fmuld   %f32,%f4,%f4

1573         fmuld   %f34,%f14,%f14

1575         fmuld   %f36,%f20,%f20

1577         fmuld   %f38,%f30,%f30

1579         fsubd   %f6,%f4,%f6
```

```
1581         faddd   %f14,%f12,%f14

1583         fsubd   %f22,%f20,%f22

1585         faddd   %f30,%f28,%f30

1587         faddd   %f6,%f0,%f6

1589         faddd   %f14,%f8,%f14

1591         faddd   %f22,%f16,%f22

1593         faddd   %f30,%f24,%f30
1594         mov     %l0,%l4

1596         fnegd   %f6,%f4
1597         lda     [%i1]%asi,%l0           ! preload next argument

1599         fnegd   %f14,%f12
1600         lda     [%i1]%asi,%f0

1602         fnegd   %f22,%f20
1603         lda     [%i1+4]%asi,%f3

1605         fnegd   %f30,%f28
1606         andn    %l0,%i5,%l0
1607         add     %i1,%i2,%i1

1609         andcc   %l4,2,%g0
1610         fmovdnz %icc,%f4,%f6
1611         st      %f6,[%o0]

1613         andcc   %l1,2,%g0
1614         fmovdnz %icc,%f12,%f14
1615         st      %f14,[%o1]

1617         andcc   %l2,2,%g0
1618         fmovdnz %icc,%f20,%f22
1619         st      %f22,[%o2]

1621         andcc   %l3,2,%g0
1622         fmovdnz %icc,%f28,%f30
1623         st      %f30,[%o3]

1625         addcc   %i0,-1,%i0
1626         bg,pt   %icc,.loop0
1627 ! delay slot
1628         st      %f7,[%o0+4]

1630         ba,pt   %icc,.end
1631 ! delay slot
1632         nop

1634         .align  16
1635 .case6:
1636         fmuld   %f26,%f26,%f24
1637         andcc   %l3,1,%g0
1638         bz,pn   %icc,.case7
1639 ! delay slot
1640         fxor    %f30,%f38,%f38

1642         fmuld   %f8,pp3,%f14            ! sin(x1)

1644         fmuld   %f16,pp3,%f22           ! sin(x2)
```



```
1646         fmuld   %f0,qq3,%f6             ! cos(x0)

1648         faddd   %f14,pp2,%f14
1649         fmuld   %f8,qq2,%f12

1651         faddd   %f22,pp2,%f22
1652         fmuld   %f16,qq2,%f20

1654         fmuld   %f24,qq3,%f30           ! cos(x3)

1656         faddd   %f6,qq2,%f6
1657         fmuld   %f0,pp2,%f4

1659         fmuld   %f8,%f14,%f14
1660         faddd   %f12,qq1,%f12

1662         fmuld   %f16,%f22,%f22
1663         faddd   %f20,qq1,%f20

1665         faddd   %f30,qq2,%f30
1666         fmuld   %f24,pp2,%f28

1668         fmuld   %f0,%f6,%f6
1669         faddd   %f4,pp1,%f4

1671         faddd   %f14,pp1,%f14
1672         fmuld   %f8,%f12,%f12
1673         add     %l5,%g1,%l5

1675         faddd   %f22,pp1,%f22
1676         fmuld   %f16,%f20,%f20
1677         add     %l6,%g1,%l6

1679         fmuld   %f24,%f30,%f30
1680         faddd   %f28,pp1,%f28

1682         faddd   %f6,qq1,%f6
1683         fmuld   %f0,%f4,%f4
1684         add     %l4,%g1,%l4

1686         fmuld   %f8,%f14,%f14

1688         fmuld   %f16,%f22,%f22

1690         faddd   %f30,qq1,%f30
1691         fmuld   %f24,%f28,%f28
1692         add     %l7,%g1,%l7

1694         fmuld   %f2,%f4,%f4

1696         fmuld   %f10,%f14,%f14
1697         ldd     [%l5+8],%f8

1699         fmuld   %f18,%f22,%f22
1700         ldd     [%l6+8],%f16

1702         fmuld   %f26,%f28,%f28

1704         fmuld   %f0,%f6,%f6
1705         faddd   %f4,%f32,%f4
1706         ldd     [%l4+16],%f0

1708         fmuld   %f8,%f12,%f12
1709         faddd   %f34,%f14,%f14

1711         fmuld   %f16,%f20,%f20
```

```
1712         faddd   %f36,%f22,%f22

1714         fmuld   %f24,%f30,%f30
1715         faddd   %f28,%f38,%f28
1716         ldd     [%l7+16],%f24

1718         fmuld   %f0,%f6,%f6
1719         faddd   %f4,%f2,%f4
1720         ldd     [%l4+8],%f32

1722         faddd   %f10,%f14,%f14
1723         ldd     [%l5+16],%f34

1725         faddd   %f18,%f22,%f22
1726         ldd     [%l6+16],%f36

1728         fmuld   %f24,%f30,%f30
1729         faddd   %f28,%f26,%f28
1730         ldd     [%l7+8],%f38

1732         fmuld   %f32,%f4,%f4

1734         fmuld   %f34,%f14,%f14

1736         fmuld   %f36,%f22,%f22

1738         fmuld   %f38,%f28,%f28

1740         fsubd   %f6,%f4,%f6

1742         faddd   %f14,%f12,%f14

1744         faddd   %f22,%f20,%f22

1746         fsubd   %f30,%f28,%f30

1748         faddd   %f6,%f0,%f6

1750         faddd   %f14,%f8,%f14

1752         faddd   %f22,%f16,%f22

1754         faddd   %f30,%f24,%f30
1755         mov     %l0,%l4

1757         fnegd   %f6,%f4
1758         lda     [%i1]%asi,%l0           ! preload next argument

1760         fnegd   %f14,%f12
1761         lda     [%i1]%asi,%f0

1763         fnegd   %f22,%f20
1764         lda     [%i1+4]%asi,%f3

1766         fnegd   %f30,%f28
1767         andn    %l0,%i5,%l0
1768         add     %i1,%i2,%i1

1770         andcc   %l4,2,%g0
1771         fmovdnz %icc,%f4,%f6
1772         st      %f6,[%o0]

1774         andcc   %l1,2,%g0
1775         fmovdnz %icc,%f12,%f14
1776         st      %f14,[%o1]
```



```
1778         andcc   %l2,2,%g0
1779         fmovdnz %icc,%f20,%f22
1780         st      %f22,[%o2]

1782         andcc   %l3,2,%g0
1783         fmovdnz %icc,%f28,%f30
1784         st      %f30,[%o3]

1786         addcc   %i0,-1,%i0
1787         bg,pt   %icc,.loop0
1788 ! delay slot
1789         st      %f7,[%o0+4]

1791         ba,pt   %icc,.end
1792 ! delay slot
1793         nop

1795         .align  16
1796 .case7:
1797         fmuld   %f8,pp3,%f14            ! sin(x1)

1799         fmuld   %f16,pp3,%f22           ! sin(x2)

1801         fmuld   %f24,pp3,%f30           ! sin(x3)

1803         fmuld   %f0,qq3,%f6             ! cos(x0)

1805         faddd   %f14,pp2,%f14
1806         fmuld   %f8,qq2,%f12

1808         faddd   %f22,pp2,%f22
1809         fmuld   %f16,qq2,%f20

1811         faddd   %f30,pp2,%f30
1812         fmuld   %f24,qq2,%f28

1814         faddd   %f6,qq2,%f6
1815         fmuld   %f0,pp2,%f4

1817         fmuld   %f8,%f14,%f14
1818         faddd   %f12,qq1,%f12

1820         fmuld   %f16,%f22,%f22
1821         faddd   %f20,qq1,%f20

1823         fmuld   %f24,%f30,%f30
1824         faddd   %f28,qq1,%f28

1826         fmuld   %f0,%f6,%f6
1827         faddd   %f4,pp1,%f4

1829         faddd   %f14,pp1,%f14
1830         fmuld   %f8,%f12,%f12
1831         add     %l5,%g1,%l5

1833         faddd   %f22,pp1,%f22
1834         fmuld   %f16,%f20,%f20
1835         add     %l6,%g1,%l6

1837         faddd   %f30,pp1,%f30
1838         fmuld   %f24,%f28,%f28
1839         add     %l7,%g1,%l7

1841         faddd   %f6,qq1,%f6
1842         fmuld   %f0,%f4,%f4
1843         add     %l4,%g1,%l4
```

```
1845          fmuld   %f8,%f14,%f14

1847          fmuld   %f16,%f22,%f22

1849          fmuld   %f24,%f30,%f30

1851          fmuld   %f2,%f4,%f4

1853          fmuld   %f10,%f14,%f14
1854          ldd     [%l5+8],%f8

1856          fmuld   %f18,%f22,%f22
1857          ldd     [%l6+8],%f16

1859          fmuld   %f26,%f30,%f30
1860          ldd     [%l7+8],%f24

1862          fmuld   %f0,%f6,%f6
1863          faddd   %f4,%f32,%f4
1864          ldd     [%l4+16],%f0

1866          fmuld   %f8,%f12,%f12
1867          faddd   %f34,%f14,%f14

1869          fmuld   %f16,%f20,%f20
1870          faddd   %f36,%f22,%f22

1872          fmuld   %f24,%f28,%f28
1873          faddd   %f38,%f30,%f30

1875          fmuld   %f0,%f6,%f6
1876          faddd   %f4,%f2,%f4
1877          ldd     [%l4+8],%f32

1879          faddd   %f10,%f14,%f14
1880          ldd     [%l5+16],%f34

1882          faddd   %f18,%f22,%f22
1883          ldd     [%l6+16],%f36

1885          faddd   %f26,%f30,%f30
1886          ldd     [%l7+16],%f38

1888          fmuld   %f32,%f4,%f4

1890          fmuld   %f34,%f14,%f14

1892          fmuld   %f36,%f22,%f22

1894          fmuld   %f38,%f30,%f30

1896          fsubd   %f6,%f4,%f6

1898          faddd   %f14,%f12,%f14

1900          faddd   %f22,%f20,%f22

1902          faddd   %f30,%f28,%f30

1904          faddd   %f6,%f0,%f6

1906          faddd   %f14,%f8,%f14

1908          faddd   %f22,%f16,%f22
```



```
1910          faddd   %f30,%f24,%f30
1911          mov     %l0,%l4

1913          fnegd   %f6,%f4
1914          lda     [%i1]%asi,%l0           ! preload next argument

1916          fnegd   %f14,%f12
1917          lda     [%i1]%asi,%f0

1919          fnegd   %f22,%f20
1920          lda     [%i1+4]%asi,%f3

1922          fnegd   %f30,%f28
1923          andn    %l0,%i5,%l0
1924          add     %i1,%i2,%i1

1926          andcc   %l4,2,%g0
1927          fmovdnz %icc,%f4,%f6
1928          st      %f6,[%o0]

1930          andcc   %l1,2,%g0
1931          fmovdnz %icc,%f12,%f14
1932          st      %f14,[%o1]

1934          andcc   %l2,2,%g0
1935          fmovdnz %icc,%f20,%f22
1936          st      %f22,[%o2]

1938          andcc   %l3,2,%g0
1939          fmovdnz %icc,%f28,%f30
1940          st      %f30,[%o3]

1942          addcc   %i0,-1,%i0
1943          bg,pt   %icc,.loop0
1944  ! delay slot
1945          st      %f7,[%o0+4]

1947          ba,pt   %icc,.end
1948  ! delay slot
1949          nop

1951          .align  16
1952  .case8:
1953          fmuld   %f10,%f10,%f8
1954          andcc   %l1,1,%g0
1955          bz,pn   %icc,.case12
1956  ! delay slot
1957          fxor    %f14,%f34,%f34

1959          fmuld   %f18,%f18,%f16
1960          andcc   %l2,1,%g0
1961          bz,pn   %icc,.case10
1962  ! delay slot
1963          fxor    %f22,%f36,%f36

1965          fmuld   %f26,%f26,%f24
1966          andcc   %l3,1,%g0
1967          bz,pn   %icc,.case9
1968  ! delay slot
1969          fxor    %f30,%f38,%f38

1971          fmuld   %f0,pp3,%f6             ! sin(x0)

1973          faddd   %f6,pp2,%f6
1974          fmuld   %f0,qq2,%f4
```

```
1976          fmuld   %f8,qq3,%f14            ! cos(x1)

1978          fmuld   %f16,qq3,%f22           ! cos(x2)

1980          fmuld   %f24,qq3,%f30           ! cos(x3)

1982          fmuld   %f0,%f6,%f6
1983          faddd   %f4,qq1,%f4

1985          faddd   %f14,qq2,%f14
1986          fmuld   %f8,pp2,%f12

1988          faddd   %f22,qq2,%f22
1989          fmuld   %f16,pp2,%f20

1991          faddd   %f30,qq2,%f30
1992          fmuld   %f24,pp2,%f28

1994          faddd   %f6,pp1,%f6
1995          fmuld   %f0,%f4,%f4
1996          add     %l4,%g1,%l4

1998          fmuld   %f8,%f14,%f14
1999          faddd   %f12,pp1,%f12

2001          fmuld   %f16,%f22,%f22
2002          faddd   %f20,pp1,%f20

2004          fmuld   %f24,%f30,%f30
2005          faddd   %f28,pp1,%f28

2007          fmuld   %f0,%f6,%f6

2009          faddd   %f14,qq1,%f14
2010          fmuld   %f8,%f12,%f12
2011          add     %l5,%g1,%l5

2013          faddd   %f22,qq1,%f22
2014          fmuld   %f16,%f20,%f20
2015          add     %l6,%g1,%l6

2017          faddd   %f30,qq1,%f30
2018          fmuld   %f24,%f28,%f28
2019          add     %l7,%g1,%l7

2021          fmuld   %f2,%f6,%f6
2022          ldd     [%l4+8],%f0

2024          fmuld   %f10,%f12,%f12

2026          fmuld   %f18,%f20,%f20

2028          fmuld   %f26,%f28,%f28

2030          fmuld   %f0,%f4,%f4
2031          faddd   %f32,%f6,%f6

2033          fmuld   %f8,%f14,%f14
2034          faddd   %f12,%f34,%f12
2035          ldd     [%l5+16],%f8

2037          fmuld   %f16,%f22,%f22
2038          faddd   %f20,%f36,%f20
2039          ldd     [%l6+16],%f16

2041          fmuld   %f24,%f30,%f30
```



```
2042          faddd   %f28,%f38,%f28
2043          ldd     [%l7+16],%f24

2045          faddd   %f2,%f6,%f6
2046          ldd     [%l4+16],%f32

2048          fmuld   %f8,%f14,%f14
2049          faddd   %f12,%f10,%f12
2050          ldd     [%l5+8],%f34

2052          fmuld   %f16,%f22,%f22
2053          faddd   %f20,%f18,%f20
2054          ldd     [%l6+8],%f36

2056          fmuld   %f24,%f30,%f30
2057          faddd   %f28,%f26,%f28
2058          ldd     [%l7+8],%f38

2060          fmuld   %f32,%f6,%f6

2062          fmuld   %f34,%f12,%f12

2064          fmuld   %f36,%f20,%f20

2066          fmuld   %f38,%f28,%f28

2068          faddd   %f6,%f4,%f6

2070          fsubd   %f14,%f12,%f14

2072          fsubd   %f22,%f20,%f22

2074          fsubd   %f30,%f28,%f30

2076          faddd   %f6,%f0,%f6

2078          faddd   %f14,%f8,%f14

2080          faddd   %f22,%f16,%f22

2082          faddd   %f30,%f24,%f30
2083          mov     %l0,%l4

2085          fnegd   %f6,%f4
2086          lda     [%i1]%asi,%l0           ! preload next argument

2088          fnegd   %f14,%f12
2089          lda     [%i1]%asi,%f0

2091          fnegd   %f22,%f20
2092          lda     [%i1+4]%asi,%f3

2094          fnegd   %f30,%f28
2095          andn    %l0,%i5,%l0
2096          add     %i1,%i2,%i1

2098          andcc   %l4,2,%g0
2099          fmovdnz %icc,%f4,%f6
2100          st      %f6,[%o0]

2102          andcc   %l1,2,%g0
2103          fmovdnz %icc,%f12,%f14
2104          st      %f14,[%o1]

2106          andcc   %l2,2,%g0
2107          fmovdnz %icc,%f20,%f22
```

```
2108         st      %f22,[%o2]

2110         andcc   %l3,2,%g0
2111         fmovdnz %icc,%f28,%f30
2112         st      %f30,[%o3]

2114         addcc   %i0,-1,%i0
2115         bg,pt   %icc,.loop0
2116 ! delay slot
2117         st      %f7,[%o0+4]

2119         ba,pt   %icc,.end
2120 ! delay slot
2121         nop

2123         .align  16
2124 .case9:
2125         fmuld   %f0,pp3,%f6             ! sin(x0)

2127         fmuld   %f24,pp3,%f30           ! sin(x3)

2129         faddd   %f6,pp2,%f6
2130         fmuld   %f0,qq2,%f4

2132         fmuld   %f8,qq3,%f14            ! cos(x1)

2134         fmuld   %f16,qq3,%f22           ! cos(x2)

2136         faddd   %f30,pp2,%f30
2137         fmuld   %f24,qq2,%f28

2139         fmuld   %f0,%f6,%f6
2140         faddd   %f4,qq1,%f4

2142         faddd   %f14,qq2,%f14
2143         fmuld   %f8,pp2,%f12

2145         faddd   %f22,qq2,%f22
2146         fmuld   %f16,pp2,%f20

2148         fmuld   %f24,%f30,%f30
2149         faddd   %f28,qq1,%f28

2151         faddd   %f6,pp1,%f6
2152         fmuld   %f0,%f4,%f4
2153         add     %l4,%g1,%l4

2155         fmuld   %f8,%f14,%f14
2156         faddd   %f12,pp1,%f12

2158         fmuld   %f16,%f22,%f22
2159         faddd   %f20,pp1,%f20

2161         faddd   %f30,pp1,%f30
2162         fmuld   %f24,%f28,%f28
2163         add     %l7,%g1,%l7

2165         fmuld   %f0,%f6,%f6

2167         faddd   %f14,qq1,%f14
2168         fmuld   %f8,%f12,%f12
2169         add     %l5,%g1,%l5

2171         faddd   %f22,qq1,%f22
2172         fmuld   %f16,%f20,%f20
2173         add     %l6,%g1,%l6
```



```
2175         fmuld   %f24,%f30,%f30

2177         fmuld   %f2,%f6,%f6
2178         ldd     [%l4+8],%f0

2180         fmuld   %f10,%f12,%f12

2182         fmuld   %f18,%f20,%f20

2184         fmuld   %f26,%f30,%f30
2185         ldd     [%l7+8],%f24

2187         fmuld   %f0,%f4,%f4
2188         faddd   %f32,%f6,%f6

2190         fmuld   %f8,%f14,%f14
2191         faddd   %f12,%f34,%f12
2192         ldd     [%l5+16],%f8

2194         fmuld   %f16,%f22,%f22
2195         faddd   %f20,%f36,%f20
2196         ldd     [%l6+16],%f16

2198         fmuld   %f24,%f28,%f28
2199         faddd   %f38,%f30,%f30

2201         faddd   %f2,%f6,%f6
2202         ldd     [%l4+16],%f32

2204         fmuld   %f8,%f14,%f14
2205         faddd   %f12,%f10,%f12
2206         ldd     [%l5+8],%f34

2208         fmuld   %f16,%f22,%f22
2209         faddd   %f20,%f18,%f20
2210         ldd     [%l6+8],%f36

2212         faddd   %f26,%f30,%f30
2213         ldd     [%l7+16],%f38

2215         fmuld   %f32,%f6,%f6

2217         fmuld   %f34,%f12,%f12

2219         fmuld   %f36,%f20,%f20

2221         fmuld   %f38,%f30,%f30

2223         faddd   %f6,%f4,%f6

2225         fsubd   %f14,%f12,%f14

2227         fsubd   %f22,%f20,%f22

2229         faddd   %f30,%f28,%f30

2231         faddd   %f6,%f0,%f6

2233         faddd   %f14,%f8,%f14

2235         faddd   %f22,%f16,%f22

2237         faddd   %f30,%f24,%f30
2238         mov     %l0,%l4
```

```
2240         fnegd   %f6,%f4
2241         lda     [%i1]%asi,%l0           ! preload next argument

2243         fnegd   %f14,%f12
2244         lda     [%i1]%asi,%f0

2246         fnegd   %f22,%f20
2247         lda     [%i1+4]%asi,%f3

2249         fnegd   %f30,%f28
2250         andn    %l0,%i5,%l0
2251         add     %i1,%i2,%i1

2253         andcc   %l4,2,%g0
2254         fmovdnz %icc,%f4,%f6
2255         st      %f6,[%o0]

2257         andcc   %l1,2,%g0
2258         fmovdnz %icc,%f12,%f14
2259         st      %f14,[%o1]

2261         andcc   %l2,2,%g0
2262         fmovdnz %icc,%f20,%f22
2263         st      %f22,[%o2]

2265         andcc   %l3,2,%g0
2266         fmovdnz %icc,%f28,%f30
2267         st      %f30,[%o3]

2269         addcc   %i0,-1,%i0
2270         bg,pt   %icc,.loop0
2271 ! delay slot
2272         st      %f7,[%o0+4]

2274         ba,pt   %icc,.end
2275 ! delay slot
2276         nop

2278         .align  16
2279 .case10:
2280         fmuld   %f26,%f26,%f24
2281         andcc   %l3,1,%g0
2282         bz,pn   %icc,.case11
2283 ! delay slot
2284         fxor    %f30,%f38,%f38

2286         fmuld   %f0,pp3,%f6             ! sin(x0)

2288         fmuld   %f16,pp3,%f22           ! sin(x2)

2290         faddd   %f6,pp2,%f6
2291         fmuld   %f0,qq2,%f4

2293         fmuld   %f8,qq3,%f14            ! cos(x1)

2295         faddd   %f22,pp2,%f22
2296         fmuld   %f16,qq2,%f20

2298         fmuld   %f24,qq3,%f30           ! cos(x3)

2300         fmuld   %f0,%f6,%f6
2301         faddd   %f4,qq1,%f4

2303         faddd   %f14,qq2,%f14
2304         fmuld   %f8,pp2,%f12
```



```
2306         fmuld   %f16,%f22,%f22
2307         faddd   %f20,qq1,%f20

2309         faddd   %f30,qq2,%f30
2310         fmuld   %f24,pp2,%f28

2312         faddd   %f6,pp1,%f6
2313         fmuld   %f0,%f4,%f4
2314         add     %l4,%g1,%l4

2316         fmuld   %f8,%f14,%f14
2317         faddd   %f12,pp1,%f12

2319         faddd   %f22,pp1,%f22
2320         fmuld   %f16,%f20,%f20
2321         add     %l6,%g1,%l6

2323         fmuld   %f24,%f30,%f30
2324         faddd   %f28,pp1,%f28

2326         fmuld   %f0,%f6,%f6

2328         faddd   %f14,qq1,%f14
2329         fmuld   %f8,%f12,%f12
2330         add     %l5,%g1,%l5

2332         fmuld   %f16,%f22,%f22

2334         faddd   %f30,qq1,%f30
2335         fmuld   %f24,%f28,%f28
2336         add     %l7,%g1,%l7

2338         fmuld   %f2,%f6,%f6
2339         ldd     [%l4+8],%f0

2341         fmuld   %f10,%f12,%f12

2343         fmuld   %f18,%f22,%f22
2344         ldd     [%l6+8],%f16

2346         fmuld   %f26,%f28,%f28

2348         fmuld   %f0,%f4,%f4
2349         faddd   %f32,%f6,%f6

2351         fmuld   %f8,%f14,%f14
2352         faddd   %f12,%f34,%f12
2353         ldd     [%l5+16],%f8

2355         fmuld   %f16,%f20,%f20
2356         faddd   %f36,%f22,%f22

2358         fmuld   %f24,%f30,%f30
2359         faddd   %f28,%f38,%f28
2360         ldd     [%l7+16],%f24

2362         faddd   %f2,%f6,%f6
2363         ldd     [%l4+16],%f32

2365         fmuld   %f8,%f14,%f14
2366         faddd   %f12,%f10,%f12
2367         ldd     [%l5+8],%f34

2369         faddd   %f18,%f22,%f22
2370         ldd     [%l6+16],%f36
```

```
2372          fmuld   %f24,%f30,%f30
2373          faddd   %f28,%f26,%f28
2374          ldd     [%l7+8],%f38

2376          fmuld   %f32,%f6,%f6

2378          fmuld   %f34,%f12,%f12

2380          fmuld   %f36,%f22,%f22

2382          fmuld   %f38,%f28,%f28

2384          faddd   %f6,%f4,%f6

2386          fsubd   %f14,%f12,%f14

2388          faddd   %f22,%f20,%f22

2390          fsubd   %f30,%f28,%f30

2392          faddd   %f6,%f0,%f6

2394          faddd   %f14,%f8,%f14

2396          faddd   %f22,%f16,%f22

2398          faddd   %f30,%f24,%f30
2399          mov     %l0,%l4

2401          fnegd   %f6,%f4
2402          lda     [%i1]%asi,%l0           ! preload next argument

2404          fnegd   %f14,%f12
2405          lda     [%i1]%asi,%f0

2407          fnegd   %f22,%f20
2408          lda     [%i1+4]%asi,%f3

2410          fnegd   %f30,%f28
2411          andn    %l0,%i5,%l0
2412          add     %i1,%i2,%i1

2414          andcc   %l4,2,%g0
2415          fmovdnz %icc,%f4,%f6
2416          st      %f6,[%o0]

2418          andcc   %l1,2,%g0
2419          fmovdnz %icc,%f12,%f14
2420          st      %f14,[%o1]

2422          andcc   %l2,2,%g0
2423          fmovdnz %icc,%f20,%f22
2424          st      %f22,[%o2]

2426          andcc   %l3,2,%g0
2427          fmovdnz %icc,%f28,%f30
2428          st      %f30,[%o3]

2430          addcc   %i0,-1,%i0
2431          bg,pt   %icc,.loop0
2432  ! delay slot
2433          st      %f7,[%o0+4]

2435          ba,pt   %icc,.end
2436  ! delay slot
2437          nop
```



```
2439          .align  16
2440  .case11:
2441          fmuld   %f0,pp3,%f6             ! sin(x0)

2443          fmuld   %f16,pp3,%f22           ! sin(x2)

2445          fmuld   %f24,pp3,%f30           ! sin(x3)

2447          faddd   %f6,pp2,%f6
2448          fmuld   %f0,qq2,%f4

2450          fmuld   %f8,qq3,%f14            ! cos(x1)

2452          faddd   %f22,pp2,%f22
2453          fmuld   %f16,qq2,%f20

2455          faddd   %f30,pp2,%f30
2456          fmuld   %f24,qq2,%f28

2458          fmuld   %f0,%f6,%f6
2459          faddd   %f4,qq1,%f4

2461          faddd   %f14,qq2,%f14
2462          fmuld   %f8,pp2,%f12

2464          fmuld   %f16,%f22,%f22
2465          faddd   %f20,qq1,%f20

2467          fmuld   %f24,%f30,%f30
2468          faddd   %f28,qq1,%f28

2470          faddd   %f6,pp1,%f6
2471          fmuld   %f0,%f4,%f4
2472          add     %l4,%g1,%l4

2474          fmuld   %f8,%f14,%f14
2475          faddd   %f12,pp1,%f12

2477          faddd   %f22,pp1,%f22
2478          fmuld   %f16,%f20,%f20
2479          add     %l6,%g1,%l6

2481          faddd   %f30,pp1,%f30
2482          fmuld   %f24,%f28,%f28
2483          add     %l7,%g1,%l7

2485          fmuld   %f0,%f6,%f6

2487          faddd   %f14,qq1,%f14
2488          fmuld   %f8,%f12,%f12
2489          add     %l5,%g1,%l5

2491          fmuld   %f16,%f22,%f22

2493          fmuld   %f24,%f30,%f30

2495          fmuld   %f2,%f6,%f6
2496          ldd     [%l4+8],%f0

2498          fmuld   %f10,%f12,%f12

2500          fmuld   %f18,%f22,%f22
2501          ldd     [%l6+8],%f16

2503          fmuld   %f26,%f30,%f30
```

```
2504          ldd     [%l7+8],%f24

2506          fmuld   %f0,%f4,%f4
2507          faddd   %f32,%f6,%f6

2509          fmuld   %f8,%f14,%f14
2510          faddd   %f12,%f34,%f12
2511          ldd     [%l5+16],%f8

2513          fmuld   %f16,%f20,%f20
2514          faddd   %f36,%f22,%f22

2516          fmuld   %f24,%f28,%f28
2517          faddd   %f38,%f30,%f30

2519          faddd   %f2,%f6,%f6
2520          ldd     [%l4+16],%f32

2522          fmuld   %f8,%f14,%f14
2523          faddd   %f12,%f10,%f12
2524          ldd     [%l5+8],%f34

2526          faddd   %f18,%f22,%f22
2527          ldd     [%l6+16],%f36

2529          faddd   %f26,%f30,%f30
2530          ldd     [%l7+16],%f38

2532          fmuld   %f32,%f6,%f6

2534          fmuld   %f34,%f12,%f12

2536          fmuld   %f36,%f22,%f22

2538          fmuld   %f38,%f30,%f30

2540          faddd   %f6,%f4,%f6

2542          fsubd   %f14,%f12,%f14

2544          faddd   %f22,%f20,%f22

2546          faddd   %f30,%f28,%f30

2548          faddd   %f6,%f0,%f6

2550          faddd   %f14,%f8,%f14

2552          faddd   %f22,%f16,%f22

2554          faddd   %f30,%f24,%f30
2555          mov     %l0,%l4

2557          fnegd   %f6,%f4
2558          lda     [%i1]%asi,%l0           ! preload next argument

2560          fnegd   %f14,%f12
2561          lda     [%i1]%asi,%f0

2563          fnegd   %f22,%f20
2564          lda     [%i1+4]%asi,%f3

2566          fnegd   %f30,%f28
2567          andn    %l0,%i5,%l0
2568          add     %i1,%i2,%i1
```



```
2570          andcc   %l4,2,%g0
2571          fmovdnz %icc,%f4,%f6
2572          st      %f6,[%o0]

2574          andcc   %l1,2,%g0
2575          fmovdnz %icc,%f12,%f14
2576          st      %f14,[%o1]

2578          andcc   %l2,2,%g0
2579          fmovdnz %icc,%f20,%f22
2580          st      %f22,[%o2]

2582          andcc   %l3,2,%g0
2583          fmovdnz %icc,%f28,%f30
2584          st      %f30,[%o3]

2586          addcc   %i0,-1,%i0
2587          bg,pt   %icc,.loop0
2588  ! delay slot
2589          st      %f7,[%o0+4]

2591          ba,pt   %icc,.end
2592  ! delay slot
2593          nop

2595          .align  16
2596  .case12:
2597          fmuld   %f18,%f18,%f16
2598          andcc   %l2,1,%g0
2599          bz,pn   %icc,.case14
2600  ! delay slot
2601          fxor    %f22,%f36,%f36

2603          fmuld   %f26,%f26,%f24
2604          andcc   %l3,1,%g0
2605          bz,pn   %icc,.case13
2606  ! delay slot
2607          fxor    %f30,%f38,%f38

2609          fmuld   %f0,pp3,%f6             ! sin(x0)

2611          fmuld   %f8,pp3,%f14            ! sin(x1)

2613          faddd   %f6,pp2,%f6
2614          fmuld   %f0,qq2,%f4

2616          faddd   %f14,pp2,%f14
2617          fmuld   %f8,qq2,%f12

2619          fmuld   %f16,qq3,%f22           ! cos(x2)

2621          fmuld   %f24,qq3,%f30           ! cos(x3)

2623          fmuld   %f0,%f6,%f6
2624          faddd   %f4,qq1,%f4

2626          fmuld   %f8,%f14,%f14
2627          faddd   %f12,qq1,%f12

2629          faddd   %f22,qq2,%f22
2630          fmuld   %f16,pp2,%f20

2632          faddd   %f30,qq2,%f30
2633          fmuld   %f24,pp2,%f28

2635          faddd   %f6,pp1,%f6
```

```
2636         fmuld   %f0,%f4,%f4
2637         add     %l4,%g1,%l4

2639         faddd   %f14,pp1,%f14
2640         fmuld   %f8,%f12,%f12
2641         add     %l5,%g1,%l5

2643         fmuld   %f16,%f22,%f22
2644         faddd   %f20,pp1,%f20

2646         fmuld   %f24,%f30,%f30
2647         faddd   %f28,pp1,%f28

2649         fmuld   %f0,%f6,%f6

2651         fmuld   %f8,%f14,%f14

2653         faddd   %f22,qq1,%f22
2654         fmuld   %f16,%f20,%f20
2655         add     %l6,%g1,%l6

2657         faddd   %f30,qq1,%f30
2658         fmuld   %f24,%f28,%f28
2659         add     %l7,%g1,%l7

2661         fmuld   %f2,%f6,%f6
2662         ldd     [%l4+8],%f0

2664         fmuld   %f10,%f14,%f14
2665         ldd     [%l5+8],%f8

2667         fmuld   %f18,%f20,%f20

2669         fmuld   %f26,%f28,%f28

2671         fmuld   %f0,%f4,%f4
2672         faddd   %f32,%f6,%f6

2674         fmuld   %f8,%f12,%f12
2675         faddd   %f34,%f14,%f14

2677         fmuld   %f16,%f22,%f22
2678         faddd   %f20,%f36,%f20
2679         ldd     [%l6+16],%f16

2681         fmuld   %f24,%f30,%f30
2682         faddd   %f28,%f38,%f28
2683         ldd     [%l7+16],%f24

2685         faddd   %f2,%f6,%f6
2686         ldd     [%l4+16],%f32

2688         faddd   %f10,%f14,%f14
2689         ldd     [%l5+16],%f34

2691         fmuld   %f16,%f22,%f22
2692         faddd   %f20,%f18,%f20
2693         ldd     [%l6+8],%f36

2695         fmuld   %f24,%f30,%f30
2696         faddd   %f28,%f26,%f28
2697         ldd     [%l7+8],%f38

2699         fmuld   %f32,%f6,%f6

2701         fmuld   %f34,%f14,%f14
```



```
2703         fmuld   %f36,%f20,%f20

2705         fmuld   %f38,%f28,%f28

2707         faddd   %f6,%f4,%f6

2709         faddd   %f14,%f12,%f14

2711         fsubd   %f22,%f20,%f22

2713         fsubd   %f30,%f28,%f30

2715         faddd   %f6,%f0,%f6

2717         faddd   %f14,%f8,%f14

2719         faddd   %f22,%f16,%f22

2721         faddd   %f30,%f24,%f30
2722         mov     %l0,%l4

2724         fnegd   %f6,%f4
2725         lda     [%i1]%asi,%l0           ! preload next argument

2727         fnegd   %f14,%f12
2728         lda     [%i1]%asi,%f0

2730         fnegd   %f22,%f20
2731         lda     [%i1+4]%asi,%f3

2733         fnegd   %f30,%f28
2734         andn    %l0,%i5,%l0
2735         add     %i1,%i2,%i1

2737         andcc   %l4,2,%g0
2738         fmovdnz %icc,%f4,%f6
2739         st      %f6,[%o0]

2741         andcc   %l1,2,%g0
2742         fmovdnz %icc,%f12,%f14
2743         st      %f14,[%o1]

2745         andcc   %l2,2,%g0
2746         fmovdnz %icc,%f20,%f22
2747         st      %f22,[%o2]

2749         andcc   %l3,2,%g0
2750         fmovdnz %icc,%f28,%f30
2751         st      %f30,[%o3]

2753         addcc   %i0,-1,%i0
2754         bg,pt   %icc,.loop0
2755 ! delay slot
2756         st      %f7,[%o0+4]

2758         ba,pt   %icc,.end
2759 ! delay slot
2760         nop

2762         .align  16
2763 .case13:
2764         fmuld   %f0,pp3,%f6             ! sin(x0)

2766         fmuld   %f8,pp3,%f14            ! sin(x1)
```

```
2768        fmuld   %f24,pp3,%f30           ! sin(x3)

2770        faddd   %f6,pp2,%f6
2771        fmuld   %f0,qq2,%f4

2773        faddd   %f14,pp2,%f14
2774        fmuld   %f8,qq2,%f12

2776        fmuld   %f16,qq3,%f22           ! cos(x2)

2778        faddd   %f30,pp2,%f30
2779        fmuld   %f24,qq2,%f28

2781        fmuld   %f0,%f6,%f6
2782        faddd   %f4,qq1,%f4

2784        fmuld   %f8,%f14,%f14
2785        faddd   %f12,qq1,%f12

2787        faddd   %f22,qq2,%f22
2788        fmuld   %f16,pp2,%f20

2790        fmuld   %f24,%f30,%f30
2791        faddd   %f28,qq1,%f28

2793        faddd   %f6,pp1,%f6
2794        fmuld   %f0,%f4,%f4
2795        add     %l4,%g1,%l4

2797        faddd   %f14,pp1,%f14
2798        fmuld   %f8,%f12,%f12
2799        add     %l5,%g1,%l5

2801        fmuld   %f16,%f22,%f22
2802        faddd   %f20,pp1,%f20

2804        faddd   %f30,pp1,%f30
2805        fmuld   %f24,%f28,%f28
2806        add     %l7,%g1,%l7

2808        fmuld   %f0,%f6,%f6

2810        fmuld   %f8,%f14,%f14

2812        faddd   %f22,qq1,%f22
2813        fmuld   %f16,%f20,%f20
2814        add     %l6,%g1,%l6

2816        fmuld   %f24,%f30,%f30

2818        fmuld   %f2,%f6,%f6
2819        ldd     [%l4+8],%f0

2821        fmuld   %f10,%f14,%f14
2822        ldd     [%l5+8],%f8

2824        fmuld   %f18,%f20,%f20

2826        fmuld   %f26,%f30,%f30
2827        ldd     [%l7+8],%f24

2829        fmuld   %f0,%f4,%f4
2830        faddd   %f32,%f6,%f6

2832        fmuld   %f8,%f12,%f12
2833        faddd   %f34,%f14,%f14
```



```
2835        fmuld   %f16,%f22,%f22
2836        faddd   %f20,%f36,%f20
2837        ldd     [%l6+16],%f16

2839        fmuld   %f24,%f28,%f28
2840        faddd   %f38,%f30,%f30

2842        faddd   %f2,%f6,%f6
2843        ldd     [%l4+16],%f32

2845        faddd   %f10,%f14,%f14
2846        ldd     [%l5+16],%f34

2848        fmuld   %f16,%f22,%f22
2849        faddd   %f20,%f18,%f20
2850        ldd     [%l6+8],%f36

2852        faddd   %f26,%f30,%f30
2853        ldd     [%l7+16],%f38

2855        fmuld   %f32,%f6,%f6

2857        fmuld   %f34,%f14,%f14

2859        fmuld   %f36,%f20,%f20

2861        fmuld   %f38,%f30,%f30

2863        faddd   %f6,%f4,%f6

2865        faddd   %f14,%f12,%f14

2867        fsubd   %f22,%f20,%f22

2869        faddd   %f30,%f28,%f30

2871        faddd   %f6,%f0,%f6

2873        faddd   %f14,%f8,%f14

2875        faddd   %f22,%f16,%f22

2877        faddd   %f30,%f24,%f30
2878        mov     %l0,%l4

2880        fnegd   %f6,%f4
2881        lda     [%i1]%asi,%l0           ! preload next argument

2883        fnegd   %f14,%f12
2884        lda     [%i1]%asi,%f0

2886        fnegd   %f22,%f20
2887        lda     [%i1+4]%asi,%f3

2889        fnegd   %f30,%f28
2890        andn    %l0,%i5,%l0
2891        add     %i1,%i2,%i1

2893        andcc   %l4,2,%g0
2894        fmovdnz %icc,%f4,%f6
2895        st      %f6,[%o0]

2897        andcc   %l1,2,%g0
2898        fmovdnz %icc,%f12,%f14
2899        st      %f14,[%o1]
```

```
2901         andcc   %l2,2,%g0
2902         fmovdnz %icc,%f20,%f22
2903         st      %f22,[%o2]

2905         andcc   %l3,2,%g0
2906         fmovdnz %icc,%f28,%f30
2907         st      %f30,[%o3]

2909         addcc   %i0,-1,%i0
2910         bg,pt   %icc,.loop0
2911 ! delay slot
2912         st      %f7,[%o0+4]

2914         ba,pt   %icc,.end
2915 ! delay slot
2916         nop

2918         .align  16
2919 .case14:
2920         fmuld   %f26,%f26,%f24
2921         andcc   %l3,1,%g0
2922         bz,pn   %icc,.case15
2923 ! delay slot
2924         fxor    %f30,%f38,%f38

2926         fmuld   %f0,pp3,%f6             ! sin(x0)

2928         fmuld   %f8,pp3,%f14            ! sin(x1)

2930         fmuld   %f16,pp3,%f22           ! sin(x2)

2932         faddd   %f6,pp2,%f6
2933         fmuld   %f0,qq2,%f4

2935         faddd   %f14,pp2,%f14
2936         fmuld   %f8,qq2,%f12

2938         faddd   %f22,pp2,%f22
2939         fmuld   %f16,qq2,%f20

2941         fmuld   %f24,qq3,%f30           ! cos(x3)

2943         fmuld   %f0,%f6,%f6
2944         faddd   %f4,qq1,%f4

2946         fmuld   %f8,%f14,%f14
2947         faddd   %f12,qq1,%f12

2949         fmuld   %f16,%f22,%f22
2950         faddd   %f20,qq1,%f20

2952         faddd   %f30,qq2,%f30
2953         fmuld   %f24,pp2,%f28

2955         faddd   %f6,pp1,%f6
2956         fmuld   %f0,%f4,%f4
2957         add     %l4,%g1,%l4

2959         faddd   %f14,pp1,%f14
2960         fmuld   %f8,%f12,%f12
2961         add     %l5,%g1,%l5

2963         faddd   %f22,pp1,%f22
2964         fmuld   %f16,%f20,%f20
2965         add     %l6,%g1,%l6
```



```
2967         fmuld   %f24,%f30,%f30
2968         faddd   %f28,pp1,%f28

2970         fmuld   %f0,%f6,%f6

2972         fmuld   %f8,%f14,%f14

2974         fmuld   %f16,%f22,%f22

2976         faddd   %f30,qq1,%f30
2977         fmuld   %f24,%f28,%f28
2978         add     %l7,%g1,%l7

2980         fmuld   %f2,%f6,%f6
2981         ldd     [%l4+8],%f0

2983         fmuld   %f10,%f14,%f14
2984         ldd     [%l5+8],%f8

2986         fmuld   %f18,%f22,%f22
2987         ldd     [%l6+8],%f16

2989         fmuld   %f26,%f28,%f28

2991         fmuld   %f0,%f4,%f4
2992         faddd   %f32,%f6,%f6

2994         fmuld   %f8,%f12,%f12
2995         faddd   %f34,%f14,%f14

2997         fmuld   %f16,%f20,%f20
2998         faddd   %f36,%f22,%f22

3000         fmuld   %f24,%f30,%f30
3001         faddd   %f28,%f38,%f28
3002         ldd     [%l7+16],%f24

3004         faddd   %f2,%f6,%f6
3005         ldd     [%l4+16],%f32

3007         faddd   %f10,%f14,%f14
3008         ldd     [%l5+16],%f34

3010         faddd   %f18,%f22,%f22
3011         ldd     [%l6+16],%f36

3013         fmuld   %f24,%f30,%f30
3014         faddd   %f28,%f26,%f28
3015         ldd     [%l7+8],%f38

3017         fmuld   %f32,%f6,%f6

3019         fmuld   %f34,%f14,%f14

3021         fmuld   %f36,%f22,%f22

3023         fmuld   %f38,%f28,%f28

3025         faddd   %f6,%f4,%f6

3027         faddd   %f14,%f12,%f14

3029         faddd   %f22,%f20,%f22

3031         fsubd   %f30,%f28,%f30
```

```
3033         faddd   %f6,%f0,%f6

3035         faddd   %f14,%f8,%f14

3037         faddd   %f22,%f16,%f22

3039         faddd   %f30,%f24,%f30
3040         mov     %l0,%l4

3042         fnegd   %f6,%f4
3043         lda     [%i1]%asi,%l0           ! preload next argument

3045         fnegd   %f14,%f12
3046         lda     [%i1]%asi,%f0

3048         fnegd   %f22,%f20
3049         lda     [%i1+4]%asi,%f3

3051         fnegd   %f30,%f28
3052         andn    %l0,%i5,%l0
3053         add     %i1,%i2,%i1

3055         andcc   %l4,2,%g0
3056         fmovdnz %icc,%f4,%f6
3057         st      %f6,[%o0]

3059         andcc   %l1,2,%g0
3060         fmovdnz %icc,%f12,%f14
3061         st      %f14,[%o1]

3063         andcc   %l2,2,%g0
3064         fmovdnz %icc,%f20,%f22
3065         st      %f22,[%o2]

3067         andcc   %l3,2,%g0
3068         fmovdnz %icc,%f28,%f30
3069         st      %f30,[%o3]

3071         addcc   %i0,-1,%i0
3072         bg,pt   %icc,.loop0
3073 ! delay slot
3074         st      %f7,[%o0+4]

3076         ba,pt   %icc,.end
3077 ! delay slot
3078         nop

3080         .align  16
3081 .case15:
3082         fmuld   %f0,pp3,%f6             ! sin(x0)

3084         fmuld   %f8,pp3,%f14            ! sin(x1)

3086         fmuld   %f16,pp3,%f22           ! sin(x2)

3088         fmuld   %f24,pp3,%f30           ! sin(x3)

3090         faddd   %f6,pp2,%f6
3091         fmuld   %f0,qq2,%f4

3093         faddd   %f14,pp2,%f14
3094         fmuld   %f8,qq2,%f12

3096         faddd   %f22,pp2,%f22
3097         fmuld   %f16,qq2,%f20
```



```
3099         faddd   %f30,pp2,%f30
3100         fmuld   %f24,qq2,%f28

3102         fmuld   %f0,%f6,%f6
3103         faddd   %f4,qq1,%f4

3105         fmuld   %f8,%f14,%f14
3106         faddd   %f12,qq1,%f12

3108         fmuld   %f16,%f22,%f22
3109         faddd   %f20,qq1,%f20

3111         fmuld   %f24,%f30,%f30
3112         faddd   %f28,qq1,%f28

3114         faddd   %f6,pp1,%f6
3115         fmuld   %f0,%f4,%f4
3116         add     %l4,%g1,%l4

3118         faddd   %f14,pp1,%f14
3119         fmuld   %f8,%f12,%f12
3120         add     %l5,%g1,%l5

3122         faddd   %f22,pp1,%f22
3123         fmuld   %f16,%f20,%f20
3124         add     %l6,%g1,%l6

3126         faddd   %f30,pp1,%f30
3127         fmuld   %f24,%f28,%f28
3128         add     %l7,%g1,%l7

3130         fmuld   %f0,%f6,%f6

3132         fmuld   %f8,%f14,%f14

3134         fmuld   %f16,%f22,%f22

3136         fmuld   %f24,%f30,%f30

3138         fmuld   %f2,%f6,%f6
3139         ldd     [%l4+8],%f0

3141         fmuld   %f10,%f14,%f14
3142         ldd     [%l5+8],%f8

3144         fmuld   %f18,%f22,%f22
3145         ldd     [%l6+8],%f16

3147         fmuld   %f26,%f30,%f30
3148         ldd     [%l7+8],%f24

3150         fmuld   %f0,%f4,%f4
3151         faddd   %f32,%f6,%f6

3153         fmuld   %f8,%f12,%f12
3154         faddd   %f34,%f14,%f14

3156         fmuld   %f16,%f20,%f20
3157         faddd   %f36,%f22,%f22

3159         fmuld   %f24,%f28,%f28
3160         faddd   %f38,%f30,%f30

3162         faddd   %f2,%f6,%f6
3163         ldd     [%l4+16],%f32
```

```
3165         faddd   %f10,%f14,%f14
3166         ldd     [%l5+16],%f34

3168         faddd   %f18,%f22,%f22
3169         ldd     [%l6+16],%f36

3171         faddd   %f26,%f30,%f30
3172         ldd     [%l7+16],%f38

3174         fmuld   %f32,%f6,%f6

3176         fmuld   %f34,%f14,%f14

3178         fmuld   %f36,%f22,%f22

3180         fmuld   %f38,%f30,%f30

3182         faddd   %f6,%f4,%f6

3184         faddd   %f14,%f12,%f14

3186         faddd   %f22,%f20,%f22

3188         faddd   %f30,%f28,%f30

3190         faddd   %f6,%f0,%f6

3192         faddd   %f14,%f8,%f14

3194         faddd   %f22,%f16,%f22

3196         faddd   %f30,%f24,%f30
3197         mov     %l0,%l4

3199         fnegd   %f6,%f4
3200         lda     [%i1]%asi,%l0           ! preload next argument

3202         fnegd   %f14,%f12
3203         lda     [%i1]%asi,%f0

3205         fnegd   %f22,%f20
3206         lda     [%i1+4]%asi,%f3

3208         fnegd   %f30,%f28
3209         andn    %l0,%i5,%l0
3210         add     %i1,%i2,%i1

3212         andcc   %l4,2,%g0
3213         fmovdnz %icc,%f4,%f6
3214         st      %f6,[%o0]

3216         andcc   %l1,2,%g0
3217         fmovdnz %icc,%f12,%f14
3218         st      %f14,[%o1]

3220         andcc   %l2,2,%g0
3221         fmovdnz %icc,%f20,%f22
3222         st      %f22,[%o2]

3224         andcc   %l3,2,%g0
3225         fmovdnz %icc,%f28,%f30
3226         st      %f30,[%o3]

3228         addcc   %i0,-1,%i0
3229         bg,pt   %icc,.loop0
```



```
3230 ! delay slot
3231         st      %f7,[%o0+4]

3233         ba,pt   %icc,.end
3234 ! delay slot
3235         nop


3238         .align  16
3239 .end:
3240         st      %f15,[%o1+4]
3241         st      %f23,[%o2+4]
3242         st      %f31,[%o3+4]
3243         ld      [%fp+biguns],%i5
3244         tst     %i5                     ! check for huge arguments remaining
3245         be,pt   %icc,.exit
3246 ! delay slot
3247         nop
3248 #ifdef __sparcv9
3249         ldx     [%fp+xsave],%o1
3250         ldx     [%fp+ysave],%o3
3251 #else
3252         ld      [%fp+xsave],%o1
3253         ld      [%fp+ysave],%o3
3254 #endif
3255         ld      [%fp+nsave],%o0
3256         ld      [%fp+sxsave],%o2
3257         ld      [%fp+sysave],%o4
3258         sra     %o2,0,%o2               ! sign-extend for V9
3259         sra     %o4,0,%o4
3260         call    __vlibm_vsin_big_ultra3
3261         sra     %o5,0,%o5               ! delay slot

3263 .exit:
3264         ret
3265         restore


3268         .align  16
3269 .last1:
3270         faddd   %f2,c3two44,%f4
3271         st      %f15,[%o1+4]
3272 .last1_from_range1:
3273         mov     0,%l1
3274         fzeros  %f8
3275         fzero   %f10
3276         add     %fp,junk,%o1
3277 .last2:
3278         faddd   %f10,c3two44,%f12
3279         st      %f23,[%o2+4]
3280 .last2_from_range2:
3281         mov     0,%l2
3282         fzeros  %f16
3283         fzero   %f18
3284         add     %fp,junk,%o2
3285 .last3:
3286         faddd   %f18,c3two44,%f20
3287         st      %f31,[%o3+4]
3288         st      %f5,[%fp+nk0]
3289         st      %f13,[%fp+nk1]
3290 .last3_from_range3:
3291         mov     0,%l3
3292         fzeros  %f24
3293         fzero   %f26
3294         ba,pt   %icc,.cont
3295 ! delay slot
```

```
3296         add     %fp,junk,%o3


3299         .align  16
3300 .range0:
3301         cmp     %l0,%o4
3302         bl,pt   %icc,1f                 ! hx < 0x3e400000
3303 ! delay slot, harmless if branch taken
3304         sethi   %hi(0x7ff00000),%o7
3305         cmp     %l0,%o7
3306         bl,a,pt %icc,2f                 ! branch if finite
3307 ! delay slot, squashed if branch not taken
3308         st      %o4,[%fp+biguns]        ! set biguns
3309         fzero   %f0
3310         fmuld   %f2,%f0,%f2
3311         st      %f2,[%o0]
3312         ba,pt   %icc,2f
3313 ! delay slot
3314         st      %f3,[%o0+4]
3315 1:
3316         fdtoi   %f2,%f4                 ! raise inexact if not zero
3317         st      %f0,[%o0]
3318         st      %f3,[%o0+4]
3319 2:
3320         addcc   %i0,-1,%i0
3321         ble,pn  %icc,.end
3322 ! delay slot, harmless if branch taken
3323         add     %i3,%i4,%i3             ! y += stridey
3324         andn    %l1,%i5,%l0             ! hx &= ~0x80000000
3325         fmovs   %f8,%f0
3326         fmovs   %f11,%f3
3327         ba,pt   %icc,.loop0
3328 ! delay slot
3329         add     %i1,%i2,%i1             ! x += stridex


3332         .align  16
3333 .range1:
3334         cmp     %l1,%o4
3335         bl,pt   %icc,1f                 ! hx < 0x3e400000
3336 ! delay slot, harmless if branch taken
3337         sethi   %hi(0x7ff00000),%o7
3338         cmp     %l1,%o7
3339         bl,a,pt %icc,2f                 ! branch if finite
3340 ! delay slot, squashed if branch not taken
3341         st      %o4,[%fp+biguns]        ! set biguns
3342         fzero   %f8
3343         fmuld   %f10,%f8,%f10
3344         st      %f10,[%o1]
3345         ba,pt   %icc,2f
3346 ! delay slot
3347         st      %f11,[%o1+4]
3348 1:
3349         fdtoi   %f10,%f12               ! raise inexact if not zero
3350         st      %f8,[%o1]
3351         st      %f11,[%o1+4]
3352 2:
3353         addcc   %i0,-1,%i0
3354         ble,pn  %icc,.last1_from_range1
3355 ! delay slot, harmless if branch taken
3356         add     %i3,%i4,%i3             ! y += stridey
3357         andn    %l2,%i5,%l1             ! hx &= ~0x80000000
3358         fmovs   %f16,%f8
3359         fmovs   %f19,%f11
3360         ba,pt   %icc,.loop1
3361 ! delay slot
```



```
3362         add     %i1,%i2,%i1             ! x += stridex


3365         .align  16
3366 .range2:
3367         cmp     %l2,%o4
3368         bl,pt   %icc,1f                 ! hx < 0x3e400000
3369 ! delay slot, harmless if branch taken
3370         sethi   %hi(0x7ff00000),%o7
3371         cmp     %l2,%o7
3372         bl,a,pt %icc,2f                 ! branch if finite
3373 ! delay slot, squashed if branch not taken
3374         st      %o4,[%fp+biguns]        ! set biguns
3375         fzero   %f16
3376         fmuld   %f18,%f16,%f18
3377         st      %f18,[%o2]
3378         ba,pt   %icc,2f
3379 ! delay slot
3380         st      %f19,[%o2+4]
3381 1:
3382         fdtoi   %f18,%f20               ! raise inexact if not zero
3383         st      %f16,[%o2]
3384         st      %f19,[%o2+4]
3385 2:
3386         addcc   %i0,-1,%i0
3387         ble,pn  %icc,.last2_from_range2
3388 ! delay slot, harmless if branch taken
3389         add     %i3,%i4,%i3             ! y += stridey
3390         andn    %l3,%i5,%l2             ! hx &= ~0x80000000
3391         fmovs   %f24,%f16
3392         fmovs   %f27,%f19
3393         ba,pt   %icc,.loop2
3394 ! delay slot
3395         add     %i1,%i2,%i1             ! x += stridex


3398         .align  16
3399 .range3:
3400         cmp     %l3,%o4
3401         bl,pt   %icc,1f                 ! hx < 0x3e400000
3402 ! delay slot, harmless if branch taken
3403         sethi   %hi(0x7ff00000),%o7
3404         cmp     %l3,%o7
3405         bl,a,pt %icc,2f                 ! branch if finite
3406 ! delay slot, squashed if branch not taken
3407         st      %o4,[%fp+biguns]        ! set biguns
3408         fzero   %f24
3409         fmuld   %f26,%f24,%f26
3410         st      %f26,[%o3]
3411         ba,pt   %icc,2f
3412 ! delay slot
3413         st      %f27,[%o3+4]
3414 1:
3415         fdtoi   %f26,%f28               ! raise inexact if not zero
3416         st      %f24,[%o3]
3417         st      %f27,[%o3+4]
3418 2:
3419         addcc   %i0,-1,%i0
3420         ble,pn  %icc,.last3_from_range3
3421 ! delay slot, harmless if branch taken
3422         add     %i3,%i4,%i3             ! y += stridey
3423         ld      [%i1],%l3
3424         ld      [%i1],%f24
3425         ld      [%i1+4],%f27
3426         andn    %l3,%i5,%l3             ! hx &= ~0x80000000
3427         ba,pt   %icc,.loop3
```

```
3428 ! delay slot
3429         add     %i1,%i2,%i1             ! x += stridex

3431         SET_SIZE(__vsin_ultra3)
```

```
**********************************************************
   16403 Sat May 10 12:10:02 2014
new/usr/src/lib/libmvec/common/vis/__vsincos.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */
/*
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 */

        .file   "__vsincos.S"

#include "libm.h"

        RO_DATA
        .align  64
constants:
        .word   0x42c80000,0x00000000   ! 3 * 2^44
        .word   0x43380000,0x00000000   ! 3 * 2^51
        .word   0x3fe45f30,0x6dc9c883   ! invpio2
        .word   0x3ff921fb,0x54442c00   ! pio2_1
        .word   0x3d318469,0x898cc400   ! pio2_2
        .word   0x3a71701b,0x839a2520   ! pio2_3
        .word   0xbfc55555,0x55555533   ! pp1
        .word   0x3f811111,0x10e7d53b   ! pp2
        .word   0xbf2a0167,0xe6b3cf9b   ! pp3
        .word   0xbfdfffff,0xffffff65   ! qq1
        .word   0x3fa55555,0x54f88ed0   ! qq2
        .word   0xbf56c12c,0xdd185f60   ! qq3

! local storage indices

#define xsave           STACK_BIAS-0x8
#define ssave           STACK_BIAS-0x10
#define csave           STACK_BIAS-0x18
#define nsave           STACK_BIAS-0x1c
#define sxsave          STACK_BIAS-0x20
#define sssave          STACK_BIAS-0x24
#define biguns          STACK_BIAS-0x28
#define junk            STACK_BIAS-0x30
#define nk2             STACK_BIAS-0x38
#define nk1             STACK_BIAS-0x3c
#define nk0             STACK_BIAS-0x40
```



```
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x40

! register use

! i0  n
! i1  x
! i2  stridex
! i3  s
! i4  strides
! i5  0x80000000,n0

! l0  hx0,k0
! l1  hx1,k1
! l2  hx2,k2
! l3  c
! l4  pc0
! l5  pc1
! l6  pc2
! l7  stridec

! the following are 64-bit registers in both V8+ and V9

! g1  __vlibm_TBL_sincos2
! g5  scratch,n1

! o0  ps0
! o1  ps1
! o2  ps2
! o3  0x3fe921fb
! o4  0x3e400000
! o5  0x4099251e
! o7  scratch,n2

! f0  x0,z0
! f2  abs(x0)
! f4
! f6
! f8
! f10 x1,z1
! f12 abs(x1)
! f14
! f16
! f18
! f20 x2,z2
! f22 abs(x2)
! f24
! f26
! f28
! f30
! f32
! f34
! f36
! f38

#define c3two44 %f40
#define c3two51 %f42
#define invpio2 %f44
#define pio2_1  %f46
#define pio2_2  %f48
#define pio2_3  %f50
#define pp1     %f52
#define pp2     %f54
#define pp3     %f56
#define qq1     %f58
#define qq2     %f60
```

```
#define qq3     %f62

        ENTRY(__vsincos)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,constants,o0)
        PIC_SET(l7,__vlibm_TBL_sincos2,o1)
        mov     %o1,%g1
        wr      %g0,0x82,%asi           ! set %asi for non-faulting loads
#ifdef __sparcv9
        stx     %i1,[%fp+xsave]         ! save arguments
        stx     %i3,[%fp+ssave]
        stx     %i5,[%fp+csave]
        ldx     [%fp+STACK_BIAS+0xb0],%l7
#else
        st      %i1,[%fp+xsave]         ! save arguments
        st      %i3,[%fp+ssave]
        st      %i5,[%fp+csave]
        ld      [%fp+0x5c],%l7
#endif
        st      %i0,[%fp+nsave]
        st      %i2,[%fp+sxsave]
        st      %i4,[%fp+sssave]
        mov     %i5,%l3
        st      %g0,[%fp+biguns]        ! biguns = 0
        ldd     [%o0+0x00],c3two44      ! load/set up constants
        ldd     [%o0+0x08],c3two51
        ldd     [%o0+0x10],invpio2
        ldd     [%o0+0x18],pio2_1
        ldd     [%o0+0x20],pio2_2
        ldd     [%o0+0x28],pio2_3
        ldd     [%o0+0x30],pp1
        ldd     [%o0+0x38],pp2
        ldd     [%o0+0x40],pp3
        ldd     [%o0+0x48],qq1
        ldd     [%o0+0x50],qq2
        ldd     [%o0+0x58],qq3
        sethi   %hi(0x80000000),%i5
        sethi   %hi(0x3e400000),%o4
        sethi   %hi(0x3fe921fb),%o3
        or      %o3,%lo(0x3fe921fb),%o3
        sethi   %hi(0x4099251e),%o5
        or      %o5,%lo(0x4099251e),%o5
        sll     %i2,3,%i2               ! scale strides
        sll     %i4,3,%i4
        sll     %l7,3,%l7
        add     %fp,junk,%o0            ! loop prologue
        add     %fp,junk,%o1
        add     %fp,junk,%o2
        ld      [%i1],%l0               ! *x
        ld      [%i1],%f0
        ld      [%i1+4],%f3
        andn    %l0,%i5,%l0             ! mask off sign
        ba      .loop0
        add     %i1,%i2,%i1             ! x += stridex

! 16-byte aligned
        .align  16
.loop0:
        lda     [%i1]%asi,%l1           ! preload next argument
        sub     %l0,%o4,%g5
        sub     %o5,%l0,%o7
        fabss   %f0,%f2

        lda     [%i1]%asi,%f10
        orcc    %o7,%g5,%g0
```



```
        mov     %i3,%o0                 ! ps0 = s
        bl,pn   %icc,.range0            ! hx < 0x3e400000 or hx > 0x4099251e

! delay slot
        lda     [%i1+4]%asi,%f13
        addcc   %i0,-1,%i0
        add     %i3,%i4,%i3             ! s += strides

        mov     %l3,%l4                 ! pc0 = c
        add     %l3,%l7,%l3             ! c += stridec
        ble,pn  %icc,.last1

! delay slot
        andn    %l1,%i5,%l1
        add     %i1,%i2,%i1             ! x += stridex
        faddd   %f2,c3two44,%f4
        st      %f17,[%o1+4]

.loop1:
        lda     [%i1]%asi,%l2           ! preload next argument
        sub     %l1,%o4,%g5
        sub     %o5,%l1,%o7
        fabss   %f10,%f12

        lda     [%i1]%asi,%f20
        orcc    %o7,%g5,%g0
        mov     %i3,%o1                 ! ps1 = s
        bl,pn   %icc,.range1            ! hx < 0x3e400000 or hx > 0x4099251e

! delay slot
        lda     [%i1+4]%asi,%f23
        addcc   %i0,-1,%i0
        add     %i3,%i4,%i3             ! s += strides

        mov     %l3,%l5                 ! pc1 = c
        add     %l3,%l7,%l3             ! c += stridec
        ble,pn  %icc,.last2

! delay slot
        andn    %l2,%i5,%l2
        add     %i1,%i2,%i1             ! x += stridex
        faddd   %f12,c3two44,%f14
        st      %f27,[%o2+4]

.loop2:
        sub     %l2,%o4,%g5
        sub     %o5,%l2,%o7
        fabss   %f20,%f22
        st      %f5,[%fp+nk0]

        orcc    %o7,%g5,%g0
        mov     %i3,%o2                 ! ps2 = s
        bl,pn   %icc,.range2            ! hx < 0x3e400000 or hx > 0x4099251e
! delay slot
        st      %f15,[%fp+nk1]

        mov     %l3,%l6                 ! pc2 = c

.cont:
        add     %i3,%i4,%i3             ! s += strides
        add     %l3,%l7,%l3             ! c += stridec
        faddd   %f22,c3two44,%f24
        st      %f25,[%fp+nk2]

        sub     %o3,%l0,%l0
        sub     %o3,%l1,%l1
```

```
260         fmovs   %f3,%f1

262         sub     %o3,%l2,%l2
263         fmovs   %f13,%f11

265         or      %l0,%l1,%l0
266         orcc    %l0,%l2,%g0
267         fmovs   %f23,%f21

269         fmuld   %f0,invpio2,%f6         ! x * invpio2, for medium range

271         fmuld   %f10,invpio2,%f16
272         ld      [%fp+nk0],%l0

274         fmuld   %f20,invpio2,%f26
275         ld      [%fp+nk1],%l1

277         bl,pn   %icc,.medium
278 ! delay slot
279         ld      [%fp+nk2],%l2

281         sll     %l0,5,%l0               ! k
282         fcmpd   %fcc0,%f0,pio2_3        ! x < pio2_3 iff x < 0

284         sll     %l1,5,%l1
285         ldd     [%l0+%g1],%f4
286         fcmpd   %fcc1,%f10,pio2_3

288         sll     %l2,5,%l2
289         ldd     [%l1+%g1],%f14
290         fcmpd   %fcc2,%f20,pio2_3

292         ldd     [%l2+%g1],%f24

294         fsubd   %f2,%f4,%f2             ! x -= __vlibm_TBL_sincos2[k]

296         fsubd   %f12,%f14,%f12

298         fsubd   %f22,%f24,%f22

300         fmuld   %f2,%f2,%f0             ! z = x * x

302         fmuld   %f12,%f12,%f10

304         fmuld   %f22,%f22,%f20

306         fmuld   %f0,pp3,%f6

308         fmuld   %f10,pp3,%f16

310         fmuld   %f20,pp3,%f26

312         faddd   %f6,pp2,%f6
313         fmuld   %f0,qq3,%f4

315         faddd   %f16,pp2,%f16
316         fmuld   %f10,qq3,%f14

318         faddd   %f26,pp2,%f26
319         fmuld   %f20,qq3,%f24

321         fmuld   %f0,%f6,%f6
322         faddd   %f4,qq2,%f4

324         fmuld   %f10,%f16,%f16
325         faddd   %f14,qq2,%f14
```



```
327         fmuld   %f20,%f26,%f26
328         faddd   %f24,qq2,%f24

330         faddd   %f6,pp1,%f6
331         fmuld   %f0,%f4,%f4
332         add     %l0,%g1,%l0

334         faddd   %f16,pp1,%f16
335         fmuld   %f10,%f14,%f14
336         add     %l1,%g1,%l1

338         faddd   %f26,pp1,%f26
339         fmuld   %f20,%f24,%f24
340         add     %l2,%g1,%l2

342         fmuld   %f0,%f6,%f6
343         faddd   %f4,qq1,%f4

345         fmuld   %f10,%f16,%f16
346         faddd   %f14,qq1,%f14

348         fmuld   %f20,%f26,%f26
349         faddd   %f24,qq1,%f24

351         fmuld   %f2,%f6,%f6
352         ldd     [%l0+8],%f8

354         fmuld   %f12,%f16,%f16
355         ldd     [%l1+8],%f18

357         fmuld   %f22,%f26,%f26
358         ldd     [%l2+8],%f28

360         faddd   %f6,%f2,%f6
361         fmuld   %f0,%f4,%f4
362         ldd     [%l0+16],%f30

364         faddd   %f16,%f12,%f16
365         fmuld   %f10,%f14,%f14
366         ldd     [%l1+16],%f32

368         faddd   %f26,%f22,%f26
369         fmuld   %f20,%f24,%f24
370         ldd     [%l2+16],%f34

372         fmuld   %f8,%f6,%f0             ! s * spoly

374         fmuld   %f18,%f16,%f10

376         fmuld   %f28,%f26,%f20

378         fmuld   %f30,%f4,%f2            ! c * cpoly

380         fmuld   %f32,%f14,%f12

382         fmuld   %f34,%f24,%f22

384         fmuld   %f30,%f6,%f6            ! c * spoly
385         fsubd   %f2,%f0,%f2

387         fmuld   %f32,%f16,%f16
388         fsubd   %f12,%f10,%f12

390         fmuld   %f34,%f26,%f26
391         fsubd   %f22,%f20,%f22
```

```
393         fmuld   %f8,%f4,%f4             ! s * cpoly
394         faddd   %f2,%f30,%f2
395         st      %f2,[%l4]

397         fmuld   %f18,%f14,%f14
398         faddd   %f12,%f32,%f12
399         st      %f3,[%l4+4]

401         fmuld   %f28,%f24,%f24
402         faddd   %f22,%f34,%f22
403         st      %f12,[%l5]

405         faddd   %f6,%f4,%f6
406         st      %f13,[%l5+4]

408         faddd   %f16,%f14,%f16
409         st      %f22,[%l6]

411         faddd   %f26,%f24,%f26
412         st      %f23,[%l6+4]

414         faddd   %f6,%f8,%f6

416         faddd   %f16,%f18,%f16

418         faddd   %f26,%f28,%f26

420         fnegd   %f6,%f4
421         lda     [%i1]%asi,%l0           ! preload next argument

423         fnegd   %f16,%f14
424         lda     [%i1]%asi,%f0

426         fnegd   %f26,%f24
427         lda     [%i1+4]%asi,%f3
428         andn    %l0,%i5,%l0
429         add     %i1,%i2,%i1

431         fmovdl  %fcc0,%f4,%f6           ! (hx < -0)? -s : s
432         st      %f6,[%o0]

434         fmovdl  %fcc1,%f14,%f16
435         st      %f16,[%o1]

437         fmovdl  %fcc2,%f24,%f26
438         st      %f26,[%o2]
439         addcc   %i0,-1,%i0

441         bg,pt   %icc,.loop0
442 ! delay slot
443         st      %f7,[%o0+4]

445         ba,pt   %icc,.end
446 ! delay slot
447         nop


450         .align  16
451 .medium:
452         faddd   %f6,c3two51,%f4
453         st      %f5,[%fp+nk0]

455         faddd   %f16,c3two51,%f14
456         st      %f15,[%fp+nk1]
```



```
458         faddd   %f26,c3two51,%f24
459         st      %f25,[%fp+nk2]

461         fsubd   %f4,c3two51,%f6

463         fsubd   %f14,c3two51,%f16

465         fsubd   %f24,c3two51,%f26

467         fmuld   %f6,pio2_1,%f2
468         ld      [%fp+nk0],%i5           ! n

470         fmuld   %f16,pio2_1,%f12
471         ld      [%fp+nk1],%g5

473         fmuld   %f26,pio2_1,%f22
474         ld      [%fp+nk2],%o7

476         fsubd   %f0,%f2,%f0
477         fmuld   %f6,pio2_2,%f4
478         mov     %o0,%o4                 ! if (n & 1) swap ps, pc
479         andcc   %i5,1,%g0

481         fsubd   %f10,%f12,%f10
482         fmuld   %f16,pio2_2,%f14
483         movnz   %icc,%l4,%o0
484         and     %i5,3,%i5

486         fsubd   %f20,%f22,%f20
487         fmuld   %f26,pio2_2,%f24
488         movnz   %icc,%o4,%l4

490         fsubd   %f0,%f4,%f30
491         mov     %o1,%o4
492         andcc   %g5,1,%g0

494         fsubd   %f10,%f14,%f32
495         movnz   %icc,%l5,%o1
496         and     %g5,3,%g5

498         fsubd   %f20,%f24,%f34
499         movnz   %icc,%o4,%l5

501         fsubd   %f0,%f30,%f0
502         fcmple32 %f30,pio2_3,%l0        ! x <= pio2_3 iff x < 0
503         mov     %o2,%o4
504         andcc   %o7,1,%g0

506         fsubd   %f10,%f32,%f10
507         fcmple32 %f32,pio2_3,%l1
508         movnz   %icc,%l6,%o2
509         and     %o7,3,%o7

511         fsubd   %f20,%f34,%f20
512         fcmple32 %f34,pio2_3,%l2
513         movnz   %icc,%o4,%l6

515         fsubd   %f0,%f4,%f0
516         fmuld   %f6,pio2_3,%f6
517         add     %i5,1,%o4               ! n = (n >> 1) | (((n + 1) ^ l) & 2)
518         srl     %i5,1,%i5

520         fsubd   %f10,%f14,%f10
521         fmuld   %f16,pio2_3,%f16
522         xor     %o4,%l0,%o4
```

```
524         fsubd   %f20,%f24,%f20
525         fmuld   %f26,pio2_3,%f26
526         and     %o4,2,%o4

528         fsubd   %f6,%f0,%f6
529         or      %i5,%o4,%i5

531         fsubd   %f16,%f10,%f16
532         add     %g5,1,%o4
533         srl     %g5,1,%g5

535         fsubd   %f26,%f20,%f26
536         xor     %o4,%l1,%o4

538         fsubd   %f30,%f6,%f0            ! reduced x
539         and     %o4,2,%o4

541         fsubd   %f32,%f16,%f10
542         or      %g5,%o4,%g5

544         fsubd   %f34,%f26,%f20
545         add     %o7,1,%o4
546         srl     %o7,1,%o7

548         fzero   %f38
549         xor     %o4,%l2,%o4

551         fabsd   %f0,%f2
552         and     %o4,2,%o4

554         fabsd   %f10,%f12
555         or      %o7,%o4,%o7

557         fabsd   %f20,%f22
558         sethi   %hi(0x3e400000),%o4

560         fnegd   %f38,%f38

562         faddd   %f2,c3two44,%f4
563         st      %f5,[%fp+nk0]

565         faddd   %f12,c3two44,%f14
566         st      %f15,[%fp+nk1]

568         faddd   %f22,c3two44,%f24
569         st      %f25,[%fp+nk2]

571         fsubd   %f30,%f0,%f4

573         fsubd   %f32,%f10,%f14

575         fsubd   %f34,%f20,%f24

577         fsubd   %f4,%f6,%f6             ! w
578         ld      [%fp+nk0],%l0

580         fsubd   %f14,%f16,%f16
581         ld      [%fp+nk1],%l1

583         fsubd   %f24,%f26,%f26
584         ld      [%fp+nk2],%l2
585         sll     %l0,5,%l0               ! k

587         fand    %f0,%f38,%f30           ! sign bit of x
588         ldd     [%l0+%g1],%f4
589         sll     %l1,5,%l1
```



```
591         fand    %f10,%f38,%f32
592         ldd     [%l1+%g1],%f14
593         sll     %l2,5,%l2

595         fand    %f20,%f38,%f34
596         ldd     [%l2+%g1],%f24

598         fsubd   %f2,%f4,%f2             ! x -= __vlibm_TBL_sincos2[k]

600         fsubd   %f12,%f14,%f12

602         fsubd   %f22,%f24,%f22

604         fmuld   %f2,%f2,%f0             ! z = x * x
605         fxor    %f6,%f30,%f30

607         fmuld   %f12,%f12,%f10
608         fxor    %f16,%f32,%f32

610         fmuld   %f22,%f22,%f20
611         fxor    %f26,%f34,%f34

613         fmuld   %f0,pp3,%f6

615         fmuld   %f10,pp3,%f16

617         fmuld   %f20,pp3,%f26

619         faddd   %f6,pp2,%f6
620         fmuld   %f0,qq3,%f4

622         faddd   %f16,pp2,%f16
623         fmuld   %f10,qq3,%f14

625         faddd   %f26,pp2,%f26
626         fmuld   %f20,qq3,%f24

628         fmuld   %f0,%f6,%f6
629         faddd   %f4,qq2,%f4

631         fmuld   %f10,%f16,%f16
632         faddd   %f14,qq2,%f14

634         fmuld   %f20,%f26,%f26
635         faddd   %f24,qq2,%f24

637         faddd   %f6,pp1,%f6
638         fmuld   %f0,%f4,%f4
639         add     %l0,%g1,%l0

641         faddd   %f16,pp1,%f16
642         fmuld   %f10,%f14,%f14
643         add     %l1,%g1,%l1

645         faddd   %f26,pp1,%f26
646         fmuld   %f20,%f24,%f24
647         add     %l2,%g1,%l2

649         fmuld   %f0,%f6,%f6
650         faddd   %f4,qq1,%f4

652         fmuld   %f10,%f16,%f16
653         faddd   %f14,qq1,%f14

655         fmuld   %f20,%f26,%f26
```

```
656         faddd   %f24,qq1,%f24

658         fmuld   %f2,%f6,%f6
659         ldd     [%l0+16],%f8

661         fmuld   %f12,%f16,%f16
662         ldd     [%l1+16],%f18

664         fmuld   %f22,%f26,%f26
665         ldd     [%l2+16],%f28

667         faddd   %f6,%f30,%f6
668         fmuld   %f0,%f4,%f4
669         ldd     [%l0+8],%f30

671         faddd   %f16,%f32,%f16
672         fmuld   %f10,%f14,%f14
673         ldd     [%l1+8],%f32

675         faddd   %f26,%f34,%f26
676         fmuld   %f20,%f24,%f24
677         ldd     [%l2+8],%f34

679         fmuld   %f8,%f4,%f0             ! c * cpoly
680         faddd   %f6,%f2,%f6

682         fmuld   %f18,%f14,%f10
683         faddd   %f16,%f12,%f16

685         fmuld   %f28,%f24,%f20
686         faddd   %f26,%f22,%f26

688         fmuld   %f30,%f6,%f2            ! s * spoly

690         fmuld   %f32,%f16,%f12

692         fmuld   %f34,%f26,%f22

694         fmuld   %f8,%f6,%f6             ! c * spoly
695         fsubd   %f0,%f2,%f2

697         fmuld   %f18,%f16,%f16
698         fsubd   %f10,%f12,%f12

700         fmuld   %f28,%f26,%f26
701         fsubd   %f20,%f22,%f22

703         fmuld   %f30,%f4,%f4            ! s * cpoly
704         faddd   %f8,%f2,%f8

706         fmuld   %f32,%f14,%f14
707         faddd   %f18,%f12,%f18

709         fmuld   %f34,%f24,%f24
710         faddd   %f28,%f22,%f28

712         faddd   %f4,%f6,%f6

714         faddd   %f14,%f16,%f16

716         faddd   %f24,%f26,%f26

718         faddd   %f30,%f6,%f6            ! now %f6 = sin |x|, %f8 = cos |x|

720         faddd   %f32,%f16,%f16
```



```
722         faddd   %f34,%f26,%f26

724         fnegd   %f8,%f4                 ! if (n & 1) c = -c
725         lda     [%i1]%asi,%l0           ! preload next argument
726         mov     %i5,%l1

728         fnegd   %f18,%f14
729         lda     [%i1]%asi,%f0
730         sethi   %hi(0x80000000),%i5

732         fnegd   %f28,%f24
733         lda     [%i1+4]%asi,%f3

735         andcc   %l1,1,%g0
736         fmovdnz %icc,%f4,%f8
737         st      %f8,[%l4]

739         andcc   %g5,1,%g0
740         fmovdnz %icc,%f14,%f18
741         st      %f9,[%l4+4]

743         andcc   %o7,1,%g0
744         fmovdnz %icc,%f24,%f28
745         st      %f18,[%l5]

747         fnegd   %f6,%f4                 ! if (n & 2) s = -s
748         st      %f19,[%l5+4]
749         andn    %l0,%i5,%l0

751         fnegd   %f16,%f14
752         st      %f28,[%l6]
753         add     %i1,%i2,%i1

755         fnegd   %f26,%f24
756         st      %f29,[%l6+4]

758         andcc   %l1,2,%g0
759         fmovdnz %icc,%f4,%f6
760         st      %f6,[%o0]

762         andcc   %g5,2,%g0
763         fmovdnz %icc,%f14,%f16
764         st      %f16,[%o1]

766         andcc   %o7,2,%g0
767         fmovdnz %icc,%f24,%f26
768         st      %f26,[%o2]

770         addcc   %i0,-1,%i0
771         bg,pt   %icc,.loop0
772 ! delay slot
773         st      %f7,[%o0+4]

775         ba,pt   %icc,.end
776 ! delay slot
777         nop


780         .align  16
781 .end:
782         st      %f17,[%o1+4]
783         st      %f27,[%o2+4]
784         ld      [%fp+biguns],%i5
785         tst     %i5                     ! check for huge arguments remaining
786         be,pt   %icc,.exit
787 ! delay slot
```

```
788         nop
789 #ifdef __sparcv9
790         stx     %o5,[%sp+STACK_BIAS+0xb8]
791         ldx     [%fp+xsave],%o1
792         ldx     [%fp+ssave],%o3
793         ldx     [%fp+csave],%o5
794         ldx     [%fp+STACK_BIAS+0xb0],%i5
795         stx     %i5,[%sp+STACK_BIAS+0xb0]
796 #else
797         st      %o5,[%sp+0x60]
798         ld      [%fp+xsave],%o1
799         ld      [%fp+ssave],%o3
800         ld      [%fp+csave],%o5
801         ld      [%fp+0x5c],%i5
802         st      %i5,[%sp+0x5c]
803 #endif
804         ld      [%fp+nsave],%o0
805         ld      [%fp+sxsave],%o2
806         ld      [%fp+sssave],%o4
807         sra     %o2,0,%o2               ! sign-extend for V9
808         call    __vlibm_vsincos_big
809         sra     %o4,0,%o4               ! delay slot

811 .exit:
812         ret
813         restore


816         .align  16
817 .last1:
818         faddd   %f2,c3two44,%f4
819         st      %f17,[%o1+4]
820 .last1_from_range1:
821         mov     0,%l1
822         fzeros  %f10
823         fzero   %f12
824         add     %fp,junk,%o1
825         add     %fp,junk,%l5
826 .last2:
827         faddd   %f12,c3two44,%f14
828         st      %f27,[%o2+4]
829         st      %f5,[%fp+nk0]
830         st      %f15,[%fp+nk1]
831 .last2_from_range2:
832         mov     0,%l2
833         fzeros  %f20
834         fzero   %f22
835         add     %fp,junk,%o2
836         ba,pt   %icc,.cont
837 ! delay slot
838         add     %fp,junk,%l6


841         .align  16
842 .range0:
843         cmp     %l0,%o4
844         bl,pt   %icc,1f                 ! hx < 0x3e400000
845 ! delay slot, harmless if branch taken
846         sethi   %hi(0x7ff00000),%o7
847         cmp     %l0,%o7
848         bl,a,pt %icc,2f                 ! branch if finite
849 ! delay slot, squashed if branch not taken
850         st      %o4,[%fp+biguns]        ! set biguns
851         fzero   %f0
852         fmuld   %f2,%f0,%f2
853         st      %f2,[%o0]
```



```
854         st      %f3,[%o0+4]
855         st      %f2,[%l3]
856         ba,pt   %icc,2f
857 ! delay slot
858         st      %f3,[%l3+4]
859 1:
860         fdtoi   %f2,%f4                 ! raise inexact if not zero
861         st      %f0,[%o0]
862         st      %f3,[%o0+4]
863         sethi   %hi(0x3ff00000),%g5
864         st      %g5,[%l3]
865         st      %g0,[%l3+4]
866 2:
867         addcc   %i0,-1,%i0
868         ble,pn  %icc,.end
869 ! delay slot, harmless if branch taken
870         add     %i3,%i4,%i3             ! s += strides
871         add     %l3,%l7,%l3             ! c += stridec
872         andn    %l1,%i5,%l0             ! hx &= ~0x80000000
873         fmovs   %f10,%f0
874         fmovs   %f13,%f3
875         ba,pt   %icc,.loop0
876 ! delay slot
877         add     %i1,%i2,%i1             ! x += stridex


880         .align  16
881 .range1:
882         cmp     %l1,%o4
883         bl,pt   %icc,1f                 ! hx < 0x3e400000
884 ! delay slot, harmless if branch taken
885         sethi   %hi(0x7ff00000),%o7
886         cmp     %l1,%o7
887         bl,a,pt %icc,2f                 ! branch if finite
888 ! delay slot, squashed if branch not taken
889         st      %o4,[%fp+biguns]        ! set biguns
890         fzero   %f10
891         fmuld   %f12,%f10,%f12
892         st      %f12,[%o1]
893         st      %f13,[%o1+4]
894         st      %f12,[%l3]
895         ba,pt   %icc,2f
896 ! delay slot
897         st      %f13,[%l3+4]
898 1:
899         fdtoi   %f12,%f14               ! raise inexact if not zero
900         st      %f10,[%o1]
901         st      %f13,[%o1+4]
902         sethi   %hi(0x3ff00000),%g5
903         st      %g5,[%l3]
904         st      %g0,[%l3+4]
905 2:
906         addcc   %i0,-1,%i0
907         ble,pn  %icc,.last1_from_range1
908 ! delay slot, harmless if branch taken
909         add     %i3,%i4,%i3             ! s += strides
910         add     %l3,%l7,%l3             ! c += stridec
911         andn    %l2,%i5,%l1             ! hx &= ~0x80000000
912         fmovs   %f20,%f10
913         fmovs   %f23,%f13
914         ba,pt   %icc,.loop1
915 ! delay slot
916         add     %i1,%i2,%i1             ! x += stridex


919         .align  16
```

```
.range2:
        cmp     %l2,%o4
        bl,pt   %icc,1f                 ! hx < 0x3e400000
! delay slot, harmless if branch taken
        sethi   %hi(0x7ff00000),%o7
        cmp     %l2,%o7
        bl,a,pt %icc,2f                 ! branch if finite
! delay slot, squashed if branch not taken
        st      %o4,[%fp+biguns]        ! set biguns
        fzero   %f20
        fmuld   %f22,%f20,%f22
        st      %f22,[%o2]
        st      %f23,[%o2+4]
        st      %f22,[%l3]
        ba,pt   %icc,2f
! delay slot
        st      %f23,[%l3+4]
1:
        fdtoi   %f22,%f24               ! raise inexact if not zero
        st      %f20,[%o2]
        st      %f23,[%o2+4]
        sethi   %hi(0x3ff00000),%g5
        st      %g5,[%l3]
        st      %g0,[%l3+4]
2:
        addcc   %i0,-1,%i0
        ble,pn  %icc,.last2_from_range2
! delay slot, harmless if branch taken
        add     %i3,%i4,%i3             ! s += strides
        add     %l3,%l7,%l3             ! c += stridec
        ld      [%i1],%l2
        ld      [%i1],%f20
        ld      [%i1+4],%f23
        andn    %l2,%i5,%l2             ! hx &= ~0x80000000
        ba,pt   %icc,.loop2
! delay slot
        add     %i1,%i2,%i1             ! x += stridex

        SET_SIZE(__vsincos)
```

```
**********************************************************
   14693 Sat May 10 12:10:02 2014
new/usr/src/lib/libmvec/common/vis/__vsincosf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vsincosf.S"

#include "libm.h"

        RO_DATA
        .align  64
constants:
        .word   0xbfc55554,0x60000000
        .word   0x3f811077,0xe0000000
        .word   0xbf29956b,0x60000000
        .word   0x3ff00000,0x00000000
        .word   0xbfe00000,0x00000000
        .word   0x3fa55554,0xa0000000
        .word   0xbf56c0c1,0xe0000000
        .word   0x3ef99e24,0xe0000000
        .word   0x3fe45f30,0x6dc9c883
        .word   0x43380000,0x00000000
        .word   0x3ff921fb,0x54400000
        .word   0x3dd0b461,0x1a626331
        .word   0x3f490fdb,0
        .word   0x49c90fdb,0
        .word   0x7f800000,0
        .word   0x80000000,0

#define S0              0x0
#define S1              0x08
#define S2              0x10
#define one             0x18
#define mhalf           0x20
#define C0              0x28
#define C1              0x30
#define C2              0x38
#define invpio2         0x40
```



```
#define round           0x48
#define pio2_1          0x50
#define pio2_t          0x58
#define thresh1         0x60
#define thresh2         0x68
#define inf             0x70
#define signbit         0x78

! local storage indices

#define xsave           STACK_BIAS-0x8
#define ssave           STACK_BIAS-0x10
#define csave           STACK_BIAS-0x18
#define nsave           STACK_BIAS-0x1c
#define sxsave          STACK_BIAS-0x20
#define sssave          STACK_BIAS-0x24
#define junk            STACK_BIAS-0x28
#define n3              STACK_BIAS-0x38
#define n2              STACK_BIAS-0x40
#define n1              STACK_BIAS-0x48
#define n0              STACK_BIAS-0x50
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x50

! register use

! i0  n
! i1  x
! i2  stridex
! i3  s
! i4  strides
! i5  biguns

! l0  ps0
! l1  ps1
! l2  ps2
! l3  ps3
! l4  pc0
! l5  pc1
! l6  pc2
! l7  pc3

! the following are 64-bit registers in both V8+ and V9

! g1
! g5

! o0  n0
! o1  n1
! o2  n2
! o3  n3
! o4  c
! o5  stridec
! o7

! f0  x0
! f2  x1
! f4  x2
! f6  x3
! f8  thresh1 (pi/4)
! f10 s0
! f12 s1
! f14 s2
! f16 s3
! f18 thresh2 (2^19 pi)
! f20 c0
```

```
! f22 c1
! f24 c2
! f26 c3
! f28 signbit
! f30
! f32
! f34
! f36
! f38 inf
! f40 S0
! f42 S1
! f44 S2
! f46 one
! f48 mhalf
! f50 C0
! f52 C1
! f54 C2
! f56 invpio2
! f58 round
! f60 pio2_1
! f62 pio2_t

        ENTRY(__vsincosf)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,constants,o0)
        mov     %o0,%g1

#ifdef __sparcv9
        stx     %i1,[%fp+xsave]         ! save arguments
        stx     %i3,[%fp+ssave]
        stx     %i5,[%fp+csave]
        ldx     [%fp+STACK_BIAS+0xb0],%o5
#else
        st      %i1,[%fp+xsave]         ! save arguments
        st      %i3,[%fp+ssave]
        st      %i5,[%fp+csave]
        ld      [%fp+0x5c],%o5
#endif
        st      %i0,[%fp+nsave]
        st      %i2,[%fp+sxsave]
        st      %i4,[%fp+sssave]
        mov     %i5,%o4
        mov     0,%i5                   ! biguns = 0
        ldd     [%g1+S0],%f40           ! load constants
        ldd     [%g1+S1],%f42
        ldd     [%g1+S2],%f44
        ldd     [%g1+one],%f46
        ldd     [%g1+mhalf],%f48
        ldd     [%g1+C0],%f50
        ldd     [%g1+C1],%f52
        ldd     [%g1+C2],%f54
        ldd     [%g1+invpio2],%f56
        ldd     [%g1+round],%f58
        ldd     [%g1+pio2_1],%f60
        ldd     [%g1+pio2_t],%f62
        ldd     [%g1+thresh1],%f8
        ldd     [%g1+thresh2],%f18
        ldd     [%g1+inf],%f38
        ldd     [%g1+signbit],%f28
        sll     %i2,2,%i2               ! scale strides
        sll     %i4,2,%i4
        sll     %o5,2,%o5
        nop
        fzero   %f10                    ! loop prologue
        add     %fp,junk,%l0
```



```
        fzero   %f20
        add     %fp,junk,%l4
        fzero   %f12
        add     %fp,junk,%l1
        fzero   %f22
        add     %fp,junk,%l5
        fzero   %f14
        add     %fp,junk,%l2
        fzero   %f24
        add     %fp,junk,%l6
        fzero   %f16
        add     %fp,junk,%l3
        fzero   %f26
        ba      .start
        add     %fp,junk,%l7

! 16-byte aligned
        .align  16
.start:
        ld      [%i1],%f0               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        addcc   %i0,-1,%i0
        fdtos   %f10,%f10

        st      %f10,[%l0]
        mov     %i3,%l0                 ! ps0 = s
        add     %i3,%i4,%i3             ! s += strides
        fdtos   %f20,%f20

        st      %f20,[%l4]
        mov     %o4,%l4                 ! pc0 = c
        ble,pn  %icc,.last1
! delay slot
        add     %o4,%o5,%o4             ! c += stridec

        ld      [%i1],%f2               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        addcc   %i0,-1,%i0
        fdtos   %f12,%f12

        st      %f12,[%l1]
        mov     %i3,%l1                 ! ps1 = s
        add     %i3,%i4,%i3             ! s += strides
        fdtos   %f22,%f22

        st      %f22,[%l5]
        mov     %o4,%l5                 ! pc1 = c
        ble,pn  %icc,.last2
! delay slot
        add     %o4,%o5,%o4             ! c += stridec

        ld      [%i1],%f4               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        addcc   %i0,-1,%i0
        fdtos   %f14,%f14

        st      %f14,[%l2]
        mov     %i3,%l2                 ! ps2 = s
        add     %i3,%i4,%i3             ! s += strides
        fdtos   %f24,%f24

        st      %f24,[%l6]
        mov     %o4,%l6                 ! pc2 = c
        ble,pn  %icc,.last3
! delay slot
        add     %o4,%o5,%o4             ! c += stridec
```

```
261         ld      [%i1],%f6               ! *x
262         add     %i1,%i2,%i1             ! x += stridex
263         nop
264         fdtos   %f16,%f16

266         st      %f16,[%l3]
267         mov     %i3,%l3                 ! ps3 = s
268         add     %i3,%i4,%i3             ! s += strides
269         fdtos   %f26,%f26

271         st      %f26,[%l7]
272         mov     %o4,%l7                 ! pc3 = c
273         add     %o4,%o5,%o4             ! c += stridec
274 .cont:
275         fabsd   %f0,%f30

277         fabsd   %f2,%f32

279         fabsd   %f4,%f34

281         fabsd   %f6,%f36
282         fcmple32 %f30,%f18,%o0

284         fcmple32 %f32,%f18,%o1

286         fcmple32 %f34,%f18,%o2

288         fcmple32 %f36,%f18,%o3
289         nop

291 ! 16-byte aligned
292         andcc   %o0,2,%g0
293         bz,pn   %icc,.range0            ! branch if > 2^19 pi
294 ! delay slot
295         fcmple32 %f30,%f8,%o0

297 .check1:
298         andcc   %o1,2,%g0
299         bz,pn   %icc,.range1            ! branch if > 2^19 pi
300 ! delay slot
301         fcmple32 %f32,%f8,%o1

303 .check2:
304         andcc   %o2,2,%g0
305         bz,pn   %icc,.range2            ! branch if > 2^19 pi
306 ! delay slot
307         fcmple32 %f34,%f8,%o2

309 .check3:
310         andcc   %o3,2,%g0
311         bz,pn   %icc,.range3            ! branch if > 2^19 pi
312 ! delay slot
313         fcmple32 %f36,%f8,%o3

315 .checkprimary:
316         fsmuld  %f0,%f0,%f30
317         fstod   %f0,%f0

319         fsmuld  %f2,%f2,%f32
320         fstod   %f2,%f2
321         and     %o0,%o1,%o7

323         fsmuld  %f4,%f4,%f34
324         fstod   %f4,%f4
325         and     %o2,%o7,%o7
```



```
327         fsmuld  %f6,%f6,%f36
328         fstod   %f6,%f6
329         and     %o3,%o7,%o7

331         fmuld   %f30,%f54,%f20
332         andcc   %o7,2,%g0
333         bz,pn   %icc,.medium            ! branch if any argument is > pi/4
334 ! delay slot
335         nop

337         fmuld   %f32,%f54,%f22

339         fmuld   %f34,%f54,%f24

341         fmuld   %f36,%f54,%f26

343         faddd   %f20,%f52,%f20
344         fmuld   %f30,%f44,%f10

346         faddd   %f22,%f52,%f22
347         fmuld   %f32,%f44,%f12

349         faddd   %f24,%f52,%f24
350         fmuld   %f34,%f44,%f14

352         faddd   %f26,%f52,%f26
353         fmuld   %f36,%f44,%f16

355         fmuld   %f30,%f20,%f20
356         faddd   %f10,%f42,%f10

358         fmuld   %f32,%f22,%f22
359         faddd   %f12,%f42,%f12

361         fmuld   %f34,%f24,%f24
362         faddd   %f14,%f42,%f14

364         fmuld   %f36,%f26,%f26
365         faddd   %f16,%f42,%f16

367         faddd   %f20,%f50,%f20
368         fmuld   %f30,%f10,%f10

370         faddd   %f22,%f50,%f22
371         fmuld   %f32,%f12,%f12

373         faddd   %f24,%f50,%f24
374         fmuld   %f34,%f14,%f14

376         faddd   %f26,%f50,%f26
377         fmuld   %f36,%f16,%f16

379         fmuld   %f30,%f20,%f20
380         faddd   %f10,%f40,%f10

382         fmuld   %f32,%f22,%f22
383         faddd   %f12,%f40,%f12

385         fmuld   %f34,%f24,%f24
386         faddd   %f14,%f40,%f14

388         fmuld   %f36,%f26,%f26
389         faddd   %f16,%f40,%f16

391         faddd   %f20,%f48,%f20
```

```
392         fmuld   %f30,%f10,%f10

394         faddd   %f22,%f48,%f22
395         fmuld   %f32,%f12,%f12

397         faddd   %f24,%f48,%f24
398         fmuld   %f34,%f14,%f14

400         faddd   %f26,%f48,%f26
401         fmuld   %f36,%f16,%f16

403         fmuld   %f30,%f20,%f20
404         faddd   %f10,%f46,%f10

406         fmuld   %f32,%f22,%f22
407         faddd   %f12,%f46,%f12

409         fmuld   %f34,%f24,%f24
410         faddd   %f14,%f46,%f14

412         fmuld   %f36,%f26,%f26
413         faddd   %f16,%f46,%f16

415         faddd   %f20,%f46,%f20
416         fmuld   %f0,%f10,%f10

418         faddd   %f22,%f46,%f22
419         fmuld   %f2,%f12,%f12

421         faddd   %f24,%f46,%f24
422         fmuld   %f4,%f14,%f14
423         addcc   %i0,-1,%i0

425         faddd   %f26,%f46,%f26
426         bg,pt   %icc,.start
427 ! delay slot
428         fmuld   %f6,%f16,%f16

430         ba,pt   %icc,.end
431 ! delay slot
432         nop


435         .align  16
436 .medium:
437         fmuld   %f0,%f56,%f10

439         fmuld   %f2,%f56,%f12

441         fmuld   %f4,%f56,%f14

443         fmuld   %f6,%f56,%f16

445         faddd   %f10,%f58,%f10
446         st      %f11,[%fp+n0]

448         faddd   %f12,%f58,%f12
449         st      %f13,[%fp+n1]

451         faddd   %f14,%f58,%f14
452         st      %f15,[%fp+n2]

454         faddd   %f16,%f58,%f16
455         st      %f17,[%fp+n3]

457         fsubd   %f10,%f58,%f10
```



```
459         fsubd   %f12,%f58,%f12

461         fsubd   %f14,%f58,%f14

463         fsubd   %f16,%f58,%f16

465         fmuld   %f10,%f60,%f20
466         ld      [%fp+n0],%o0

468         fmuld   %f12,%f60,%f22
469         ld      [%fp+n1],%o1

471         fmuld   %f14,%f60,%f24
472         ld      [%fp+n2],%o2

474         fmuld   %f16,%f60,%f26
475         ld      [%fp+n3],%o3

477         fsubd   %f0,%f20,%f0
478         fmuld   %f10,%f62,%f30
479         and     %o0,1,%o0
480         mov     %l0,%g1

482         fsubd   %f2,%f22,%f2
483         fmuld   %f12,%f62,%f32
484         and     %o1,1,%o1
485         movrnz  %o0,%l4,%l0             ! if (n & 1) exchange ps and pc

487         fsubd   %f4,%f24,%f4
488         fmuld   %f14,%f62,%f34
489         and     %o2,1,%o2
490         movrnz  %o0,%g1,%l4

492         fsubd   %f6,%f26,%f6
493         fmuld   %f16,%f62,%f36
494         and     %o3,1,%o3
495         mov     %l1,%g1

497         fsubd   %f0,%f30,%f0
498         movrnz  %o1,%l5,%l1

500         fsubd   %f2,%f32,%f2
501         movrnz  %o1,%g1,%l5

503         fsubd   %f4,%f34,%f4
504         mov     %l2,%g1

506         fsubd   %f6,%f36,%f6
507         movrnz  %o2,%l6,%l2

509         fmuld   %f0,%f0,%f30
510         fnegd   %f0,%f10
511         movrnz  %o2,%g1,%l6

513         fmuld   %f2,%f2,%f32
514         fnegd   %f2,%f12
515         mov     %l3,%g1

517         fmuld   %f4,%f4,%f34
518         fnegd   %f4,%f14
519         movrnz  %o3,%l7,%l3

521         fmuld   %f6,%f6,%f36
522         fnegd   %f6,%f16
523         movrnz  %o3,%g1,%l7
```

```
525         fmuld   %f30,%f54,%f20
526         fmovrdnz %o0,%f10,%f0           ! if (n & 1) x = -x

528         fmuld   %f32,%f54,%f22
529         fmovrdnz %o1,%f12,%f2

531         fmuld   %f34,%f54,%f24
532         fmovrdnz %o2,%f14,%f4

534         fmuld   %f36,%f54,%f26
535         fmovrdnz %o3,%f16,%f6

537         faddd   %f20,%f52,%f20
538         fmuld   %f30,%f44,%f10
539         ld      [%fp+n0],%o0

541         faddd   %f22,%f52,%f22
542         fmuld   %f32,%f44,%f12
543         and     %o0,2,%o0

545         faddd   %f24,%f52,%f24
546         fmuld   %f34,%f44,%f14
547         sllx    %o0,62,%g1
548         stx     %g1,[%fp+n0]

550         faddd   %f26,%f52,%f26
551         fmuld   %f36,%f44,%f16
552         ld      [%fp+n1],%o1

554         fmuld   %f30,%f20,%f20
555         faddd   %f10,%f42,%f10
556         and     %o1,2,%o1

558         fmuld   %f32,%f22,%f22
559         faddd   %f12,%f42,%f12
560         sllx    %o1,62,%g1
561         stx     %g1,[%fp+n1]

563         fmuld   %f34,%f24,%f24
564         faddd   %f14,%f42,%f14
565         ld      [%fp+n2],%o2

567         fmuld   %f36,%f26,%f26
568         faddd   %f16,%f42,%f16
569         and     %o2,2,%o2

571         faddd   %f20,%f50,%f20
572         fmuld   %f30,%f10,%f10
573         sllx    %o2,62,%g1
574         stx     %g1,[%fp+n2]

576         faddd   %f22,%f50,%f22
577         fmuld   %f32,%f12,%f12
578         ld      [%fp+n3],%o3

580         faddd   %f24,%f50,%f24
581         fmuld   %f34,%f14,%f14
582         and     %o3,2,%o3

584         faddd   %f26,%f50,%f26
585         fmuld   %f36,%f16,%f16
586         sllx    %o3,62,%g1
587         stx     %g1,[%fp+n3]

589         fmuld   %f30,%f20,%f20
```



```
590         faddd   %f10,%f40,%f10

592         fmuld   %f32,%f22,%f22
593         faddd   %f12,%f40,%f12

595         fmuld   %f34,%f24,%f24
596         faddd   %f14,%f40,%f14

598         fmuld   %f36,%f26,%f26
599         faddd   %f16,%f40,%f16

601         faddd   %f20,%f48,%f20
602         fmuld   %f30,%f10,%f10

604         faddd   %f22,%f48,%f22
605         fmuld   %f32,%f12,%f12

607         faddd   %f24,%f48,%f24
608         fmuld   %f34,%f14,%f14

610         faddd   %f26,%f48,%f26
611         fmuld   %f36,%f16,%f16

613         fmuld   %f30,%f20,%f20
614         faddd   %f10,%f46,%f10

616         fmuld   %f32,%f22,%f22
617         faddd   %f12,%f46,%f12

619         fmuld   %f34,%f24,%f24
620         faddd   %f14,%f46,%f14

622         fmuld   %f36,%f26,%f26
623         faddd   %f16,%f46,%f16

625         faddd   %f20,%f46,%f20
626         fmuld   %f0,%f10,%f10
627         ldd     [%fp+n0],%f30

629         faddd   %f22,%f46,%f22
630         fmuld   %f2,%f12,%f12
631         ldd     [%fp+n1],%f32

633         faddd   %f24,%f46,%f24
634         fmuld   %f4,%f14,%f14
635         ldd     [%fp+n2],%f34

637         faddd   %f26,%f46,%f26
638         fmuld   %f6,%f16,%f16
639         ldd     [%fp+n3],%f36

641         fxor    %f10,%f30,%f10          ! if (n & 2) negate s, c

643         fxor    %f12,%f32,%f12

645         fxor    %f14,%f34,%f14

647         fxor    %f16,%f36,%f16

649         fxor    %f20,%f30,%f20

651         fxor    %f22,%f32,%f22

653         fxor    %f24,%f34,%f24

655         addcc   %i0,-1,%i0
```

```
656         bg,pt   %icc,.start
657 ! delay slot
658         fxor    %f26,%f36,%f26

660         ba,pt   %icc,.end
661 ! delay slot
662         nop


665         .align  32
666 .end:
667         fdtos   %f10,%f10
668         st      %f10,[%l0]
669         fdtos   %f20,%f20
670         st      %f20,[%l4]
671         fdtos   %f12,%f12
672         st      %f12,[%l1]
673         fdtos   %f22,%f22
674         st      %f22,[%l5]
675         fdtos   %f14,%f14
676         st      %f14,[%l2]
677         fdtos   %f24,%f24
678         st      %f24,[%l6]
679         fdtos   %f16,%f16
680         st      %f16,[%l3]
681         fdtos   %f26,%f26
682         tst     %i5                     ! check for huge arguments remaining
683         be,pt   %icc,.exit
684 ! delay slot
685         st      %f26,[%l7]
686 #ifdef __sparcv9
687         ldx     [%fp+xsave],%o1
688         ldx     [%fp+ssave],%o3
689         ldx     [%fp+csave],%o5
690         ldx     [%fp+STACK_BIAS+0xb0],%i5
691         stx     %i5,[%sp+STACK_BIAS+0xb0]
692 #else
693         ld      [%fp+xsave],%o1
694         ld      [%fp+ssave],%o3
695         ld      [%fp+csave],%o5
696         ld      [%fp+0x5c],%i5
697         st      %i5,[%sp+0x5c]
698 #endif
699         ld      [%fp+nsave],%o0
700         ld      [%fp+sxsave],%o2
701         ld      [%fp+sssave],%o4
702         sra     %o2,0,%o2               ! sign-extend for V9
703         call    __vlibm_vsincos_bigf
704         sra     %o4,0,%o4               ! delay slot

706 .exit:
707         ret
708         restore


711         .align  32
712 .last1:
713         fdtos   %f12,%f12
714         st      %f12,[%l1]
715         nop
716         fdtos   %f22,%f22
717         st      %f22,[%l5]
718         fzeros  %f2
719         add     %fp,junk,%l5
720         add     %fp,junk,%l1
721 .last2:
```



```
722         fdtos   %f14,%f14
723         st      %f14,[%l2]
724         nop
725         fdtos   %f24,%f24
726         st      %f24,[%l6]
727         fzeros  %f4
728         add     %fp,junk,%l2
729         add     %fp,junk,%l6
730 .last3:
731         fdtos   %f16,%f16
732         st      %f16,[%l3]
733         fdtos   %f26,%f26
734         st      %f26,[%l7]
735         fzeros  %f6
736         add     %fp,junk,%l3
737         ba,pt   %icc,.cont
738 ! delay slot
739         add     %fp,junk,%l7


742         .align  16
743 .range0:
744         fcmpgt32 %f38,%f30,%o0
745         andcc   %o0,2,%g0
746         bnz,a,pt %icc,1f                ! branch if finite
747 ! delay slot, squashed if branch not taken
748         mov     1,%i5                   ! set biguns
749         fzeros  %f1
750         fmuls   %f0,%f1,%f0
751         st      %f0,[%l0]
752         st      %f0,[%l4]
753 1:
754         addcc   %i0,-1,%i0
755         ble,pn  %icc,1f
756 ! delay slot
757         nop
758         ld      [%i1],%f0
759         add     %i1,%i2,%i1
760         mov     %i3,%l0
761         add     %i3,%i4,%i3
762         fabsd   %f0,%f30
763         mov     %o4,%l4
764         add     %o4,%o5,%o4
765         fcmple32 %f30,%f18,%o0
766         andcc   %o0,2,%g0
767         bz,pn   %icc,.range0
768 ! delay slot
769         nop
770         ba,pt   %icc,.check1
771 ! delay slot
772         fcmple32 %f30,%f8,%o0
773 1:
774         fzero   %f0                     ! set up dummy argument
775         add     %fp,junk,%l0
776         add     %fp,junk,%l4
777         mov     2,%o0
778         ba,pt   %icc,.check1
779 ! delay slot
780         fzero   %f30


783         .align  16
784 .range1:
785         fcmpgt32 %f38,%f32,%o1
786         andcc   %o1,2,%g0
787         bnz,a,pt %icc,1f                ! branch if finite
```

```
788 ! delay slot, squashed if branch not taken
789         mov     1,%i5                   ! set biguns
790         fzeros  %f3
791         fmuls   %f2,%f3,%f2
792         st      %f2,[%l1]
793         st      %f2,[%l5]
794 1:
795         addcc   %i0,-1,%i0
796         ble,pn  %icc,1f
797 ! delay slot
798         nop
799         ld      [%i1],%f2
800         add     %i1,%i2,%i1
801         mov     %i3,%l1
802         add     %i3,%i4,%i3
803         fabsd   %f2,%f32
804         mov     %o4,%l5
805         add     %o4,%o5,%o4
806         fcmple32 %f32,%f18,%o1
807         andcc   %o1,2,%g0
808         bz,pn   %icc,.range1
809 ! delay slot
810         nop
811         ba,pt   %icc,.check2
812 ! delay slot
813         fcmple32 %f32,%f8,%o1
814 1:
815         fzero   %f2                     ! set up dummy argument
816         add     %fp,junk,%l1
817         add     %fp,junk,%l5
818         mov     2,%o1
819         ba,pt   %icc,.check2
820 ! delay slot
821         fzero   %f32


824         .align  16
825 .range2:
826         fcmpgt32 %f38,%f34,%o2
827         andcc   %o2,2,%g0
828         bnz,a,pt %icc,1f                ! branch if finite
829 ! delay slot, squashed if branch not taken
830         mov     1,%i5                   ! set biguns
831         fzeros  %f5
832         fmuls   %f4,%f5,%f4
833         st      %f4,[%l2]
834         st      %f4,[%l6]
835 1:
836         addcc   %i0,-1,%i0
837         ble,pn  %icc,1f
838 ! delay slot
839         nop
840         ld      [%i1],%f4
841         add     %i1,%i2,%i1
842         mov     %i3,%l2
843         add     %i3,%i4,%i3
844         fabsd   %f4,%f34
845         mov     %o4,%l6
846         add     %o4,%o5,%o4
847         fcmple32 %f34,%f18,%o2
848         andcc   %o2,2,%g0
849         bz,pn   %icc,.range2
850 ! delay slot
851         nop
852         ba,pt   %icc,.check3
853 ! delay slot
```



```
854         fcmple32 %f34,%f8,%o2
855 1:
856         fzero   %f4                     ! set up dummy argument
857         add     %fp,junk,%l2
858         add     %fp,junk,%l6
859         mov     2,%o2
860         ba,pt   %icc,.check3
861 ! delay slot
862         fzero   %f34


865         .align  16
866 .range3:
867         fcmpgt32 %f38,%f36,%o3
868         andcc   %o3,2,%g0
869         bnz,a,pt %icc,1f                ! branch if finite
870 ! delay slot, squashed if branch not taken
871         mov     1,%i5                   ! set biguns
872         fzeros  %f7
873         fmuls   %f6,%f7,%f6
874         st      %f6,[%l3]
875         st      %f6,[%l7]
876 1:
877         addcc   %i0,-1,%i0
878         ble,pn  %icc,1f
879 ! delay slot
880         nop
881         ld      [%i1],%f6
882         add     %i1,%i2,%i1
883         mov     %i3,%l3
884         add     %i3,%i4,%i3
885         fabsd   %f6,%f36
886         mov     %o4,%l7
887         add     %o4,%o5,%o4
888         fcmple32 %f36,%f18,%o3
889         andcc   %o3,2,%g0
890         bz,pn   %icc,.range3
891 ! delay slot
892         nop
893         ba,pt   %icc,.checkprimary
894 ! delay slot
895         fcmple32 %f36,%f8,%o3
896 1:
897         fzero   %f6                     ! set up dummy argument
898         add     %fp,junk,%l3
899         add     %fp,junk,%l7
900         mov     2,%o3
901         ba,pt   %icc,.checkprimary
902 ! delay slot
903         fzero   %f36

905         SET_SIZE(__vsincosf)
```

```
**********************************************************
   30537 Sat May 10 12:10:03 2014
new/usr/src/lib/libmvec/common/vis/__vsinf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */
/*
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 */

        .file   "__vsinf.S"

#include "libm.h"

        RO_DATA
        .align  64
constants:
        .word   0xbfc55554,0x60000000
        .word   0x3f811077,0xe0000000
        .word   0xbf29956b,0x60000000
        .word   0x3ff00000,0x00000000
        .word   0xbfe00000,0x00000000
        .word   0x3fa55554,0xa0000000
        .word   0xbf56c0c1,0xe0000000
        .word   0x3ef99e24,0xe0000000
        .word   0x3fe45f30,0x6dc9c883
        .word   0x43380000,0x00000000
        .word   0x3ff921fb,0x54400000
        .word   0x3dd0b461,0x1a626331
        .word   0x3f490fdb,0
        .word   0x49c90fdb,0
        .word   0x7f800000,0
        .word   0x80000000,0

#define S0              0x0
#define S1              0x08
#define S2              0x10
#define one             0x18
#define mhalf           0x20
#define C0              0x28
#define C1              0x30
#define C2              0x38
#define invpio2         0x40
```



```
#define round           0x48
#define pio2_1          0x50
#define pio2_t          0x58
#define thresh1         0x60
#define thresh2         0x68
#define inf             0x70
#define signbit         0x78

! local storage indices

#define xsave           STACK_BIAS-0x8
#define ysave           STACK_BIAS-0x10
#define nsave           STACK_BIAS-0x14
#define sxsave          STACK_BIAS-0x18
#define sysave          STACK_BIAS-0x1c
#define junk            STACK_BIAS-0x20
#define n3              STACK_BIAS-0x24
#define n2              STACK_BIAS-0x28
#define n1              STACK_BIAS-0x2c
#define n0              STACK_BIAS-0x30
! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x30

! register use

! i0  n
! i1  x
! i2  stridex
! i3  y
! i4  stridey
! i5  biguns

! l0  n0
! l1  n1
! l2  n2
! l3  n3
! l4
! l5
! l6
! l7

! the following are 64-bit registers in both V8+ and V9

! g1
! g5

! o0  py0
! o1  py1
! o2  py2
! o3  py3
! o4
! o5
! o7

! f0  x0
! f2  x1
! f4  x2
! f6  x3
! f8  thresh1 (pi/4)
! f10 y0
! f12 y1
! f14 y2
! f16 y3
! f18 thresh2 (2^19 pi)
! f20
! f22
```

```
! f24
! f26
! f28 signbit
! f30
! f32
! f34
! f36
! f38 inf
! f40 S0
! f42 S1
! f44 S2
! f46 one
! f48 mhalf
! f50 C0
! f52 C1
! f54 C2
! f56 invpio2
! f58 round
! f60 pio2_1
! f62 pio2_t

        ENTRY(__vsinf)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,constants,l1)
        mov     %l1,%g1
        wr      %g0,0x82,%asi           ! set %asi for non-faulting loads
#ifdef __sparcv9
        stx     %i1,[%fp+xsave]         ! save arguments
        stx     %i3,[%fp+ysave]
#else
        st      %i1,[%fp+xsave]         ! save arguments
        st      %i3,[%fp+ysave]
#endif
        st      %i0,[%fp+nsave]
        st      %i2,[%fp+sxsave]
        st      %i4,[%fp+sysave]
        mov     0,%i5                   ! biguns = 0
        ldd     [%g1+S0],%f40           ! load constants
        ldd     [%g1+S1],%f42
        ldd     [%g1+S2],%f44
        ldd     [%g1+one],%f46
        ldd     [%g1+mhalf],%f48
        ldd     [%g1+C0],%f50
        ldd     [%g1+C1],%f52
        ldd     [%g1+C2],%f54
        ldd     [%g1+invpio2],%f56
        ldd     [%g1+round],%f58
        ldd     [%g1+pio2_1],%f60
        ldd     [%g1+pio2_t],%f62
        ldd     [%g1+thresh1],%f8
        ldd     [%g1+thresh2],%f18
        ldd     [%g1+inf],%f38
        ldd     [%g1+signbit],%f28
        sll     %i2,2,%i2               ! scale strides
        sll     %i4,2,%i4
        fzero   %f10                    ! loop prologue
        add     %fp,junk,%o0
        fzero   %f12
        add     %fp,junk,%o1
        fzero   %f14
        add     %fp,junk,%o2
        fzero   %f16
        ba      .start
        add     %fp,junk,%o3
```



```
! 16-byte aligned
        .align  16
.start:
        ld      [%i1],%f0               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        addcc   %i0,-1,%i0
        fdtos   %f10,%f10

        st      %f10,[%o0]
        mov     %i3,%o0                 ! py0 = y
        ble,pn  %icc,.last1
! delay slot
        add     %i3,%i4,%i3             ! y += stridey

        ld      [%i1],%f2               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        addcc   %i0,-1,%i0
        fdtos   %f12,%f12

        st      %f12,[%o1]
        mov     %i3,%o1                 ! py1 = y
        ble,pn  %icc,.last2
! delay slot
        add     %i3,%i4,%i3             ! y += stridey

        ld      [%i1],%f4               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        addcc   %i0,-1,%i0
        fdtos   %f14,%f14

        st      %f14,[%o2]
        mov     %i3,%o2                 ! py2 = y
        ble,pn  %icc,.last3
! delay slot
        add     %i3,%i4,%i3             ! y += stridey

        ld      [%i1],%f6               ! *x
        add     %i1,%i2,%i1             ! x += stridex
        nop
        fdtos   %f16,%f16

        st      %f16,[%o3]
        mov     %i3,%o3                 ! py3 = y
        add     %i3,%i4,%i3             ! y += stridey
.cont:
        fabsd   %f0,%f30

        fabsd   %f2,%f32

        fabsd   %f4,%f34

        fabsd   %f6,%f36
        fcmple32 %f30,%f18,%l0

        fcmple32 %f32,%f18,%l1

        fcmple32 %f34,%f18,%l2

        fcmple32 %f36,%f18,%l3
        nop

! 16-byte aligned
        andcc   %l0,2,%g0
        bz,pn   %icc,.range0            ! branch if > 2^19 pi
! delay slot
        fcmple32 %f30,%f8,%l0
```

```
.check1:
        andcc   %l1,2,%g0
        bz,pn   %icc,.range1            ! branch if > 2^19 pi
! delay slot
        fcmple32 %f32,%f8,%l1

.check2:
        andcc   %l2,2,%g0
        bz,pn   %icc,.range2            ! branch if > 2^19 pi
! delay slot
        fcmple32 %f34,%f8,%l2

.check3:
        andcc   %l3,2,%g0
        bz,pn   %icc,.range3            ! branch if > 2^19 pi
! delay slot
        fcmple32 %f36,%f8,%l3

.checkprimary:
        fsmuld  %f0,%f0,%f30
        fstod   %f0,%f0

        fsmuld  %f2,%f2,%f32
        fstod   %f2,%f2
        and     %l0,%l1,%o4

        fsmuld  %f4,%f4,%f34
        fstod   %f4,%f4

        fsmuld  %f6,%f6,%f36
        fstod   %f6,%f6
        and     %l2,%l3,%o5

        fmuld   %f30,%f44,%f10
        and     %o4,%o5,%o5

        fmuld   %f32,%f44,%f12
        andcc   %o5,2,%g0
        bz,pn   %icc,.medium            ! branch if any argument is > pi/4
! delay slot
        nop

        fmuld   %f34,%f44,%f14

        fmuld   %f36,%f44,%f16

        fmuld   %f30,%f40,%f20
        faddd   %f10,%f42,%f10

        fmuld   %f32,%f40,%f22
        faddd   %f12,%f42,%f12

        fmuld   %f34,%f40,%f24
        faddd   %f14,%f42,%f14

        fmuld   %f36,%f40,%f26
        faddd   %f16,%f42,%f16

        fmuld   %f30,%f30,%f30
        faddd   %f20,%f46,%f20

        fmuld   %f32,%f32,%f32
        faddd   %f22,%f46,%f22

        fmuld   %f34,%f34,%f34
```



```
        faddd   %f24,%f46,%f24

        fmuld   %f36,%f36,%f36
        faddd   %f26,%f46,%f26

        fmuld   %f30,%f10,%f10

        fmuld   %f32,%f12,%f12

        fmuld   %f34,%f14,%f14

        fmuld   %f36,%f16,%f16

        faddd   %f10,%f20,%f10

        faddd   %f12,%f22,%f12

        faddd   %f14,%f24,%f14

        faddd   %f16,%f26,%f16

        fmuld   %f0,%f10,%f10

        fmuld   %f2,%f12,%f12

        fmuld   %f4,%f14,%f14

        addcc   %i0,-1,%i0
        bg,pt   %icc,.start
! delay slot
        fmuld   %f6,%f16,%f16

        ba,pt   %icc,.end
! delay slot
        nop


        .align  16
.medium:
        fmuld   %f0,%f56,%f10

        fmuld   %f2,%f56,%f12

        fmuld   %f4,%f56,%f14

        fmuld   %f6,%f56,%f16

        faddd   %f10,%f58,%f10
        st      %f11,[%fp+n0]

        faddd   %f12,%f58,%f12
        st      %f13,[%fp+n1]

        faddd   %f14,%f58,%f14
        st      %f15,[%fp+n2]

        faddd   %f16,%f58,%f16
        st      %f17,[%fp+n3]

        fsubd   %f10,%f58,%f10

        fsubd   %f12,%f58,%f12

        fsubd   %f14,%f58,%f14

        fsubd   %f16,%f58,%f16
```

```
393         fmuld   %f10,%f60,%f20
394         ld      [%fp+n0],%l0

396         fmuld   %f12,%f60,%f22
397         ld      [%fp+n1],%l1

399         fmuld   %f14,%f60,%f24
400         ld      [%fp+n2],%l2

402         fmuld   %f16,%f60,%f26
403         ld      [%fp+n3],%l3

405         fsubd   %f0,%f20,%f0
406         fmuld   %f10,%f62,%f30

408         fsubd   %f2,%f22,%f2
409         fmuld   %f12,%f62,%f32

411         fsubd   %f4,%f24,%f4
412         fmuld   %f14,%f62,%f34

414         fsubd   %f6,%f26,%f6
415         fmuld   %f16,%f62,%f36

417         fsubd   %f0,%f30,%f0

419         fsubd   %f2,%f32,%f2

421         fsubd   %f4,%f34,%f4

423         fsubd   %f6,%f36,%f6
424         andcc   %l0,1,%g0

426         fmuld   %f0,%f0,%f30
427         bz,pn   %icc,.case8
428 ! delay slot
429         andcc   %l1,1,%g0

431         fmuld   %f2,%f2,%f32
432         bz,pn   %icc,.case4
433 ! delay slot
434         andcc   %l2,1,%g0

436         fmuld   %f4,%f4,%f34
437         bz,pn   %icc,.case2
438 ! delay slot
439         andcc   %l3,1,%g0

441         fmuld   %f6,%f6,%f36
442         bz,pn   %icc,.case1
443 ! delay slot
444         nop

446 !.case0:
447         fmuld   %f30,%f54,%f10          ! cos(x0)
448         fzero   %f0

450         fmuld   %f32,%f54,%f12          ! cos(x1)
451         fzero   %f2

453         fmuld   %f34,%f54,%f14          ! cos(x2)
454         fzero   %f4

456         fmuld   %f36,%f54,%f16          ! cos(x3)
457         fzero   %f6
```



```
459         fmuld   %f30,%f48,%f20
460         faddd   %f10,%f52,%f10

462         fmuld   %f32,%f48,%f22
463         faddd   %f12,%f52,%f12

465         fmuld   %f34,%f48,%f24
466         faddd   %f14,%f52,%f14

468         fmuld   %f36,%f48,%f26
469         faddd   %f16,%f52,%f16

471         fmuld   %f30,%f10,%f10
472         faddd   %f20,%f46,%f20

474         fmuld   %f32,%f12,%f12
475         faddd   %f22,%f46,%f22

477         fmuld   %f34,%f14,%f14
478         faddd   %f24,%f46,%f24

480         fmuld   %f36,%f16,%f16
481         faddd   %f26,%f46,%f26

483         fmuld   %f30,%f30,%f30
484         faddd   %f10,%f50,%f10
485         and     %l0,2,%g1

487         fmuld   %f32,%f32,%f32
488         faddd   %f12,%f50,%f12
489         and     %l1,2,%g5

491         fmuld   %f34,%f34,%f34
492         faddd   %f14,%f50,%f14
493         and     %l2,2,%o4

495         fmuld   %f36,%f36,%f36
496         faddd   %f16,%f50,%f16
497         and     %l3,2,%o5

499         fmuld   %f30,%f10,%f10
500         fmovrdnz %g1,%f28,%f0

502         fmuld   %f32,%f12,%f12
503         fmovrdnz %g5,%f28,%f2

505         fmuld   %f34,%f14,%f14
506         fmovrdnz %o4,%f28,%f4

508         fmuld   %f36,%f16,%f16
509         fmovrdnz %o5,%f28,%f6

511         faddd   %f10,%f20,%f10

513         faddd   %f12,%f22,%f12

515         faddd   %f14,%f24,%f14

517         faddd   %f16,%f26,%f16

519         fxor    %f10,%f0,%f10

521         fxor    %f12,%f2,%f12

523         fxor    %f14,%f4,%f14
```

```
525         addcc   %i0,-1,%i0
526         bg,pt   %icc,.start
527 ! delay slot
528         fxor    %f16,%f6,%f16

530         ba,pt   %icc,.end
531 ! delay slot
532         nop

534         .align  16
535 .case1:
536         fmuld   %f30,%f54,%f10          ! cos(x0)
537         fzero   %f0

539         fmuld   %f32,%f54,%f12          ! cos(x1)
540         fzero   %f2

542         fmuld   %f34,%f54,%f14          ! cos(x2)
543         fzero   %f4

545         fmuld   %f36,%f44,%f16          ! sin(x3)

547         fmuld   %f30,%f48,%f20
548         faddd   %f10,%f52,%f10

550         fmuld   %f32,%f48,%f22
551         faddd   %f12,%f52,%f12

553         fmuld   %f34,%f48,%f24
554         faddd   %f14,%f52,%f14

556         fmuld   %f36,%f40,%f26
557         faddd   %f16,%f42,%f16

559         fmuld   %f30,%f10,%f10
560         faddd   %f20,%f46,%f20

562         fmuld   %f32,%f12,%f12
563         faddd   %f22,%f46,%f22

565         fmuld   %f34,%f14,%f14
566         faddd   %f24,%f46,%f24

568         fmuld   %f36,%f36,%f36
569         faddd   %f26,%f46,%f26

571         fmuld   %f30,%f30,%f30
572         faddd   %f10,%f50,%f10
573         and     %l0,2,%g1

575         fmuld   %f32,%f32,%f32
576         faddd   %f12,%f50,%f12
577         and     %l1,2,%g5

579         fmuld   %f34,%f34,%f34
580         faddd   %f14,%f50,%f14
581         and     %l2,2,%o4

583         fmuld   %f36,%f16,%f16
584         fzero   %f36

586         fmuld   %f30,%f10,%f10
587         fmovrdnz %g1,%f28,%f0

589         fmuld   %f32,%f12,%f12
```



```
590         fmovrdnz %g5,%f28,%f2

592         fmuld   %f34,%f14,%f14
593         fmovrdnz %o4,%f28,%f4

595         faddd   %f16,%f26,%f16
596         and     %l3,2,%o5

598         faddd   %f10,%f20,%f10

600         faddd   %f12,%f22,%f12

602         faddd   %f14,%f24,%f14

604         fmuld   %f6,%f16,%f16
605         fmovrdnz %o5,%f28,%f36

607         fxor    %f10,%f0,%f10

609         fxor    %f12,%f2,%f12

611         fxor    %f14,%f4,%f14

613         addcc   %i0,-1,%i0
614         bg,pt   %icc,.start
615 ! delay slot
616         fxor    %f16,%f36,%f16

618         ba,pt   %icc,.end
619 ! delay slot
620         nop

622         .align  16
623 .case2:
624         fmuld   %f6,%f6,%f36
625         bz,pn   %icc,.case3
626 ! delay slot
627         nop

629         fmuld   %f30,%f54,%f10          ! cos(x0)
630         fzero   %f0

632         fmuld   %f32,%f54,%f12          ! cos(x1)
633         fzero   %f2

635         fmuld   %f34,%f44,%f14          ! sin(x2)

637         fmuld   %f36,%f54,%f16          ! cos(x3)
638         fzero   %f6

640         fmuld   %f30,%f48,%f20
641         faddd   %f10,%f52,%f10

643         fmuld   %f32,%f48,%f22
644         faddd   %f12,%f52,%f12

646         fmuld   %f34,%f40,%f24
647         faddd   %f14,%f42,%f14

649         fmuld   %f36,%f48,%f26
650         faddd   %f16,%f52,%f16

652         fmuld   %f30,%f10,%f10
653         faddd   %f20,%f46,%f20

655         fmuld   %f32,%f12,%f12
```

```
656         faddd   %f22,%f46,%f22

658         fmuld   %f34,%f34,%f34
659         faddd   %f24,%f46,%f24

661         fmuld   %f36,%f16,%f16
662         faddd   %f26,%f46,%f26

664         fmuld   %f30,%f30,%f30
665         faddd   %f10,%f50,%f10
666         and     %l0,2,%g1

668         fmuld   %f32,%f32,%f32
669         faddd   %f12,%f50,%f12
670         and     %l1,2,%g5

672         fmuld   %f34,%f14,%f14
673         fzero   %f34

675         fmuld   %f36,%f36,%f36
676         faddd   %f16,%f50,%f16
677         and     %l3,2,%o5

679         fmuld   %f30,%f10,%f10
680         fmovrdnz %g1,%f28,%f0

682         fmuld   %f32,%f12,%f12
683         fmovrdnz %g5,%f28,%f2

685         faddd   %f14,%f24,%f14
686         and     %l2,2,%o4

688         fmuld   %f36,%f16,%f16
689         fmovrdnz %o5,%f28,%f6

691         faddd   %f10,%f20,%f10

693         faddd   %f12,%f22,%f12

695         fmuld   %f4,%f14,%f14
696         fmovrdnz %o4,%f28,%f34

698         faddd   %f16,%f26,%f16

700         fxor    %f10,%f0,%f10

702         fxor    %f12,%f2,%f12

704         fxor    %f14,%f34,%f14

706         addcc   %i0,-1,%i0
707         bg,pt   %icc,.start
708 ! delay slot
709         fxor    %f16,%f6,%f16

711         ba,pt   %icc,.end
712 ! delay slot
713         nop

715         .align  16
716 .case3:
717         fmuld   %f30,%f54,%f10          ! cos(x0)
718         fzero   %f0

720         fmuld   %f32,%f54,%f12          ! cos(x1)
721         fzero   %f2
```



```
723         fmuld   %f34,%f44,%f14          ! sin(x2)

725         fmuld   %f36,%f44,%f16          ! sin(x3)

727         fmuld   %f30,%f48,%f20
728         faddd   %f10,%f52,%f10

730         fmuld   %f32,%f48,%f22
731         faddd   %f12,%f52,%f12

733         fmuld   %f34,%f40,%f24
734         faddd   %f14,%f42,%f14

736         fmuld   %f36,%f40,%f26
737         faddd   %f16,%f42,%f16

739         fmuld   %f30,%f10,%f10
740         faddd   %f20,%f46,%f20

742         fmuld   %f32,%f12,%f12
743         faddd   %f22,%f46,%f22

745         fmuld   %f34,%f34,%f34
746         faddd   %f24,%f46,%f24

748         fmuld   %f36,%f36,%f36
749         faddd   %f26,%f46,%f26

751         fmuld   %f30,%f30,%f30
752         faddd   %f10,%f50,%f10
753         and     %l0,2,%g1

755         fmuld   %f32,%f32,%f32
756         faddd   %f12,%f50,%f12
757         and     %l1,2,%g5

759         fmuld   %f34,%f14,%f14
760         fzero   %f34

762         fmuld   %f36,%f16,%f16
763         fzero   %f36

765         fmuld   %f30,%f10,%f10
766         fmovrdnz %g1,%f28,%f0

768         fmuld   %f32,%f12,%f12
769         fmovrdnz %g5,%f28,%f2

771         faddd   %f14,%f24,%f14
772         and     %l2,2,%o4

774         faddd   %f16,%f26,%f16
775         and     %l3,2,%o5

777         faddd   %f10,%f20,%f10

779         faddd   %f12,%f22,%f12

781         fmuld   %f4,%f14,%f14
782         fmovrdnz %o4,%f28,%f34

784         fmuld   %f6,%f16,%f16
785         fmovrdnz %o5,%f28,%f36

787         fxor    %f10,%f0,%f10
```

```
789         fxor    %f12,%f2,%f12

791         fxor    %f14,%f34,%f14

793         addcc   %i0,-1,%i0
794         bg,pt   %icc,.start
795 ! delay slot
796         fxor    %f16,%f36,%f16

798         ba,pt   %icc,.end
799 ! delay slot
800         nop

802         .align  16
803 .case4:
804         fmuld   %f4,%f4,%f34
805         bz,pn   %icc,.case6
806 ! delay slot
807         andcc   %l3,1,%g0

809         fmuld   %f6,%f6,%f36
810         bz,pn   %icc,.case5
811 ! delay slot
812         nop

814         fmuld   %f30,%f54,%f10          ! cos(x0)
815         fzero   %f0

817         fmuld   %f32,%f44,%f12          ! sin(x1)

819         fmuld   %f34,%f54,%f14          ! cos(x2)
820         fzero   %f4

822         fmuld   %f36,%f54,%f16          ! cos(x3)
823         fzero   %f6

825         fmuld   %f30,%f48,%f20
826         faddd   %f10,%f52,%f10

828         fmuld   %f32,%f40,%f22
829         faddd   %f12,%f42,%f12

831         fmuld   %f34,%f48,%f24
832         faddd   %f14,%f52,%f14

834         fmuld   %f36,%f48,%f26
835         faddd   %f16,%f52,%f16

837         fmuld   %f30,%f10,%f10
838         faddd   %f20,%f46,%f20

840         fmuld   %f32,%f32,%f32
841         faddd   %f22,%f46,%f22

843         fmuld   %f34,%f14,%f14
844         faddd   %f24,%f46,%f24

846         fmuld   %f36,%f16,%f16
847         faddd   %f26,%f46,%f26

849         fmuld   %f30,%f30,%f30
850         faddd   %f10,%f50,%f10
851         and     %l0,2,%g1

853         fmuld   %f32,%f12,%f12
```



```
854         fzero   %f32

856         fmuld   %f34,%f34,%f34
857         faddd   %f14,%f50,%f14
858         and     %l2,2,%o4

860         fmuld   %f36,%f36,%f36
861         faddd   %f16,%f50,%f16
862         and     %l3,2,%o5

864         fmuld   %f30,%f10,%f10
865         fmovrdnz %g1,%f28,%f0

867         faddd   %f12,%f22,%f12
868         and     %l1,2,%g5

870         fmuld   %f34,%f14,%f14
871         fmovrdnz %o4,%f28,%f4

873         fmuld   %f36,%f16,%f16
874         fmovrdnz %o5,%f28,%f6

876         faddd   %f10,%f20,%f10

878         fmuld   %f2,%f12,%f12
879         fmovrdnz %g5,%f28,%f32

881         faddd   %f14,%f24,%f14

883         faddd   %f16,%f26,%f16

885         fxor    %f10,%f0,%f10

887         fxor    %f12,%f32,%f12

889         fxor    %f14,%f4,%f14

891         addcc   %i0,-1,%i0
892         bg,pt   %icc,.start
893 ! delay slot
894         fxor    %f16,%f6,%f16

896         ba,pt   %icc,.end
897 ! delay slot
898         nop

900         .align  16
901 .case5:
902         fmuld   %f30,%f54,%f10          ! cos(x0)
903         fzero   %f0

905         fmuld   %f32,%f44,%f12          ! sin(x1)

907         fmuld   %f34,%f54,%f14          ! cos(x2)
908         fzero   %f4

910         fmuld   %f36,%f44,%f16          ! sin(x3)

912         fmuld   %f30,%f48,%f20
913         faddd   %f10,%f52,%f10

915         fmuld   %f32,%f40,%f22
916         faddd   %f12,%f42,%f12

918         fmuld   %f34,%f48,%f24
919         faddd   %f14,%f52,%f14
```

```
        fmuld   %f36,%f40,%f26
        faddd   %f16,%f42,%f16

        fmuld   %f30,%f10,%f10
        faddd   %f20,%f46,%f20

        fmuld   %f32,%f32,%f32
        faddd   %f22,%f46,%f22

        fmuld   %f34,%f14,%f14
        faddd   %f24,%f46,%f24

        fmuld   %f36,%f36,%f36
        faddd   %f26,%f46,%f26

        fmuld   %f30,%f30,%f30
        faddd   %f10,%f50,%f10
        and     %l0,2,%g1

        fmuld   %f32,%f12,%f12
        fzero   %f32

        fmuld   %f34,%f34,%f34
        faddd   %f14,%f50,%f14
        and     %l2,2,%o4

        fmuld   %f36,%f16,%f16
        fzero   %f36

        fmuld   %f30,%f10,%f10
        fmovrdnz %g1,%f28,%f0

        faddd   %f12,%f22,%f12
        and     %l1,2,%g5

        fmuld   %f34,%f14,%f14
        fmovrdnz %o4,%f28,%f4

        faddd   %f16,%f26,%f16
        and     %l3,2,%o5

        faddd   %f10,%f20,%f10

        fmuld   %f2,%f12,%f12
        fmovrdnz %g5,%f28,%f32

        faddd   %f14,%f24,%f14

        fmuld   %f6,%f16,%f16
        fmovrdnz %o5,%f28,%f36

        fxor    %f10,%f0,%f10

        fxor    %f12,%f32,%f12

        fxor    %f14,%f4,%f14

        addcc   %i0,-1,%i0
        bg,pt   %icc,.start
! delay slot
        fxor    %f16,%f36,%f16

        ba,pt   %icc,.end
! delay slot
        nop
```



```
        .align  16
.case6:
        fmuld   %f6,%f6,%f36
        bz,pn   %icc,.case7
! delay slot
        nop

        fmuld   %f30,%f54,%f10          ! cos(x0)
        fzero   %f0

        fmuld   %f32,%f44,%f12          ! sin(x1)

        fmuld   %f34,%f44,%f14          ! sin(x2)

        fmuld   %f36,%f54,%f16          ! cos(x3)
        fzero   %f6

        fmuld   %f30,%f48,%f20
        faddd   %f10,%f52,%f10

        fmuld   %f32,%f40,%f22
        faddd   %f12,%f42,%f12

        fmuld   %f34,%f40,%f24
        faddd   %f14,%f42,%f14

        fmuld   %f36,%f48,%f26
        faddd   %f16,%f52,%f16

        fmuld   %f30,%f10,%f10
        faddd   %f20,%f46,%f20

        fmuld   %f32,%f32,%f32
        faddd   %f22,%f46,%f22

        fmuld   %f34,%f34,%f34
        faddd   %f24,%f46,%f24

        fmuld   %f36,%f16,%f16
        faddd   %f26,%f46,%f26

        fmuld   %f30,%f30,%f30
        faddd   %f10,%f50,%f10
        and     %l0,2,%g1

        fmuld   %f32,%f12,%f12
        fzero   %f32

        fmuld   %f34,%f14,%f14
        fzero   %f34

        fmuld   %f36,%f36,%f36
        faddd   %f16,%f50,%f16
        and     %l3,2,%o5

        fmuld   %f30,%f10,%f10
        fmovrdnz %g1,%f28,%f0

        faddd   %f12,%f22,%f12
        and     %l1,2,%g5

        faddd   %f14,%f24,%f14
        and     %l2,2,%o4

        fmuld   %f36,%f16,%f16
```

```
1052         fmovrdnz %o5,%f28,%f6

1054         faddd   %f10,%f20,%f10

1056         fmuld   %f2,%f12,%f12
1057         fmovrdnz %g5,%f28,%f32

1059         fmuld   %f4,%f14,%f14
1060         fmovrdnz %o4,%f28,%f34

1062         faddd   %f16,%f26,%f16

1064         fxor    %f10,%f0,%f10

1066         fxor    %f12,%f32,%f12

1068         fxor    %f14,%f34,%f14

1070         addcc   %i0,-1,%i0
1071         bg,pt   %icc,.start
1072 ! delay slot
1073         fxor    %f16,%f6,%f16

1075         ba,pt   %icc,.end
1076 ! delay slot
1077         nop

1079         .align  16
1080 .case7:
1081         fmuld   %f30,%f54,%f10          ! cos(x0)
1082         fzero   %f0

1084         fmuld   %f32,%f44,%f12          ! sin(x1)

1086         fmuld   %f34,%f44,%f14          ! sin(x2)

1088         fmuld   %f36,%f44,%f16          ! sin(x3)

1090         fmuld   %f30,%f48,%f20
1091         faddd   %f10,%f52,%f10

1093         fmuld   %f32,%f40,%f22
1094         faddd   %f12,%f42,%f12

1096         fmuld   %f34,%f40,%f24
1097         faddd   %f14,%f42,%f14

1099         fmuld   %f36,%f40,%f26
1100         faddd   %f16,%f42,%f16

1102         fmuld   %f30,%f10,%f10
1103         faddd   %f20,%f46,%f20

1105         fmuld   %f32,%f32,%f32
1106         faddd   %f22,%f46,%f22

1108         fmuld   %f34,%f34,%f34
1109         faddd   %f24,%f46,%f24

1111         fmuld   %f36,%f36,%f36
1112         faddd   %f26,%f46,%f26

1114         fmuld   %f30,%f30,%f30
1115         faddd   %f10,%f50,%f10
1116         and     %l0,2,%g1
```



```
1118         fmuld   %f32,%f12,%f12
1119         fzero   %f32

1121         fmuld   %f34,%f14,%f14
1122         fzero   %f34

1124         fmuld   %f36,%f16,%f16
1125         fzero   %f36

1127         fmuld   %f30,%f10,%f10
1128         fmovrdnz %g1,%f28,%f0

1130         faddd   %f12,%f22,%f12
1131         and     %l1,2,%g5

1133         faddd   %f14,%f24,%f14
1134         and     %l2,2,%o4

1136         faddd   %f16,%f26,%f16
1137         and     %l3,2,%o5

1139         faddd   %f10,%f20,%f10

1141         fmuld   %f2,%f12,%f12
1142         fmovrdnz %g5,%f28,%f32

1144         fmuld   %f4,%f14,%f14
1145         fmovrdnz %o4,%f28,%f34

1147         fmuld   %f6,%f16,%f16
1148         fmovrdnz %o5,%f28,%f36

1150         fxor    %f10,%f0,%f10

1152         fxor    %f12,%f32,%f12

1154         fxor    %f14,%f34,%f14

1156         addcc   %i0,-1,%i0
1157         bg,pt   %icc,.start
1158 ! delay slot
1159         fxor    %f16,%f36,%f16

1161         ba,pt   %icc,.end
1162 ! delay slot
1163         nop


1166         .align  16
1167 .case8:
1168         fmuld   %f2,%f2,%f32
1169         bz,pn   %icc,.case12
1170 ! delay slot
1171         andcc   %l2,1,%g0

1173         fmuld   %f4,%f4,%f34
1174         bz,pn   %icc,.case10
1175 ! delay slot
1176         andcc   %l3,1,%g0

1178         fmuld   %f6,%f6,%f36
1179         bz,pn   %icc,.case9
1180 ! delay slot
1181         nop

1183         fmuld   %f30,%f44,%f10          ! sin(x0)
```

```
1185         fmuld   %f32,%f54,%f12          ! cos(x1)
1186         fzero   %f2

1188         fmuld   %f34,%f54,%f14          ! cos(x2)
1189         fzero   %f4

1191         fmuld   %f36,%f54,%f16          ! cos(x3)
1192         fzero   %f6

1194         fmuld   %f30,%f40,%f20
1195         faddd   %f10,%f42,%f10

1197         fmuld   %f32,%f48,%f22
1198         faddd   %f12,%f52,%f12

1200         fmuld   %f34,%f48,%f24
1201         faddd   %f14,%f52,%f14

1203         fmuld   %f36,%f48,%f26
1204         faddd   %f16,%f52,%f16

1206         fmuld   %f30,%f30,%f30
1207         faddd   %f20,%f46,%f20

1209         fmuld   %f32,%f12,%f12
1210         faddd   %f22,%f46,%f22

1212         fmuld   %f34,%f14,%f14
1213         faddd   %f24,%f46,%f24

1215         fmuld   %f36,%f16,%f16
1216         faddd   %f26,%f46,%f26

1218         fmuld   %f30,%f10,%f10
1219         fzero   %f30

1221         fmuld   %f32,%f32,%f32
1222         faddd   %f12,%f50,%f12
1223         and     %l1,2,%g5

1225         fmuld   %f34,%f34,%f34
1226         faddd   %f14,%f50,%f14
1227         and     %l2,2,%o4

1229         fmuld   %f36,%f36,%f36
1230         faddd   %f16,%f50,%f16
1231         and     %l3,2,%o5

1233         faddd   %f10,%f20,%f10
1234         and     %l0,2,%g1

1236         fmuld   %f32,%f12,%f12
1237         fmovrdnz %g5,%f28,%f2

1239         fmuld   %f34,%f14,%f14
1240         fmovrdnz %o4,%f28,%f4

1242         fmuld   %f36,%f16,%f16
1243         fmovrdnz %o5,%f28,%f6

1245         fmuld   %f0,%f10,%f10
1246         fmovrdnz %g1,%f28,%f30

1248         faddd   %f12,%f22,%f12
```



```
1250         faddd   %f14,%f24,%f14

1252         faddd   %f16,%f26,%f16

1254         fxor    %f10,%f30,%f10

1256         fxor    %f12,%f2,%f12

1258         fxor    %f14,%f4,%f14

1260         addcc   %i0,-1,%i0
1261         bg,pt   %icc,.start
1262 ! delay slot
1263         fxor    %f16,%f6,%f16

1265         ba,pt   %icc,.end
1266 ! delay slot
1267         nop

1269         .align  16
1270 .case9:
1271         fmuld   %f30,%f44,%f10          ! sin(x0)

1273         fmuld   %f32,%f54,%f12          ! cos(x1)
1274         fzero   %f2

1276         fmuld   %f34,%f54,%f14          ! cos(x2)
1277         fzero   %f4

1279         fmuld   %f36,%f44,%f16          ! sin(x3)

1281         fmuld   %f30,%f40,%f20
1282         faddd   %f10,%f42,%f10

1284         fmuld   %f32,%f48,%f22
1285         faddd   %f12,%f52,%f12

1287         fmuld   %f34,%f48,%f24
1288         faddd   %f14,%f52,%f14

1290         fmuld   %f36,%f40,%f26
1291         faddd   %f16,%f42,%f16

1293         fmuld   %f30,%f30,%f30
1294         faddd   %f20,%f46,%f20

1296         fmuld   %f32,%f12,%f12
1297         faddd   %f22,%f46,%f22

1299         fmuld   %f34,%f14,%f14
1300         faddd   %f24,%f46,%f24

1302         fmuld   %f36,%f36,%f36
1303         faddd   %f26,%f46,%f26

1305         fmuld   %f30,%f10,%f10
1306         fzero   %f30

1308         fmuld   %f32,%f32,%f32
1309         faddd   %f12,%f50,%f12
1310         and     %l1,2,%g5

1312         fmuld   %f34,%f34,%f34
1313         faddd   %f14,%f50,%f14
1314         and     %l2,2,%o4
```

```
1316         fmuld   %f36,%f16,%f16
1317         fzero   %f36

1319         faddd   %f10,%f20,%f10
1320         and     %l0,2,%g1

1322         fmuld   %f32,%f12,%f12
1323         fmovrdnz %g5,%f28,%f2

1325         fmuld   %f34,%f14,%f14
1326         fmovrdnz %o4,%f28,%f4

1328         faddd   %f16,%f26,%f16
1329         and     %l3,2,%o5

1331         fmuld   %f0,%f10,%f10
1332         fmovrdnz %g1,%f28,%f30

1334         faddd   %f12,%f22,%f12

1336         faddd   %f14,%f24,%f14

1338         fmuld   %f6,%f16,%f16
1339         fmovrdnz %o5,%f28,%f36

1341         fxor    %f10,%f30,%f10

1343         fxor    %f12,%f2,%f12

1345         fxor    %f14,%f4,%f14

1347         addcc   %i0,-1,%i0
1348         bg,pt   %icc,.start
1349 ! delay slot
1350         fxor    %f16,%f36,%f16

1352         ba,pt   %icc,.end
1353 ! delay slot
1354         nop

1356         .align  16
1357 .case10:
1358         fmuld   %f6,%f6,%f36
1359         bz,pn   %icc,.case11
1360 ! delay slot
1361         nop

1363         fmuld   %f30,%f44,%f10          ! sin(x0)

1365         fmuld   %f32,%f54,%f12          ! cos(x1)
1366         fzero   %f2

1368         fmuld   %f34,%f44,%f14          ! sin(x2)

1370         fmuld   %f36,%f54,%f16          ! cos(x3)
1371         fzero   %f6

1373         fmuld   %f30,%f40,%f20
1374         faddd   %f10,%f42,%f10

1376         fmuld   %f32,%f48,%f22
1377         faddd   %f12,%f52,%f12

1379         fmuld   %f34,%f40,%f24
1380         faddd   %f14,%f42,%f14
```



```
1382         fmuld   %f36,%f48,%f26
1383         faddd   %f16,%f52,%f16

1385         fmuld   %f30,%f30,%f30
1386         faddd   %f20,%f46,%f20

1388         fmuld   %f32,%f12,%f12
1389         faddd   %f22,%f46,%f22

1391         fmuld   %f34,%f34,%f34
1392         faddd   %f24,%f46,%f24

1394         fmuld   %f36,%f16,%f16
1395         faddd   %f26,%f46,%f26

1397         fmuld   %f30,%f10,%f10
1398         fzero   %f30

1400         fmuld   %f32,%f32,%f32
1401         faddd   %f12,%f50,%f12
1402         and     %l1,2,%g5

1404         fmuld   %f34,%f14,%f14
1405         fzero   %f34

1407         fmuld   %f36,%f36,%f36
1408         faddd   %f16,%f50,%f16
1409         and     %l3,2,%o5

1411         faddd   %f10,%f20,%f10
1412         and     %l0,2,%g1

1414         fmuld   %f32,%f12,%f12
1415         fmovrdnz %g5,%f28,%f2

1417         faddd   %f14,%f24,%f14
1418         and     %l2,2,%o4

1420         fmuld   %f36,%f16,%f16
1421         fmovrdnz %o5,%f28,%f6

1423         fmuld   %f0,%f10,%f10
1424         fmovrdnz %g1,%f28,%f30

1426         faddd   %f12,%f22,%f12

1428         fmuld   %f4,%f14,%f14
1429         fmovrdnz %o4,%f28,%f34

1431         faddd   %f16,%f26,%f16

1433         fxor    %f10,%f30,%f10

1435         fxor    %f12,%f2,%f12

1437         fxor    %f14,%f34,%f14

1439         addcc   %i0,-1,%i0
1440         bg,pt   %icc,.start
1441 ! delay slot
1442         fxor    %f16,%f6,%f16

1444         ba,pt   %icc,.end
1445 ! delay slot
1446         nop
```

```
1448         .align  16
1449 .case11:
1450         fmuld   %f30,%f44,%f10          ! sin(x0)

1452         fmuld   %f32,%f54,%f12          ! cos(x1)
1453         fzero   %f2

1455         fmuld   %f34,%f44,%f14          ! sin(x2)

1457         fmuld   %f36,%f44,%f16          ! sin(x3)

1459         fmuld   %f30,%f40,%f20
1460         faddd   %f10,%f42,%f10

1462         fmuld   %f32,%f48,%f22
1463         faddd   %f12,%f52,%f12

1465         fmuld   %f34,%f40,%f24
1466         faddd   %f14,%f42,%f14

1468         fmuld   %f36,%f40,%f26
1469         faddd   %f16,%f42,%f16

1471         fmuld   %f30,%f30,%f30
1472         faddd   %f20,%f46,%f20

1474         fmuld   %f32,%f12,%f12
1475         faddd   %f22,%f46,%f22

1477         fmuld   %f34,%f34,%f34
1478         faddd   %f24,%f46,%f24

1480         fmuld   %f36,%f36,%f36
1481         faddd   %f26,%f46,%f26

1483         fmuld   %f30,%f10,%f10
1484         fzero   %f30

1486         fmuld   %f32,%f32,%f32
1487         faddd   %f12,%f50,%f12
1488         and     %l1,2,%g5

1490         fmuld   %f34,%f14,%f14
1491         fzero   %f34

1493         fmuld   %f36,%f16,%f16
1494         fzero   %f36

1496         faddd   %f10,%f20,%f10
1497         and     %l0,2,%g1

1499         fmuld   %f32,%f12,%f12
1500         fmovrdnz %g5,%f28,%f2

1502         faddd   %f14,%f24,%f14
1503         and     %l2,2,%o4

1505         faddd   %f16,%f26,%f16
1506         and     %l3,2,%o5

1508         fmuld   %f0,%f10,%f10
1509         fmovrdnz %g1,%f28,%f30

1511         faddd   %f12,%f22,%f12

1513         fmuld   %f4,%f14,%f14
```



```
1514         fmovrdnz %o4,%f28,%f34

1516         fmuld   %f6,%f16,%f16
1517         fmovrdnz %o5,%f28,%f36

1519         fxor    %f10,%f30,%f10

1521         fxor    %f12,%f2,%f12

1523         fxor    %f14,%f34,%f14

1525         addcc   %i0,-1,%i0
1526         bg,pt   %icc,.start
1527 ! delay slot
1528         fxor    %f16,%f36,%f16

1530         ba,pt   %icc,.end
1531 ! delay slot
1532         nop

1534         .align  16
1535 .case12:
1536         fmuld   %f4,%f4,%f34
1537         bz,pn   %icc,.case14
1538 ! delay slot
1539         andcc   %l3,1,%g0

1541         fmuld   %f6,%f6,%f36
1542         bz,pn   %icc,.case13
1543 ! delay slot
1544         nop

1546         fmuld   %f30,%f44,%f10          ! sin(x0)

1548         fmuld   %f32,%f44,%f12          ! sin(x1)

1550         fmuld   %f34,%f54,%f14          ! cos(x2)
1551         fzero   %f4

1553         fmuld   %f36,%f54,%f16          ! cos(x3)
1554         fzero   %f6

1556         fmuld   %f30,%f40,%f20
1557         faddd   %f10,%f42,%f10

1559         fmuld   %f32,%f40,%f22
1560         faddd   %f12,%f42,%f12

1562         fmuld   %f34,%f48,%f24
1563         faddd   %f14,%f52,%f14

1565         fmuld   %f36,%f48,%f26
1566         faddd   %f16,%f52,%f16

1568         fmuld   %f30,%f30,%f30
1569         faddd   %f20,%f46,%f20

1571         fmuld   %f32,%f32,%f32
1572         faddd   %f22,%f46,%f22

1574         fmuld   %f34,%f14,%f14
1575         faddd   %f24,%f46,%f24

1577         fmuld   %f36,%f16,%f16
1578         faddd   %f26,%f46,%f26
```

```
1580         fmuld   %f30,%f10,%f10
1581         fzero   %f30

1583         fmuld   %f32,%f12,%f12
1584         fzero   %f32

1586         fmuld   %f34,%f34,%f34
1587         faddd   %f14,%f50,%f14
1588         and     %l2,2,%o4

1590         fmuld   %f36,%f36,%f36
1591         faddd   %f16,%f50,%f16
1592         and     %l3,2,%o5

1594         faddd   %f10,%f20,%f10
1595         and     %l0,2,%g1

1597         faddd   %f12,%f22,%f12
1598         and     %l1,2,%g5

1600         fmuld   %f34,%f14,%f14
1601         fmovrdnz %o4,%f28,%f4

1603         fmuld   %f36,%f16,%f16
1604         fmovrdnz %o5,%f28,%f6

1606         fmuld   %f0,%f10,%f10
1607         fmovrdnz %g1,%f28,%f30

1609         fmuld   %f2,%f12,%f12
1610         fmovrdnz %g5,%f28,%f32

1612         faddd   %f14,%f24,%f14

1614         faddd   %f16,%f26,%f16

1616         fxor    %f10,%f30,%f10

1618         fxor    %f12,%f32,%f12

1620         fxor    %f14,%f4,%f14

1622         addcc   %i0,-1,%i0
1623         bg,pt   %icc,.start
1624 ! delay slot
1625         fxor    %f16,%f6,%f16

1627         ba,pt   %icc,.end
1628 ! delay slot
1629         nop

1631         .align  16
1632 .case13:
1633         fmuld   %f30,%f44,%f10          ! sin(x0)

1635         fmuld   %f32,%f44,%f12          ! sin(x1)

1637         fmuld   %f34,%f54,%f14          ! cos(x2)
1638         fzero   %f4

1640         fmuld   %f36,%f44,%f16          ! sin(x3)

1642         fmuld   %f30,%f40,%f20
1643         faddd   %f10,%f42,%f10

1645         fmuld   %f32,%f40,%f22
```



```
1646         faddd   %f12,%f42,%f12

1648         fmuld   %f34,%f48,%f24
1649         faddd   %f14,%f52,%f14

1651         fmuld   %f36,%f40,%f26
1652         faddd   %f16,%f42,%f16

1654         fmuld   %f30,%f30,%f30
1655         faddd   %f20,%f46,%f20

1657         fmuld   %f32,%f32,%f32
1658         faddd   %f22,%f46,%f22

1660         fmuld   %f34,%f14,%f14
1661         faddd   %f24,%f46,%f24

1663         fmuld   %f36,%f36,%f36
1664         faddd   %f26,%f46,%f26

1666         fmuld   %f30,%f10,%f10
1667         fzero   %f30

1669         fmuld   %f32,%f12,%f12
1670         fzero   %f32

1672         fmuld   %f34,%f34,%f34
1673         faddd   %f14,%f50,%f14
1674         and     %l2,2,%o4

1676         fmuld   %f36,%f16,%f16
1677         fzero   %f36

1679         faddd   %f10,%f20,%f10
1680         and     %l0,2,%g1

1682         faddd   %f12,%f22,%f12
1683         and     %l1,2,%g5

1685         fmuld   %f34,%f14,%f14
1686         fmovrdnz %o4,%f28,%f4

1688         faddd   %f16,%f26,%f16
1689         and     %l3,2,%o5

1691         fmuld   %f0,%f10,%f10
1692         fmovrdnz %g1,%f28,%f30

1694         fmuld   %f2,%f12,%f12
1695         fmovrdnz %g5,%f28,%f32

1697         faddd   %f14,%f24,%f14

1699         fmuld   %f6,%f16,%f16
1700         fmovrdnz %o5,%f28,%f36

1702         fxor    %f10,%f30,%f10

1704         fxor    %f12,%f32,%f12

1706         fxor    %f14,%f4,%f14

1708         addcc   %i0,-1,%i0
1709         bg,pt   %icc,.start
1710 ! delay slot
1711         fxor    %f16,%f36,%f16
```

```
1713         ba,pt   %icc,.end
1714 ! delay slot
1715         nop

1717         .align  16
1718 .case14:
1719         fmuld   %f6,%f6,%f36
1720         bz,pn   %icc,.case15
1721 ! delay slot
1722         nop

1724         fmuld   %f30,%f44,%f10          ! sin(x0)

1726         fmuld   %f32,%f44,%f12          ! sin(x1)

1728         fmuld   %f34,%f44,%f14          ! sin(x2)

1730         fmuld   %f36,%f54,%f16          ! cos(x3)
1731         fzero   %f6

1733         fmuld   %f30,%f40,%f20
1734         faddd   %f10,%f42,%f10

1736         fmuld   %f32,%f40,%f22
1737         faddd   %f12,%f42,%f12

1739         fmuld   %f34,%f40,%f24
1740         faddd   %f14,%f42,%f14

1742         fmuld   %f36,%f48,%f26
1743         faddd   %f16,%f52,%f16

1745         fmuld   %f30,%f30,%f30
1746         faddd   %f20,%f46,%f20

1748         fmuld   %f32,%f32,%f32
1749         faddd   %f22,%f46,%f22

1751         fmuld   %f34,%f34,%f34
1752         faddd   %f24,%f46,%f24

1754         fmuld   %f36,%f16,%f16
1755         faddd   %f26,%f46,%f26

1757         fmuld   %f30,%f10,%f10
1758         fzero   %f30

1760         fmuld   %f32,%f12,%f12
1761         fzero   %f32

1763         fmuld   %f34,%f14,%f14
1764         fzero   %f34

1766         fmuld   %f36,%f36,%f36
1767         faddd   %f16,%f50,%f16
1768         and     %l3,2,%o5

1770         faddd   %f10,%f20,%f10
1771         and     %l0,2,%g1

1773         faddd   %f12,%f22,%f12
1774         and     %l1,2,%g5

1776         faddd   %f14,%f24,%f14
1777         and     %l2,2,%o4
```



```
1779         fmuld   %f36,%f16,%f16
1780         fmovrdnz %o5,%f28,%f6

1782         fmuld   %f0,%f10,%f10
1783         fmovrdnz %g1,%f28,%f30

1785         fmuld   %f2,%f12,%f12
1786         fmovrdnz %g5,%f28,%f32

1788         fmuld   %f4,%f14,%f14
1789         fmovrdnz %o4,%f28,%f34

1791         faddd   %f16,%f26,%f16

1793         fxor    %f10,%f30,%f10

1795         fxor    %f12,%f32,%f12

1797         fxor    %f14,%f34,%f14

1799         addcc   %i0,-1,%i0
1800         bg,pt   %icc,.start
1801 ! delay slot
1802         fxor    %f16,%f6,%f16

1804         ba,pt   %icc,.end
1805 ! delay slot
1806         nop

1808         .align  16
1809 .case15:
1810         fmuld   %f30,%f44,%f10          ! sin(x0)

1812         fmuld   %f32,%f44,%f12          ! sin(x1)

1814         fmuld   %f34,%f44,%f14          ! sin(x2)

1816         fmuld   %f36,%f44,%f16          ! sin(x3)

1818         fmuld   %f30,%f40,%f20
1819         faddd   %f10,%f42,%f10

1821         fmuld   %f32,%f40,%f22
1822         faddd   %f12,%f42,%f12

1824         fmuld   %f34,%f40,%f24
1825         faddd   %f14,%f42,%f14

1827         fmuld   %f36,%f40,%f26
1828         faddd   %f16,%f42,%f16

1830         fmuld   %f30,%f30,%f30
1831         faddd   %f20,%f46,%f20

1833         fmuld   %f32,%f32,%f32
1834         faddd   %f22,%f46,%f22

1836         fmuld   %f34,%f34,%f34
1837         faddd   %f24,%f46,%f24

1839         fmuld   %f36,%f36,%f36
1840         faddd   %f26,%f46,%f26

1842         fmuld   %f30,%f10,%f10
1843         fzero   %f30
```

```
1845         fmuld   %f32,%f12,%f12
1846         fzero   %f32

1848         fmuld   %f34,%f14,%f14
1849         fzero   %f34

1851         fmuld   %f36,%f16,%f16
1852         fzero   %f36

1854         faddd   %f10,%f20,%f10
1855         and     %l0,2,%g1

1857         faddd   %f12,%f22,%f12
1858         and     %l1,2,%g5

1860         faddd   %f14,%f24,%f14
1861         and     %l2,2,%o4

1863         faddd   %f16,%f26,%f16
1864         and     %l3,2,%o5

1866         fmuld   %f0,%f10,%f10
1867         fmovrdnz %g1,%f28,%f30

1869         fmuld   %f2,%f12,%f12
1870         fmovrdnz %g5,%f28,%f32

1872         fmuld   %f4,%f14,%f14
1873         fmovrdnz %o4,%f28,%f34

1875         fmuld   %f6,%f16,%f16
1876         fmovrdnz %o5,%f28,%f36

1878         fxor    %f10,%f30,%f10

1880         fxor    %f12,%f32,%f12

1882         fxor    %f14,%f34,%f14

1884         addcc   %i0,-1,%i0
1885         bg,pt   %icc,.start
1886 ! delay slot
1887         fxor    %f16,%f36,%f16

1889         ba,pt   %icc,.end
1890 ! delay slot
1891         nop


1894         .align  32
1895 .end:
1896         fdtos   %f10,%f10
1897         st      %f10,[%o0]
1898         fdtos   %f12,%f12
1899         st      %f12,[%o1]
1900         fdtos   %f14,%f14
1901         st      %f14,[%o2]
1902         fdtos   %f16,%f16
1903         tst     %i5                     ! check for huge arguments remaining
1904         be,pt   %icc,.exit
1905 ! delay slot
1906         st      %f16,[%o3]
1907 #ifdef __sparcv9
1908         ldx     [%fp+xsave],%o1
1909         ldx     [%fp+ysave],%o3
```



```
1910 #else
1911         ld      [%fp+xsave],%o1
1912         ld      [%fp+ysave],%o3
1913 #endif
1914         ld      [%fp+nsave],%o0
1915         ld      [%fp+sxsave],%o2
1916         ld      [%fp+sysave],%o4
1917         sra     %o2,0,%o2               ! sign-extend for V9
1918         call    __vlibm_vsin_bigf
1919         sra     %o4,0,%o4               ! delay slot

1921 .exit:
1922         ret
1923         restore


1926         .align  32
1927 .last1:
1928         fdtos   %f12,%f12
1929         st      %f12,[%o1]
1930         fzeros  %f2
1931         add     %fp,junk,%o1
1932 .last2:
1933         fdtos   %f14,%f14
1934         st      %f14,[%o2]
1935         fzeros  %f4
1936         add     %fp,junk,%o2
1937 .last3:
1938         fdtos   %f16,%f16
1939         st      %f16,[%o3]
1940         fzeros  %f6
1941         ba,pt   %icc,.cont
1942 ! delay slot
1943         add     %fp,junk,%o3


1946         .align  16
1947 .range0:
1948         fcmpgt32 %f38,%f30,%l0
1949         andcc   %l0,2,%g0
1950         bnz,a,pt %icc,1f                ! branch if finite
1951 ! delay slot, squashed if branch not taken
1952         mov     1,%i5                   ! set biguns
1953         fzeros  %f1
1954         fmuls   %f0,%f1,%f0
1955         st      %f0,[%o0]
1956 1:
1957         addcc   %i0,-1,%i0
1958         ble,pn  %icc,1f
1959 ! delay slot
1960         nop
1961         ld      [%i1],%f0
1962         add     %i1,%i2,%i1
1963         mov     %i3,%o0
1964         add     %i3,%i4,%i3
1965         fabsd   %f0,%f30
1966         fcmple32 %f30,%f18,%l0
1967         andcc   %l0,2,%g0
1968         bz,pn   %icc,.range0
1969 ! delay slot
1970         nop
1971         ba,pt   %icc,.check1
1972 ! delay slot
1973         fcmple32 %f30,%f8,%l0
1974 1:
1975         fzero   %f0                     ! set up dummy argument
```

```
1976         add     %fp,junk,%o0
1977         mov     2,%l0
1978         ba,pt   %icc,.check1
1979 ! delay slot
1980         fzero   %f30


1983         .align  16
1984 .range1:
1985         fcmpgt32 %f38,%f32,%l1
1986         andcc   %l1,2,%g0
1987         bnz,a,pt %icc,1f                ! branch if finite
1988 ! delay slot, squashed if branch not taken
1989         mov     1,%i5                   ! set biguns
1990         fzeros  %f3
1991         fmuls   %f2,%f3,%f2
1992         st      %f2,[%o1]
1993 1:
1994         addcc   %i0,-1,%i0
1995         ble,pn  %icc,1f
1996 ! delay slot
1997         nop
1998         ld      [%i1],%f2
1999         add     %i1,%i2,%i1
2000         mov     %i3,%o1
2001         add     %i3,%i4,%i3
2002         fabsd   %f2,%f32
2003         fcmple32 %f32,%f18,%l1
2004         andcc   %l1,2,%g0
2005         bz,pn   %icc,.range1
2006 ! delay slot
2007         nop
2008         ba,pt   %icc,.check2
2009 ! delay slot
2010         fcmple32 %f32,%f8,%l1
2011 1:
2012         fzero   %f2                     ! set up dummy argument
2013         add     %fp,junk,%o1
2014         mov     2,%l1
2015         ba,pt   %icc,.check2
2016 ! delay slot
2017         fzero   %f32


2020         .align  16
2021 .range2:
2022         fcmpgt32 %f38,%f34,%l2
2023         andcc   %l2,2,%g0
2024         bnz,a,pt %icc,1f                ! branch if finite
2025 ! delay slot, squashed if branch not taken
2026         mov     1,%i5                   ! set biguns
2027         fzeros  %f5
2028         fmuls   %f4,%f5,%f4
2029         st      %f4,[%o2]
2030 1:
2031         addcc   %i0,-1,%i0
2032         ble,pn  %icc,1f
2033 ! delay slot
2034         nop
2035         ld      [%i1],%f4
2036         add     %i1,%i2,%i1
2037         mov     %i3,%o2
2038         add     %i3,%i4,%i3
2039         fabsd   %f4,%f34
2040         fcmple32 %f34,%f18,%l2
2041         andcc   %l2,2,%g0
```



```
2042         bz,pn   %icc,.range2
2043 ! delay slot
2044         nop
2045         ba,pt   %icc,.check3
2046 ! delay slot
2047         fcmple32 %f34,%f8,%l2
2048 1:
2049         fzero   %f4                     ! set up dummy argument
2050         add     %fp,junk,%o2
2051         mov     2,%l2
2052         ba,pt   %icc,.check3
2053 ! delay slot
2054         fzero   %f34


2057         .align  16
2058 .range3:
2059         fcmpgt32 %f38,%f36,%l3
2060         andcc   %l3,2,%g0
2061         bnz,a,pt %icc,1f                ! branch if finite
2062 ! delay slot, squashed if branch not taken
2063         mov     1,%i5                   ! set biguns
2064         fzeros  %f7
2065         fmuls   %f6,%f7,%f6
2066         st      %f6,[%o3]
2067 1:
2068         addcc   %i0,-1,%i0
2069         ble,pn  %icc,1f
2070 ! delay slot
2071         nop
2072         ld      [%i1],%f6
2073         add     %i1,%i2,%i1
2074         mov     %i3,%o3
2075         add     %i3,%i4,%i3
2076         fabsd   %f6,%f36
2077         fcmple32 %f36,%f18,%l3
2078         andcc   %l3,2,%g0
2079         bz,pn   %icc,.range3
2080 ! delay slot
2081         nop
2082         ba,pt   %icc,.checkprimary
2083 ! delay slot
2084         fcmple32 %f36,%f8,%l3
2085 1:
2086         fzero   %f6                     ! set up dummy argument
2087         add     %fp,junk,%o3
2088         mov     2,%l3
2089         ba,pt   %icc,.checkprimary
2090 ! delay slot
2091         fzero   %f36

2093         SET_SIZE(__vsinf)
```

```
**********************************************************
   64908 Sat May 10 12:10:03 2014
new/usr/src/lib/libmvec/common/vis/__vsqrt.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
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 */
/*
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 */

        .file   "__vsqrt.S"

#include "libm.h"

        RO_DATA
        .align  64

.CONST_TBL:
        .word   0x3fe00000, 0x00000000  ! A1  =  5.00000000000000001789e-01
        .word   0xbfbfffff, 0xfffd0bfd  ! A2  = -1.24999999997314110667e-01
        .word   0x3fafffff, 0xfffb5bfb  ! A3  =  6.24999999978896565817e-02
        .word   0xbfa4000f, 0xc00b4fc8  ! A4  = -3.90629693917215481458e-02
        .word   0x3f9c0018, 0xc012da4e  ! A5  =  2.73441188080261677282e-02
        .word   0x000fffff, 0xffffffff  ! DC0 =  0x000fffffffffffff
        .word   0x00001000, 0x00000000  ! DC2 =  0x0000100000000000
        .word   0x7fffe000, 0x00000000  ! DC3 =  0x7fffe00000000000

! i = [0,128]
! TBL[8*i+0] = 1.0 / (*(double*)&(0x3fe0000000000000LL + (i << 45)));
! TBL[8*i+1] = (double)(2.0 * sqrtl(*(double*)&(0x3fe0000000000000LL + (i << 45)
! TBL[8*i+2] = (double)(2.0 * sqrtl(*(double*)&(0x3fe0000000000000LL + (i << 45)
! TBL[8*i+3] = 0
! TBL[8*i+4] = 1.0 / (*(double*)&(0x3fe0000000000000LL + (i << 45)));
! TBL[8*i+5] = (double)(2.0 * sqrtl(2.0) * sqrtl(*(double*)&(0x3fe0000000000000L
! TBL[8*i+6] = (double)(2.0 * sqrtl(2.0) * sqrtl(*(double*)&(0x3fe0000000000000L
! TBL[8*i+7] = 0

        .word   0x40000000, 0x00000000, 0x3ff6a09e, 0x667f3bcd
        .word   0xbc9bdd34, 0x13b26456, 0x00000000, 0x00000000
        .word   0x40000000, 0x00000000, 0x40000000, 0x00000000
        .word   0xb8f00000, 0x00000000, 0x00000000, 0x00000000
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547         .word   0xbca3923d, 0xf03e1e2f, 0x00000000, 0x00000000
548         .word   0x3ff05197, 0xf7d73404, 0x3fffaf9b, 0x02e7e8f2
549         .word   0x3c897a76, 0x8f34e1c2, 0x00000000, 0x00000000
550         .word   0x3ff05197, 0xf7d73404, 0x400667c5, 0x7199104b
551         .word   0x3c875b89, 0x6f332e70, 0x00000000, 0x00000000
552         .word   0x3ff04104, 0x10410410, 0x3fffbfbf, 0x7ebc755f
553         .word   0xbc9b2a94, 0x084da0b6, 0x00000000, 0x00000000
554         .word   0x3ff04104, 0x10410410, 0x4006732f, 0x8d0e2f77
555         .word   0xbc93dffd, 0x470422e3, 0x00000000, 0x00000000
556         .word   0x3ff03091, 0xb51f5e1a, 0x3fffcfdb, 0xc999e97d
557         .word   0x3c82be17, 0xecdd3bbc, 0x00000000, 0x00000000
558         .word   0x3ff03091, 0xb51f5e1a, 0x40067e93, 0xddbc0e73
559         .word   0xbc86eb9f, 0x32ac1a5c, 0x00000000, 0x00000000
560         .word   0x3ff02040, 0x81020408, 0x3fffdfef, 0xefebe3d6
561         .word   0xbc909afc, 0xfc7c1f3b, 0x00000000, 0x00000000
562         .word   0x3ff02040, 0x81020408, 0x400689f2, 0x6c6b01d0
563         .word   0x3cae816f, 0x9d2a1032, 0x00000000, 0x00000000
564         .word   0x3ff01010, 0x10101010, 0x3fffeffb, 0xfdfebf1f
565         .word   0x3c95dee5, 0x1994f18b, 0x00000000, 0x00000000
566         .word   0x3ff01010, 0x10101010, 0x4006954b, 0x41cd4293
567         .word   0x3ca3d5bc, 0xcc443076, 0x00000000, 0x00000000
568         .word   0x3ff00000, 0x00000000, 0x40000000, 0x00000000
569         .word   0x00000000, 0x00000000, 0x00000000, 0x00000000
570         .word   0x3ff00000, 0x00000000, 0x4006a09e, 0x667f3bcd
571         .word   0xbcabdd34, 0x13b26456, 0x00000000, 0x00000000

573 #define A5              %f32
574 #define A4              %f30
575 #define A3              %f28
576 #define A2              %f26
577 #define A1              %f56

579 #define DC0             %f8
580 #define DC2             %f6
581 #define DC3             %f4

583 #define counter         %l3
584 #define TBL             %l5
585 #define stridex         %l6
586 #define stridey         %l7

588 #define _0x00001ff8     %i0
589 #define _0x7ff00000     %o0
```



```
590 #define _0x00100000     %o2

592 #define tmp_counter     STACK_BIAS-0x40
593 #define tmp_px          STACK_BIAS-0x38
594 #define tmp0            STACK_BIAS-0x30
595 #define tmp1            STACK_BIAS-0x28
596 #define tmp2            STACK_BIAS-0x20
597 #define tmp3            STACK_BIAS-0x18
598 #define tmp4            STACK_BIAS-0x10
599 #define tmp5            STACK_BIAS-0x08

601 ! sizeof temp storage - must be a multiple of 16 for V9
602 #define tmps            0x40

604 !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
605 !       !!!!!   algorithm   !!!!!
606 !  ((float*)&res)[0] = ((float*)px)[0];
607 !  ((float*)&res)[1] = ((float*)px)[1];
608 !  hx = *(int*)px;
609 !  px += stridex;
610 !
611 !  if ( hx >= 0x7ff00000 )
612 !  {
613 !    res = sqrt(res);
614 !    ((float*)py)[0] = ((float*)&res)[0];
615 !    ((float*)py)[1] = ((float*)&res)[1];
616 !    py += stridey;
617 !    goto next;
618 !  }
619 !  if ( hx < 0x00100000 )
620 !  {
621 !    res = sqrt(res);
622 !    ((float*)py)[0] = ((float*)&res)[0];
623 !    ((float*)py)[1] = ((float*)&res)[1];
624 !    py += stridey;
625 !    goto next;
626 !  }
627 !
628 !  sqrt_exp = hx >> 21;
629 !  sqrt_exp -= 512;
630 !  sqrt_exp <<= 52;
631 !  dsqrt_exp = *(double*)&sqrt_exp;
632 !  bit = hx >> 15;
633 !  bit &= 32;
634 !  ind0 = hx >> 7;
635 !  ind0 &= 0x1ff8;
636 !  ind0 += 32;
637 !  ind0 &= -64;
638 !  ind1 = ind0;
639 !  ind1 += bit;
640 !
641 !  res = vis_fand(res,DC0);      /* DC0 = vis_to_double(0x000fffff, 0xffffffff);
642 !  res = vis_for(res,A1);        /* A1  = vis_to_double(0x3fe00000, 0x00000000);
643 !  res_c = vis_fpadd32(res,DC2); /* DC2 = vis_to_double(0x00001000, 0x00000000);
644 !  res_c = vis_fand(res_c,DC3);  /* DC3 = vis_to_double(0x7fffe000, 0x00000000);
645 !
646 !  pind = (char*)TBL + ind1;
647 !  dexp_hi = ((double*)pind)[1];
648 !  dexp_lo = ((double*)pind)[2];
649 !
650 !  dtmp0 = ((double*)pind)[0];
651 !  xx = (res - res_c);
652 !  xx *= dtmp0;
653 !
654 !  res = A5 * xx;
655 !  res += A4;
```

```
!  res *= xx;
!  res += A3;
!  res *= xx;
!  res += A2;
!  res *= xx;
!  res += A1;
!  res *= xx;
!
!  res = dexp_hi * res;
!  res += dexp_lo;
!  res += dexp_hi;
!
!  dtmp0 = vis_fpadd32(dsqrt_exp,res);
!  ((float*)py)[0] = ((float*)&dtmp0)[0];
!  ((float*)py)[1] = ((float*)&dtmp0)[1];
!  py += stridey;
!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

        ENTRY(__vsqrt)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,l5)
        wr      %g0,0x82,%asi

        ldd     [TBL],A1
        sll     %i2,3,stridex
        or      %g0,%i3,%o4

        ldd     [TBL+8],A2
        sll     %i4,3,stridey
        or      %g0,0x7ff,%o0

        ldd     [TBL+16],A3
        sll     %o0,20,_0x7ff00000
        or      %g0,0x001,%o2

        ldd     [TBL+24],A4
        sll     %o2,20,_0x00100000

        ldd     [TBL+32],A5
        ldd     [TBL+40],DC0
        ldd     [TBL+48],DC2
        ldd     [TBL+56],DC3

        add     TBL,64,TBL
        add     %g0,1023,%o5
        st      %i0,[%fp+tmp_counter]

        sll     %o5,3,_0x00001ff8
        stx     %i1,[%fp+tmp_px]

.begin:
        ld      [%fp+tmp_counter],counter
        ldx     [%fp+tmp_px],%l2
        st      %g0,[%fp+tmp_counter]
.begin1:
        cmp     counter,0
        ble,pn  %icc,.exit
        lda     [%l2]%asi,%o5           ! (5_1) hx = *(int*)px;

        lda     [%l2]%asi,%f10          ! (5_0) ((float*)&res)[0] = ((float*)px)

        lda     [%l2+4]%asi,%f11        ! (5_0) ((float*)&res)[1] = ((float*)px)

        cmp     %o5,_0x7ff00000         ! (5_1) hx ? 0x7ff00000
```



```
        bge,pn  %icc,.spec              ! (5_1) if ( hx >= 0x7ff00000 )
        nop

        cmp     %o5,_0x00100000         ! (5_1) hx ? 0x00100000
        bl,pn   %icc,.spec              ! (5_1) if ( hx < 0x00100000 )
        nop

        add     %l2,stridex,%l2         ! px += stridex
        fand    %f10,DC0,%f50           ! (5_1) res = vis_fand(res,DC0);

        for     %f50,A1,%f40            ! (5_1) res = vis_for(res,A1);
        sra     %o5,21,%l1              ! (5_1) sqrt_exp = hx >> 21;
        sra     %o5,15,%i1              ! (5_1) bit = hx >> 15;

        sra     %o5,7,%o1               ! (5_1) ind0 = hx >> 7;
        sub     %l1,512,%o3             ! (5_1) sqrt_exp -= 512;

        and     %o1,_0x00001ff8,%o1     ! (5_1) ind0 &= 0x1ff8;
        lda     [%l2]%asi,%f10          ! (0_0) ((float*)&res)[0] = ((float*)px)

        add     %o1,32,%o1              ! (5_1) ind0 += 32;
        lda     [%l2+4]%asi,%f11        ! (0_0) ((float*)&res)[1] = ((float*)px)

        and     %i1,32,%i4              ! (5_1) bit &= 32;
        and     %o1,-64,%o1             ! (5_1) ind0 &= -8;

        sll     %o1,0,%o7               ! (5_1) ind1 = ind0;

        sllx    %o3,52,%o3              ! (5_1) sqrt_exp <<= 52;
        add     %o7,%i4,%l0             ! (5_1) ind1 += bit;
        lda     [%l2]%asi,%o5           ! (0_0) hx = *(int*)px;

        stx     %o3,[%fp+tmp0]          ! (5_1) dsqrt_exp = *(double*)&sqrt_exp;
        fand    %f10,DC0,%f50           ! (0_0) res = vis_fand(res,DC0);

        add     %l2,stridex,%l2         ! px += stridex
        fpadd32 %f40,DC2,%f54           ! (5_1) res_c = vis_fpadd32(res,DC2);

        add     %l0,TBL,%o1             ! (5_1) pind = (char*)TBL + ind1

        cmp     %o5,_0x7ff00000         ! (0_0) hx ? 0x7ff00000
        bge,pn  %icc,.update0           ! (0_0) if ( hx >= 0x7ff00000 )
        for     %f50,A1,%f42            ! (0_0) res = vis_for(res,A1);
.cont0:
        sra     %o5,21,%l1              ! (0_0) sqrt_exp = hx >> 21;
        sra     %o5,15,%i2              ! (0_0) bit = hx >> 15;
        ldd     [%o1],%f50              ! (5_1) dtmp0 = ((double*)pind)[0];

        sra     %o5,7,%o1               ! (0_0) ind0 = hx >> 7;
        sub     %l1,512,%o3             ! (0_0) sqrt_exp -= 512;
        fand    %f54,DC3,%f54           ! (5_1) res_c = vis_fand(res_c,DC3);

        and     %o1,_0x00001ff8,%o1     ! (0_0) ind0 &= 0x1ff8;
        lda     [%l2]%asi,%f10          ! (1_0) ((float*)&res)[0] = ((float*)px)

        add     %o1,32,%o1              ! (0_0) ind0 += 32;
        lda     [%l2+4]%asi,%f11        ! (1_0) ((float*)&res)[1] = ((float*)px)

        and     %i2,32,%i4              ! (0_0) bit &= 32;
        and     %o1,-64,%o1             ! (0_0) ind0 &= -8;
        fsubd   %f40,%f54,%f40          ! (5_1) xx = (res - res_c);

        sll     %o1,0,%o7               ! (0_0) ind1 = ind0;

        cmp     %o5,_0x00100000         ! (0_0) hx ? 0x00100000
        bl,pn   %icc,.update1           ! (0_0) if ( hx < 0x00100000 )
```

```
788         lda     [%l2]%asi,%o5           ! (1_0) hx = *(int*)px;
789 .cont1:
790         sllx    %o3,52,%o3              ! (0_0) sqrt_exp <<= 52;
791         add     %o7,%i4,%i1             ! (0_0) ind1 += bit;

793         fmuld   %f40,%f50,%f40          ! (5_1) xx *= dtmp0;
794         stx     %o3,[%fp+tmp1]          ! (0_0) dsqrt_exp = *(double*)&sqrt_exp;
795         fand    %f10,DC0,%f50           ! (1_0) res = vis_fand(res,DC0);

797         add     %l2,stridex,%l2         ! px += stridex
798         fpadd32 %f42,DC2,%f54           ! (0_0) res_c = vis_fpadd32(res,DC2);

800         add     %i1,TBL,%o1             ! (0_0) pind = (char*)TBL + ind1

802         cmp     %o5,_0x7ff00000         ! (1_0) hx ? 0x7ff00000
803         bge,pn  %icc,.update2           ! (1_0) if ( hx >= 0x7ff00000 )
804         for     %f50,A1,%f14            ! (1_0) res = vis_for(res,A1);
805 .cont2:
806         sra     %o5,21,%l1              ! (1_0) sqrt_exp = hx >> 21;
807         sra     %o5,15,%g5              ! (1_0) bit = hx >> 15;
808         ldd     [%o1],%f50              ! (0_0) dtmp0 = ((double*)pind)[0];

810         fmuld   A5,%f40,%f52            ! (5_1) res = A5 * xx;
811         sra     %o5,7,%o1               ! (1_0) ind0 = hx >> 7;
812         sub     %l1,512,%o3             ! (1_0) sqrt_exp -= 512;
813         fand    %f54,DC3,%f54           ! (0_0) res_c = vis_fand(res_c,DC3);

815         and     %o1,_0x00001ff8,%o1     ! (1_0) ind0 &= 0x1ff8;
816         lda     [%l2]%asi,%f10          ! (2_0) ((float*)&res)[0] = ((float*)px)

818         add     %o1,32,%o1              ! (1_0) ind0 += 32;
819         lda     [%l2+4]%asi,%f11        ! (2_0) ((float*)&res)[1] = ((float*)px)

821         and     %g5,32,%i4              ! (1_0) bit &= 32;
822         and     %o1,-64,%o1             ! (1_0) ind0 &= -8;
823         fsubd   %f42,%f54,%f42          ! (0_0) xx = (res - res_c);

825         sll     %o1,0,%o7               ! (1_0) ind1 = ind0;
826         faddd   %f52,A4,%f54            ! (5_1) res += A4;

828         cmp     %o5,_0x00100000         ! (1_0) hx ? 0x00100000
829         bl,pn   %icc,.update3           ! (1_0) if ( hx < 0x00100000 )
830         lda     [%l2]%asi,%o5           ! (2_0) hx = *(int*)px;
831 .cont3:
832         sllx    %o3,52,%o3              ! (1_0) sqrt_exp <<= 52;
833         add     %o7,%i4,%i2             ! (1_0) ind1 += bit;

835         fmuld   %f42,%f50,%f42          ! (0_0) xx *= dtmp0;
836         stx     %o3,[%fp+tmp2]          ! (1_0) dsqrt_exp = *(double*)&sqrt_exp;
837         fand    %f10,DC0,%f50           ! (2_0) res = vis_fand(res,DC0);

839         fmuld   %f54,%f40,%f34          ! (5_1) res *= xx;
840         fpadd32 %f14,DC2,%f54           ! (1_0) res_c = vis_fpadd32(res,DC2);
841         add     %l2,stridex,%l2         ! px += stridex

843         add     %i2,TBL,%o1             ! (1_0) pind = (char*)TBL + ind1

845         cmp     %o5,_0x7ff00000         ! (2_0) hx ? 0x7ff00000
846         bge,pn  %icc,.update4           ! (2_0) if ( hx >= 0x7ff00000 )
847         for     %f50,A1,%f18            ! (2_0) res = vis_for(res,A1);
848 .cont4:
849         sra     %o5,21,%l1              ! (2_0) sqrt_exp = hx >> 21;
850         sra     %o5,15,%g1              ! (2_0) bit = hx >> 15;
851         ldd     [%o1],%f50              ! (1_0) dtmp0 = ((double*)pind)[0];

853         fmuld   A5,%f42,%f52            ! (0_0) res = A5 * xx;
```



```
854         sra     %o5,7,%o1               ! (2_0) ind0 = hx >> 7;
855         sub     %l1,512,%o3             ! (2_0) sqrt_exp -= 512;
856         fand    %f54,DC3,%f54           ! (1_0) res_c = vis_fand(res_c,DC3);

858         and     %o1,_0x00001ff8,%o1     ! (2_0) ind0 &= 0x1ff8;
859         lda     [%l2]%asi,%f10          ! (3_0) ((float*)&res)[0] = ((float*)px)
860         faddd   %f34,A3,%f62            ! (5_1) res += A3;

862         add     %o1,32,%o1              ! (2_0) ind0 += 32;
863         lda     [%l2+4]%asi,%f11        ! (3_0) ((float*)&res)[1] = ((float*)px)

865         and     %g1,32,%i4              ! (2_0) bit &= 32;
866         and     %o1,-64,%o1             ! (2_0) ind0 &= -8;
867         fsubd   %f14,%f54,%f14          ! (1_0) xx = (res - res_c);

869         sll     %o1,0,%o7               ! (2_0) ind1 = ind0;
870         faddd   %f52,A4,%f54            ! (0_0) res += A4;

872         fmuld   %f62,%f40,%f52          ! (5_1) res *= xx;
873         cmp     %o5,_0x00100000         ! (2_0) hx ? 0x00100000
874         bl,pn   %icc,.update5           ! (2_0) if ( hx < 0x00100000 )
875         lda     [%l2]%asi,%o5           ! (3_0) hx = *(int*)px;
876 .cont5:
877         sllx    %o3,52,%o3              ! (2_0) sqrt_exp <<= 52;
878         add     %o7,%i4,%g5             ! (2_0) ind1 += bit;

880         fmuld   %f14,%f50,%f14          ! (1_0) xx *= dtmp0;
881         stx     %o3,[%fp+tmp3]          ! (2_0) dsqrt_exp = *(double*)&sqrt_exp;
882         fand    %f10,DC0,%f50           ! (3_0) res = vis_fand(res,DC0);

884         fmuld   %f54,%f42,%f34          ! (0_0) res *= xx;
885         fpadd32 %f18,DC2,%f54           ! (2_0) res_c = vis_fpadd32(res,DC2);
886         add     %l2,stridex,%l2         ! px += stridex

888         add     %g5,TBL,%o1             ! (2_0) pind = (char*)TBL + ind1
889         faddd   %f52,A2,%f20            ! (5_1) res += A2;

891         cmp     %o5,_0x7ff00000         ! (3_0) hx ? 0x7ff00000
892         bge,pn  %icc,.update6           ! (3_0) if ( hx >= 0x7ff00000 )
893         for     %f50,A1,%f44            ! (3_0) res = vis_for(res,A1);
894 .cont6:
895         sra     %o5,21,%l1              ! (3_0) sqrt_exp = hx >> 21;
896         sra     %o5,15,%i3              ! (3_0) bit = hx >> 15;
897         ldd     [%o1],%f50              ! (2_0) dtmp0 = ((double*)pind)[0];

899         fmuld   A5,%f14,%f52            ! (1_0) res = A5 * xx;
900         sra     %o5,7,%o1               ! (3_0) ind0 = hx >> 7;
901         sub     %l1,512,%o3             ! (3_0) sqrt_exp -= 512;
902         fand    %f54,DC3,%f54           ! (2_0) res_c = vis_fand(res_c,DC3);

904         fmuld   %f20,%f40,%f20          ! (5_1) res *= xx;
905         and     %o1,_0x00001ff8,%o1     ! (3_0) ind0 &= 0x1ff8;
906         lda     [%l2]%asi,%f10          ! (4_0) ((float*)&res)[0] = ((float*)px)
907         faddd   %f34,A3,%f62            ! (0_0) res += A3;

909         add     %o1,32,%o1              ! (3_0) ind0 += 32;
910         lda     [%l2+4]%asi,%f11        ! (4_0) ((float*)&res)[1] = ((float*)px)

912         and     %i3,32,%i4              ! (3_0) bit &= 32;
913         and     %o1,-64,%o1             ! (3_0) ind0 &= -8;
914         fsubd   %f18,%f54,%f18          ! (2_0) xx = (res - res_c);

916         sll     %o1,0,%o7               ! (3_0) ind1 = ind0;
917         faddd   %f52,A4,%f54            ! (1_0) res += A4;

919         fmuld   %f62,%f42,%f52          ! (0_0) res *= xx;
```

```
920         cmp     %o5,_0x00100000         ! (3_0) hx ? 0x00100000
921         bl,pn   %icc,.update7           ! (3_0) if ( hx < 0x00100000 )
922         faddd   %f20,A1,%f12            ! (5_1) res += A1;
923 .cont7:
924         lda     [%l2]%asi,%o5           ! (4_0) hx = *(int*)px;
925         sllx    %o3,52,%o3              ! (3_0) sqrt_exp <<= 52;
926         add     %o7,%i4,%g1             ! (3_0) ind1 += bit;

928         fmuld   %f18,%f50,%f18          ! (2_0) xx *= dtmp0;
929         add     %l0,TBL,%l0             ! (5_1) pind = (char*)TBL + ind1;
930         stx     %o3,[%fp+tmp4]          ! (3_0) dsqrt_exp = *(double*)&sqrt_exp;
931         fand    %f10,DC0,%f50           ! (4_0) res = vis_fand(res,DC0);

933         fmuld   %f54,%f14,%f34          ! (1_0) res *= xx;
934         add     %l2,stridex,%l2         ! px += stridex
935         ldd     [%l0+16],%f36           ! (5_1) dexp_lo = ((double*)pind)[2];
936         fpadd32 %f44,DC2,%f54           ! (3_0) res_c = vis_fpadd32(res,DC2);

938         fmuld   %f12,%f40,%f12          ! (5_1) res *= xx;
939         add     %g1,TBL,%o1             ! (3_0) (char*)div_arr+ind0
940         ldd     [%l0+8],%f40            ! (5_1) dexp_hi = ((double*)pind)[1];
941         faddd   %f52,A2,%f20            ! (0_0) res += A2;

943         cmp     %o5,_0x7ff00000         ! (4_0) hx ? 0x7ff00000
944         bge,pn  %icc,.update8           ! (4_0) if ( hx >= 0x7ff00000 )
945         for     %f50,A1,%f24            ! (4_0) res = vis_for(res,A1);
946 .cont8:
947         sra     %o5,21,%l1              ! (4_0) sqrt_exp = hx >> 21;
948         sra     %o5,15,%l0              ! (4_0) bit = hx >> 15;
949         ldd     [%o1],%f22              ! (3_0) dtmp0 = ((double*)pind)[0];

951         fmuld   A5,%f18,%f52            ! (2_0) res = A5 * xx;
952         sra     %o5,7,%o1               ! (4_0) ind0 = hx >> 7;
953         sub     %l1,512,%o3             ! (4_0) sqrt_exp -= 512;
954         fand    %f54,DC3,%f54           ! (3_0) res_c = vis_fand(res_c,DC3);

956         fmuld   %f20,%f42,%f20          ! (0_0) res *= xx;
957         and     %o1,_0x00001ff8,%o1     ! (4_0) ind0 &= 0x1ff8;
958         lda     [%l2]%asi,%f10          ! (5_0) ((float*)&res)[0] = ((float*)px)
959         faddd   %f34,A3,%f62            ! (1_0) res += A3;

961         fmuld   %f40,%f12,%f34          ! (5_1) res = dexp_hi * res;
962         add     %o1,32,%o1              ! (4_0) ind0 += 32;
963         lda     [%l2+4]%asi,%f11        ! (5_0) ((float*)&res)[1] = ((float*)px)

965         and     %l0,32,%i4              ! (4_0) bit &= 32;
966         cmp     %o5,_0x00100000         ! (4_0) hx ? 0x00100000
967         bl,pn   %icc,.update9           ! (4_0) if ( hx < 0x00100000 )
968         fsubd   %f44,%f54,%f44          ! (3_0) xx = (res - res_c);
969 .cont9:
970         and     %o1,-64,%o1             ! (4_0) ind0 &= -8;
971         faddd   %f52,A4,%f54            ! (2_0) res += A4;

973         cmp     counter,6
974         bl,pn   %icc,.tail
975         or      %g0,%o4,%l0

977         ba      .main_loop
978         nop

980         .align  16
981 .main_loop:
982         fmuld   %f62,%f14,%f52          ! (1_1) res *= xx;
983         sll     %o1,0,%i3               ! (4_1) ind1 = ind0;
984         add     %i1,TBL,%i1             ! (0_1) pind = (char*)TBL + ind1;
985         faddd   %f20,A1,%f12            ! (0_1) res += A1;
```



```
987         lda     [%l2]%asi,%o5           ! (5_1) hx = *(int*)px;
988         sllx    %o3,52,%o3              ! (4_1) sqrt_exp <<= 52;
989         add     %i3,%i4,%i3             ! (4_1) ind1 += bit;
990         faddd   %f34,%f36,%f60          ! (5_2) res += dexp_lo;

992         fmuld   %f44,%f22,%f44          ! (3_1) xx *= dtmp0;
993         add     %l2,stridex,%l2         ! px += stridex
994         stx     %o3,[%fp+tmp5]          ! (4_1) dsqrt_exp = *(double*)&sqrt_exp;
995         fand    %f10,DC0,%f50           ! (5_1) res = vis_fand(res,DC0);

997         fmuld   %f54,%f18,%f34          ! (2_1) res *= xx;
998         nop
999         ldd     [%i1+16],%f36           ! (0_1) dexp_lo = ((double*)pind)[2];
1000        fpadd32 %f24,DC2,%f54           ! (4_1) res_c = vis_fpadd32(res,DC2);

1002        fmuld   %f12,%f42,%f16          ! (0_1) res *= xx;
1003        sra     %o5,21,%l1              ! (5_1) sqrt_exp = hx >> 21;
1004        ldd     [%i1+8],%f42            ! (0_1) dexp_hi = ((double*)pind)[1];
1005        faddd   %f52,A2,%f20            ! (1_1) res += A2;

1007        ldd     [%fp+tmp0],%f48         ! (5_2) dsqrt_exp = *(double*)&sqrt_exp;
1008        cmp     %o5,_0x7ff00000         ! (5_1) hx ? 0x7ff00000
1009        bge,pn  %icc,.update10          ! (5_1) if ( hx >= 0x7ff00000 )
1010        faddd   %f60,%f40,%f60          ! (5_2) res += dexp_hi;
1011 .cont10:
1012        lda     [%l2]%asi,%f10          ! (0_0) ((float*)&res)[0] = ((float*)px)
1013        sra     %o5,15,%i1              ! (5_1) bit = hx >> 15;
1014        add     %i3,TBL,%o7             ! (4_1) pind = (char*)TBL + ind1
1015        for     %f50,A1,%f40            ! (5_1) res = vis_for(res,A1);

1017        fmuld   A5,%f44,%f52            ! (3_1) res = A5 * xx;
1018        sra     %o5,7,%o1               ! (5_1) ind0 = hx >> 7;
1019        ldd     [%o7],%f22              ! (4_1) dtmp0 = ((double*)pind)[0];
1020        fand    %f54,DC3,%f54           ! (4_1) res_c = vis_fand(res_c,DC3);

1022        fmuld   %f20,%f14,%f20          ! (1_1) res *= xx;
1023        and     %o1,_0x00001ff8,%o1     ! (5_1) ind0 &= 0x1ff8;
1024        sub     %l1,512,%o3             ! (5_1) sqrt_exp -= 512;
1025        faddd   %f34,A3,%f62            ! (2_1) res += A3;

1027        fpadd32 %f48,%f60,%f12          ! (5_2) dtmp0 = vis_fpadd32(dsqrt_exp,re
1028        add     %o1,32,%o1              ! (5_1) ind0 += 32;
1029        st      %f12,[%l0]              ! (5_2) ((float*)py)[0] = ((float*)&dtmp
1030        fmuld   %f42,%f16,%f34          ! (0_1) res = dexp_hi * res;

1032        lda     [%l2+4]%asi,%f11        ! (0_0) ((float*)&res)[1] = ((float*)px)
1033        and     %i1,32,%i4              ! (5_1) bit &= 32;
1034        and     %o1,-64,%o1             ! (5_1) ind0 &= -8;
1035        fsubd   %f24,%f54,%f24          ! (4_1) xx = (res - res_c);

1037        sll     %o1,0,%o7               ! (5_1) ind1 = ind0;
1038        add     %l0,stridey,%i1         ! py += stridey
1039        st      %f13,[%l0+4]            ! (5_2) ((float*)py)[1] = ((float*)&dtmp
1040        faddd   %f52,A4,%f54            ! (3_1) res += A4;

1042        fmuld   %f62,%f18,%f52          ! (2_1) res *= xx;
1043        cmp     %o5,_0x00100000         ! (5_1) hx ? 0x00100000
1044        bl,pn   %icc,.update11          ! (5_1) if ( hx < 0x00100000 )
1045        faddd   %f20,A1,%f12            ! (1_1) res += A1;
1046 .cont11:
1047        sllx    %o3,52,%o3              ! (5_1) sqrt_exp <<= 52;
1048        add     %o7,%i4,%l0             ! (5_1) ind1 += bit;
1049        lda     [%l2]%asi,%o5           ! (0_0) hx = *(int*)px;
1050        faddd   %f34,%f36,%f60          ! (0_1) res += dexp_lo;
```

```
1052          fmuld   %f24,%f22,%f24          ! (4_1) xx *= dtmp0;
1053          add     %i2,TBL,%i2             ! (1_1) pind = (char*)TBL + ind1;
1054          stx     %o3,[%fp+tmp0]          ! (5_1) dsqrt_exp = *(double*)&sqrt_exp;
1055          fand    %f10,DC0,%f50           ! (0_0) res = vis_fand(res,DC0);

1057          fmuld   %f54,%f44,%f34          ! (3_1) res *= xx;
1058          add     %l2,stridex,%l2         ! px += stridex
1059          ldd     [%i2+16],%f36           ! (1_1) dexp_lo = ((double*)pind)[2];
1060          fpadd32 %f40,DC2,%f54           ! (5_1) res_c = vis_fpadd32(res,DC2);

1062          fmuld   %f12,%f14,%f16          ! (1_1) res *= xx;
1063          sra     %o5,21,%l1              ! (0_0) sqrt_exp = hx >> 21;
1064          ldd     [%i2+8],%f14            ! (1_1) dexp_hi = ((double*)pind)[1];
1065          faddd   %f52,A2,%f20            ! (2_1) res += A2;

1067          ldd     [%fp+tmp1],%f48         ! (0_1) dsqrt_exp = *(double*)&sqrt_exp;
1068          cmp     %o5,_0x7ff00000         ! (0_0) hx ? 0x7ff00000
1069          bge,pn  %icc,.update12          ! (0_0) if ( hx >= 0x7ff00000 )
1070          faddd   %f60,%f42,%f60          ! (0_1) res += dexp_hi;
1071  .cont12:
1072          lda     [%l2]%asi,%f10          ! (1_0) ((float*)&res)[0] = ((float*)px)
1073          sra     %o5,15,%i2              ! (0_0) bit = hx >> 15;
1074          add     %l0,TBL,%o7             ! (5_1) pind = (char*)TBL + ind1
1075          for     %f50,A1,%f42            ! (0_0) res = vis_for(res,A1);

1077          fmuld   A5,%f24,%f52            ! (4_1) res = A5 * xx;
1078          sra     %o5,7,%o1               ! (0_0) ind0 = hx >> 7;
1079          ldd     [%o7],%f22              ! (5_1) dtmp0 = ((double*)pind)[0];
1080          fand    %f54,DC3,%f54           ! (5_1) res_c = vis_fand(res_c,DC3);

1082          fmuld   %f20,%f18,%f20          ! (2_1) res *= xx;
1083          and     %o1,_0x00001ff8,%o1     ! (0_0) ind0 &= 0x1ff8;
1084          sub     %l1,512,%o3             ! (0_0) sqrt_exp -= 512;
1085          faddd   %f34,A3,%f62            ! (3_1) res += A3;

1087          fpadd32 %f48,%f60,%f12          ! (0_1) dtmp0 = vis_fpadd32(dsqrt_exp,re
1088          add     %o1,32,%o1              ! (0_0) ind0 += 32;
1089          st      %f12,[%i1]              ! (0_1) ((float*)py)[0] = ((float*)&dtmp
1090          fmuld   %f14,%f16,%f34          ! (1_1) res = dexp_hi * res;

1092          lda     [%l2+4]%asi,%f11        ! (1_0) ((float*)&res)[1] = ((float*)px)
1093          and     %i2,32,%i4              ! (0_0) bit &= 32;
1094          and     %o1,-64,%o1             ! (0_0) ind0 &= -8;
1095          fsubd   %f40,%f54,%f40          ! (5_1) xx = (res - res_c);

1097          sll     %o1,0,%o7               ! (0_0) ind1 = ind0;
1098          add     %i1,stridey,%i2         ! py += stridey
1099          st      %f13,[%i1+4]            ! (0_1) ((float*)py)[1] = ((float*)&dtmp
1100          faddd   %f52,A4,%f54            ! (4_1) res += A4;

1102          fmuld   %f62,%f44,%f52          ! (3_1) res *= xx;
1103          cmp     %o5,_0x00100000         ! (0_0) hx ? 0x00100000
1104          bl,pn   %icc,.update13          ! (0_0) if ( hx < 0x00100000 )
1105          faddd   %f20,A1,%f12            ! (2_1) res += A1;
1106  .cont13:
1107          lda     [%l2]%asi,%o5           ! (1_0) hx = *(int*)px;
1108          sllx    %o3,52,%o3              ! (0_0) sqrt_exp <<= 52;
1109          add     %o7,%i4,%i1             ! (0_0) ind1 += bit;
1110          faddd   %f34,%f36,%f60          ! (1_1) res += dexp_lo;

1112          fmuld   %f40,%f22,%f40          ! (5_1) xx *= dtmp0;
1113          add     %g5,TBL,%g5             ! (2_1) pind = (char*)TBL + ind1;
1114          stx     %o3,[%fp+tmp1]          ! (0_0) dsqrt_exp = *(double*)&sqrt_exp;
1115          fand    %f10,DC0,%f50           ! (1_0) res = vis_fand(res,DC0);

1117          fmuld   %f54,%f24,%f34          ! (4_1) res *= xx;
```



```
1118          add     %l2,stridex,%l2         ! px += stridex
1119          ldd     [%g5+16],%f36           ! (2_1) dexp_lo = ((double*)pind)[2];
1120          fpadd32 %f42,DC2,%f54           ! (0_0) res_c = vis_fpadd32(res,DC2);

1122          fmuld   %f12,%f18,%f16          ! (2_1) res *= xx;
1123          sra     %o5,21,%l1              ! (1_0) sqrt_exp = hx >> 21;
1124          ldd     [%g5+8],%f18            ! (2_1) dexp_hi = ((double*)pind)[1];
1125          faddd   %f52,A2,%f20            ! (3_1) res += A2;

1127          ldd     [%fp+tmp2],%f48         ! (1_1) dsqrt_exp = *(double*)&sqrt_exp;
1128          cmp     %o5,_0x7ff00000         ! (1_0) hx ? 0x7ff00000
1129          bge,pn  %icc,.update14          ! (1_0) if ( hx >= 0x7ff00000 )
1130          faddd   %f60,%f14,%f60          ! (1_1) res += dexp_hi;
1131  .cont14:
1132          lda     [%l2]%asi,%f10          ! (2_0) ((float*)&res)[0] = ((float*)px)
1133          sra     %o5,15,%g5              ! (1_0) bit = hx >> 15;
1134          add     %i1,TBL,%o7             ! (0_0) pind = (char*)TBL + ind1
1135          for     %f50,A1,%f14            ! (1_0) res = vis_for(res,A1);

1137          fmuld   A5,%f40,%f52            ! (5_1) res = A5 * xx;
1138          sra     %o5,7,%o1               ! (1_0) ind0 = hx >> 7;
1139          ldd     [%o7],%f22              ! (0_0) dtmp0 = ((double*)pind)[0];
1140          fand    %f54,DC3,%f54           ! (0_0) res_c = vis_fand(res_c,DC3);

1142          fmuld   %f20,%f44,%f20          ! (3_1) res *= xx;
1143          and     %o1,_0x00001ff8,%o1     ! (1_0) ind0 &= 0x1ff8;
1144          sub     %l1,512,%o3             ! (1_0) sqrt_exp -= 512;
1145          faddd   %f34,A3,%f62            ! (4_1) res += A3;

1147          fpadd32 %f48,%f60,%f12          ! (1_1) dtmp0 = vis_fpadd32(dsqrt_exp,re
1148          add     %o1,32,%o1              ! (1_0) ind0 += 32;
1149          st      %f12,[%i2]              ! (1_1) ((float*)py)[0] = ((float*)&dtmp
1150          fmuld   %f18,%f16,%f34          ! (2_1) res = dexp_hi * res;

1152          lda     [%l2+4]%asi,%f11        ! (2_0) ((float*)&res)[1] = ((float*)px)
1153          and     %g5,32,%i4              ! (1_0) bit &= 32;
1154          and     %o1,-64,%o1             ! (1_0) ind0 &= -8;
1155          fsubd   %f42,%f54,%f42          ! (0_0) xx = (res - res_c);

1157          sll     %o1,0,%o7               ! (1_0) ind1 = ind0;
1158          add     %i2,stridey,%g5         ! py += stridey
1159          st      %f13,[%i2+4]            ! (1_1) ((float*)py)[1] = ((float*)&dtmp
1160          faddd   %f52,A4,%f54            ! (5_1) res += A4;

1162          fmuld   %f62,%f24,%f52          ! (4_1) res *= xx;
1163          cmp     %o5,_0x00100000         ! (1_0) hx ? 0x00100000
1164          bl,pn   %icc,.update15          ! (1_0) if ( hx < 0x00100000 )
1165          faddd   %f20,A1,%f12            ! (3_1) res += A1;
1166  .cont15:
1167          lda     [%l2]%asi,%o5           ! (2_0) hx = *(int*)px;
1168          sllx    %o3,52,%o3              ! (1_0) sqrt_exp <<= 52;
1169          add     %o7,%i4,%i2             ! (1_0) ind1 += bit;
1170          faddd   %f34,%f36,%f60          ! (2_1) res += dexp_lo;

1172          fmuld   %f42,%f22,%f42          ! (0_0) xx *= dtmp0;
1173          add     %g1,TBL,%g1             ! (3_1) pind = (char*)TBL + ind1;
1174          stx     %o3,[%fp+tmp2]          ! (1_0) dsqrt_exp = *(double*)&sqrt_exp;
1175          fand    %f10,DC0,%f50           ! (2_0) res = vis_fand(res,DC0);

1177          fmuld   %f54,%f40,%f34          ! (5_1) res *= xx;
1178          fpadd32 %f14,DC2,%f54           ! (1_0) res_c = vis_fpadd32(res,DC2);
1179          add     %l2,stridex,%l2         ! px += stridex
1180          ldd     [%g1+16],%f36           ! (3_1) dexp_lo = ((double*)pind)[2];

1182          fmuld   %f12,%f44,%f16          ! (3_1) res *= xx;
1183          sra     %o5,21,%l1              ! (2_0) sqrt_exp = hx >> 21;
```

```
1184          ldd     [%g1+8],%f44            ! (3_1) dexp_hi = ((double*)pind)[1];
1185          faddd   %f52,A2,%f20            ! (4_1) res += A2;

1187          ldd     [%fp+tmp3],%f48         ! (2_1) dsqrt_exp = *(double*)&sqrt_exp;
1188          cmp     %o5,_0x7ff00000         ! (2_0) hx ? 0x7ff00000
1189          bge,pn  %icc,.update16          ! (2_0) if ( hx >= 0x7ff00000 )
1190          faddd   %f60,%f18,%f60          ! (2_1) res += dexp_hi;
1191  .cont16:
1192          lda     [%l2]%asi,%f10          ! (3_0) ((float*)&res)[0] = ((float*)px)
1193          sra     %o5,15,%g1              ! (2_0) bit = hx >> 15;
1194          add     %i2,TBL,%o7             ! (1_0) pind = (char*)TBL + ind1
1195          for     %f50,A1,%f18            ! (2_0) res = vis_for(res,A1);

1197          fmuld   A5,%f42,%f52            ! (0_0) res = A5 * xx;
1198          sra     %o5,7,%o1               ! (2_0) ind0 = hx >> 7;
1199          ldd     [%o7],%f22              ! (1_0) dtmp0 = ((double*)pind)[0];
1200          fand    %f54,DC3,%f54           ! (1_0) res_c = vis_fand(res_c,DC3);

1202          fmuld   %f20,%f24,%f20          ! (4_1) res *= xx;
1203          and     %o1,_0x00001ff8,%o1     ! (2_0) ind0 &= 0x1ff8;
1204          sub     %l1,512,%o3             ! (2_0) sqrt_exp -= 512;
1205          faddd   %f34,A3,%f62            ! (5_1) res += A3;

1207          fpadd32 %f48,%f60,%f12          ! (2_1) dtmp0 = vis_fpadd32(dsqrt_exp,re
1208          add     %o1,32,%o1              ! (2_0) ind0 += 32;
1209          st      %f12,[%g5]              ! (2_1) ((float*)py)[0] = ((float*)&dtmp
1210          fmuld   %f44,%f16,%f34          ! (3_1) res = dexp_hi * res;

1212          lda     [%l2+4]%asi,%f11        ! (3_0) ((float*)&res)[1] = ((float*)px)
1213          and     %g1,32,%i4              ! (2_0) bit &= 32;
1214          and     %o1,-64,%o1             ! (2_0) ind0 &= -8;
1215          fsubd   %f14,%f54,%f14          ! (1_0) xx = (res - res_c);

1217          sll     %o1,0,%o7               ! (2_0) ind1 = ind0;
1218          add     %g5,stridey,%g1         ! py += stridey
1219          st      %f13,[%g5+4]            ! (2_1) ((float*)py)[1] = ((float*)&dtmp
1220          faddd   %f52,A4,%f54            ! (0_0) res += A4;

1222          fmuld   %f62,%f40,%f52          ! (5_1) res *= xx;
1223          cmp     %o5,_0x00100000         ! (2_0) hx ? 0x00100000
1224          bl,pn   %icc,.update17          ! (2_0) if ( hx < 0x00100000 )
1225          faddd   %f20,A1,%f12            ! (4_1) res += A1;
1226  .cont17:
1227          lda     [%l2]%asi,%o5           ! (3_0) hx = *(int*)px;
1228          sllx    %o3,52,%o3              ! (2_0) sqrt_exp <<= 52;
1229          add     %o7,%i4,%g5             ! (2_0) ind1 += bit;
1230          faddd   %f34,%f36,%f60          ! (3_1) res += dexp_lo;

1232          fmuld   %f14,%f22,%f14          ! (1_0) xx *= dtmp0;
1233          add     %i3,TBL,%i3             ! (4_1) pind = (char*)TBL + ind1;
1234          stx     %o3,[%fp+tmp3]          ! (2_0) dsqrt_exp = *(double*)&sqrt_exp;
1235          fand    %f10,DC0,%f50           ! (3_0) res = vis_fand(res,DC0);

1237          fmuld   %f54,%f42,%f34          ! (0_0) res *= xx;
1238          fpadd32 %f18,DC2,%f54           ! (2_0) res_c = vis_fpadd32(res,DC2);
1239          add     %l2,stridex,%l2         ! px += stridex
1240          ldd     [%i3+16],%f36           ! (4_1) dexp_lo = ((double*)pind)[2];

1242          fmuld   %f12,%f24,%f16          ! (4_1) res *= xx;
1243          sra     %o5,21,%l1              ! (3_0) sqrt_exp = hx >> 21;
1244          ldd     [%i3+8],%f24            ! (4_1) dexp_hi = ((double*)pind)[1];
1245          faddd   %f52,A2,%f20            ! (5_1) res += A2;

1247          ldd     [%fp+tmp4],%f48         ! (3_1) dsqrt_exp = *(double*)&sqrt_exp;
1248          cmp     %o5,_0x7ff00000         ! (3_0) hx ? 0x7ff00000
1249          bge,pn  %icc,.update18          ! (3_0) if ( hx >= 0x7ff00000 )
```



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1250          faddd   %f60,%f44,%f60          ! (3_1) res += dexp_hi;
1251  .cont18:
1252          lda     [%l2]%asi,%f10          ! (4_0) ((float*)&res)[0] = ((float*)px)
1253          sra     %o5,15,%i3              ! (3_0) bit = hx >> 15;
1254          add     %g5,TBL,%o7             ! (2_0) pind = (char*)TBL + ind1
1255          for     %f50,A1,%f44            ! (3_0) res = vis_for(res,A1);

1257          fmuld   A5,%f14,%f52            ! (1_0) res = A5 * xx;
1258          sra     %o5,7,%o1               ! (3_0) ind0 = hx >> 7;
1259          ldd     [%o7],%f22              ! (2_0) dtmp0 = ((double*)pind)[0];
1260          fand    %f54,DC3,%f54           ! (2_0) res_c = vis_fand(res_c,DC3);

1262          fmuld   %f20,%f40,%f20          ! (5_1) res *= xx;
1263          and     %o1,_0x00001ff8,%o1     ! (3_0) ind0 &= 0x1ff8;
1264          sub     %l1,512,%o3             ! (3_0) sqrt_exp -= 512;
1265          faddd   %f34,A3,%f62            ! (0_0) res += A3;

1267          fpadd32 %f48,%f60,%f12          ! (3_1) dtmp0 = vis_fpadd32(dsqrt_exp,re
1268          add     %o1,32,%o1              ! (3_0) ind0 += 32;
1269          st      %f12,[%g1]              ! (3_1) ((float*)py)[0] = ((float*)&dtmp
1270          fmuld   %f24,%f16,%f34          ! (4_1) res = dexp_hi * res;

1272          lda     [%l2+4]%asi,%f11        ! (4_0) ((float*)&res)[1] = ((float*)px)
1273          and     %i3,32,%i4              ! (3_0) bit &= 32;
1274          and     %o1,-64,%o1             ! (3_0) ind0 &= -8;
1275          fsubd   %f18,%f54,%f18          ! (2_0) xx = (res - res_c);

1277          or      %g0,%o1,%o7             ! (3_0) ind1 = ind0;
1278          add     %g1,stridey,%i3         ! py += stridey
1279          st      %f13,[%g1+4]            ! (3_1) ((float*)py)[1] = ((float*)&dtmp
1280          faddd   %f52,A4,%f54            ! (1_0) res += A4;

1282          fmuld   %f62,%f42,%f52          ! (0_0) res *= xx;
1283          cmp     %o5,_0x00100000         ! (3_0) hx ? 0x00100000
1284          bl,pn   %icc,.update19          ! (3_0) if ( hx < 0x00100000 )
1285          faddd   %f20,A1,%f12            ! (5_1) res += A1;
1286  .cont19:
1287          lda     [%l2]%asi,%o5           ! (4_0) hx = *(int*)px;
1288          sllx    %o3,52,%o3              ! (3_0) sqrt_exp <<= 52;
1289          add     %o7,%i4,%g1             ! (3_0) ind1 += bit;
1290          faddd   %f34,%f36,%f60          ! (4_1) res += dexp_lo;

1292          fmuld   %f18,%f22,%f18          ! (2_0) xx *= dtmp0;
1293          add     %l0,TBL,%l0             ! (5_1) pind = (char*)TBL + ind1;
1294          stx     %o3,[%fp+tmp4]          ! (3_0) dsqrt_exp = *(double*)&sqrt_exp;
1295          fand    %f10,DC0,%f50           ! (4_0) res = vis_fand(res,DC0);

1297          fmuld   %f54,%f14,%f34          ! (1_0) res *= xx;
1298          add     %l2,stridex,%l2         ! px += stridex
1299          ldd     [%l0+16],%f36           ! (5_1) dexp_lo = ((double*)pind)[2];
1300          fpadd32 %f44,DC2,%f54           ! (3_0) res_c = vis_fpadd32(res,DC2);

1302          fmuld   %f12,%f40,%f16          ! (5_1) res *= xx;
1303          sra     %o5,21,%l1              ! (4_0) sqrt_exp = hx >> 21;
1304          ldd     [%l0+8],%f40            ! (5_1) dexp_hi = ((double*)pind)[1];
1305          faddd   %f52,A2,%f20            ! (0_0) res += A2;

1307          ldd     [%fp+tmp5],%f48         ! (4_1) dsqrt_exp = *(double*)&sqrt_exp;
1308          cmp     %o5,_0x7ff00000         ! (4_0) hx ? 0x7ff00000
1309          bge,pn  %icc,.update20          ! (4_0) if ( hx >= 0x7ff00000 )
1310          faddd   %f60,%f24,%f60          ! (4_1) res += dexp_hi;
1311  .cont20:
1312          lda     [%l2]%asi,%f10          ! (5_0) ((float*)&res)[0] = ((float*)px)
1313          sra     %o5,15,%l0              ! (4_0) bit = hx >> 15;
1314          add     %g1,TBL,%o7             ! (3_0) (char*)div_arr+ind0
1315          for     %f50,A1,%f24            ! (4_0) res = vis_for(res,A1);
```

```
1317         fmuld   A5,%f18,%f52            ! (2_0) res = A5 * xx;
1318         sra     %o5,7,%o1               ! (4_0) ind0 = hx >> 7;
1319         ldd     [%o7],%f22              ! (3_0) dtmp0 = ((double*)pind)[0];
1320         fand    %f54,DC3,%f54           ! (3_0) res_c = vis_fand(res_c,DC3);

1322         fmuld   %f20,%f42,%f20          ! (0_0) res *= xx;
1323         and     %o1,_0x00001ff8,%o1     ! (4_0) ind0 &= 0x1ff8;
1324         sub     %l1,512,%o3             ! (4_0) sqrt_exp -= 512;
1325         faddd   %f34,A3,%f62            ! (1_0) res += A3;

1327         lda     [%l2+4]%asi,%f11        ! (5_0) ((float*)&res)[1] = ((float*)px)
1328         add     %o1,32,%o1              ! (4_0) ind0 += 32;
1329         fpadd32 %f48,%f60,%f12          ! (4_1) dtmp0 = vis_fpadd32(dsqrt_exp,re
1330         fmuld   %f40,%f16,%f34          ! (5_1) res = dexp_hi * res;

1332         and     %l0,32,%i4              ! (4_0) bit &= 32;
1333         cmp     %o5,_0x00100000         ! (4_0) hx ? 0x00100000
1334         bl,pn   %icc,.update21          ! (4_0) if ( hx < 0x00100000 )
1335         fsubd   %f44,%f54,%f44          ! (3_0) xx = (res - res_c);
1336 .cont21:
1337         and     %o1,-64,%o1             ! (4_0) ind0 &= -8;
1338         sub     counter,6,counter       ! counter
1339         st      %f12,[%i3]              ! (4_1) ((float*)py)[0] = ((float*)&dtmp
1340         faddd   %f52,A4,%f54            ! (2_0) res += A4;

1342         st      %f13,[%i3+4]            ! (4_1) ((float*)py)[1] = ((float*)&dtmp
1343         cmp     counter,6
1344         bge,pt  %icc,.main_loop
1345         add     %i3,stridey,%l0         ! py += stridey

1347 .tail:
1348         subcc   counter,1,counter
1349         bneg    .begin
1350         or      %g0,%l0,%o4

1352         fmuld   %f62,%f14,%f52          ! (1_1) res *= xx;
1353         add     %i1,TBL,%i1             ! (0_1) pind = (char*)TBL + ind1;
1354         faddd   %f20,A1,%f12            ! (0_1) res += A1;

1356         faddd   %f34,%f36,%f60          ! (5_2) res += dexp_lo;

1358         fmuld   %f44,%f22,%f44          ! (3_1) xx *= dtmp0;
1359         add     %l2,stridex,%l2         ! px += stridex

1361         fmuld   %f54,%f18,%f34          ! (2_1) res *= xx;
1362         ldd     [%i1+16],%f36           ! (0_1) dexp_lo = ((double*)pind)[2];

1364         fmuld   %f12,%f42,%f12          ! (0_1) res *= xx;
1365         ldd     [%i1+8],%f42            ! (0_1) dexp_hi = ((double*)pind)[1];
1366         faddd   %f52,A2,%f20            ! (1_1) res += A2;

1368         ldd     [%fp+tmp0],%f48         ! (5_2) dsqrt_exp = *(double*)&sqrt_exp;
1369         faddd   %f60,%f40,%f60          ! (5_2) res += dexp_hi;

1371         fmuld   A5,%f44,%f52            ! (3_1) res = A5 * xx;

1373         fmuld   %f20,%f14,%f20          ! (1_1) res *= xx;
1374         faddd   %f34,A3,%f62            ! (2_1) res += A3;

1376         fmuld   %f42,%f12,%f34          ! (0_1) res = dexp_hi * res;
1377         fpadd32 %f48,%f60,%f12          ! (5_2) dtmp0 = vis_fpadd32(dsqrt_exp,re

1379         st      %f12,[%l0]              ! (5_2) ((float*)py)[0] = ((float*)&dtmp

1381         add     %l0,stridey,%i1         ! py += stridey
```



```
1382         st      %f13,[%l0+4]            ! (5_2) ((float*)py)[1] = ((float*)&dtmp
1383         faddd   %f52,A4,%f54            ! (3_1) res += A4;

1385         subcc   counter,1,counter
1386         bneg    .begin
1387         or      %g0,%i1,%o4

1389         fmuld   %f62,%f18,%f52          ! (2_1) res *= xx;
1390         faddd   %f20,A1,%f12            ! (1_1) res += A1;

1392         faddd   %f34,%f36,%f60          ! (0_1) res += dexp_lo;

1394         add     %i2,TBL,%i2             ! (1_1) pind = (char*)TBL + ind1;

1396         fmuld   %f54,%f44,%f34          ! (3_1) res *= xx;
1397         add     %l2,stridex,%l2         ! px += stridex
1398         ldd     [%i2+16],%f36           ! (1_1) dexp_lo = ((double*)pind)[2];

1400         fmuld   %f12,%f14,%f12          ! (1_1) res *= xx;
1401         ldd     [%i2+8],%f14            ! (1_1) dexp_hi = ((double*)pind)[1];
1402         faddd   %f52,A2,%f20            ! (2_1) res += A2;

1404         ldd     [%fp+tmp1],%f48         ! (0_1) dsqrt_exp = *(double*)&sqrt_exp;
1405         faddd   %f60,%f42,%f60          ! (0_1) res += dexp_hi;

1407         fmuld   %f20,%f18,%f20          ! (2_1) res *= xx;
1408         faddd   %f34,A3,%f62            ! (3_1) res += A3;

1410         fmuld   %f14,%f12,%f34          ! (1_1) res = dexp_hi * res;
1411         fpadd32 %f48,%f60,%f12          ! (0_1) dtmp0 = vis_fpadd32(dsqrt_exp,re

1413         st      %f12,[%i1]              ! (0_1) ((float*)py)[0] = ((float*)&dtmp

1415         add     %i1,stridey,%i2         ! py += stridey
1416         st      %f13,[%i1+4]            ! (0_1) ((float*)py)[1] = ((float*)&dtmp

1418         subcc   counter,1,counter
1419         bneg    .begin
1420         or      %g0,%i2,%o4

1422         fmuld   %f62,%f44,%f52          ! (3_1) res *= xx;
1423         faddd   %f20,A1,%f12            ! (2_1) res += A1;

1425         faddd   %f34,%f36,%f60          ! (1_1) res += dexp_lo;

1427         add     %g5,TBL,%g5             ! (2_1) pind = (char*)TBL + ind1;

1429         add     %l2,stridex,%l2         ! px += stridex
1430         ldd     [%g5+16],%f36           ! (2_1) dexp_lo = ((double*)pind)[2];

1432         fmuld   %f12,%f18,%f12          ! (2_1) res *= xx;
1433         ldd     [%g5+8],%f18            ! (2_1) dexp_hi = ((double*)pind)[1];
1434         faddd   %f52,A2,%f20            ! (3_1) res += A2;

1436         ldd     [%fp+tmp2],%f48         ! (1_1) dsqrt_exp = *(double*)&sqrt_exp;
1437         faddd   %f60,%f14,%f60          ! (1_1) res += dexp_hi;

1439         fmuld   %f20,%f44,%f20          ! (3_1) res *= xx;

1441         fmuld   %f18,%f12,%f34          ! (2_1) res = dexp_hi * res;
1442         fpadd32 %f48,%f60,%f12          ! (1_1) dtmp0 = vis_fpadd32(dsqrt_exp,re

1444         st      %f12,[%i2]              ! (1_1) ((float*)py)[0] = ((float*)&dtmp

1446         add     %i2,stridey,%g5         ! py += stridey
1447         st      %f13,[%i2+4]            ! (1_1) ((float*)py)[1] = ((float*)&dtmp
```

```
1449         subcc   counter,1,counter
1450         bneg    .begin
1451         or      %g0,%g5,%o4

1453         faddd   %f20,A1,%f12            ! (3_1) res += A1;

1455         faddd   %f34,%f36,%f60          ! (2_1) res += dexp_lo;

1457         add     %g1,TBL,%g1             ! (3_1) pind = (char*)TBL + ind1;

1459         add     %l2,stridex,%l2         ! px += stridex
1460         ldd     [%g1+16],%f36           ! (3_1) dexp_lo = ((double*)pind)[2];

1462         fmuld   %f12,%f44,%f12          ! (3_1) res *= xx;
1463         ldd     [%g1+8],%f44            ! (3_1) dexp_hi = ((double*)pind)[1];

1465         ldd     [%fp+tmp3],%f48         ! (2_1) dsqrt_exp = *(double*)&sqrt_exp;
1466         faddd   %f60,%f18,%f60          ! (2_1) res += dexp_hi;

1468         fmuld   %f44,%f12,%f34          ! (3_1) res = dexp_hi * res;
1469         fpadd32 %f48,%f60,%f12          ! (2_1) dtmp0 = vis_fpadd32(dsqrt_exp,re

1471         st      %f12,[%g5]              ! (2_1) ((float*)py)[0] = ((float*)&dtmp

1473         add     %g5,stridey,%g1         ! py += stridey
1474         st      %f13,[%g5+4]            ! (2_1) ((float*)py)[1] = ((float*)&dtmp

1476         subcc   counter,1,counter
1477         bneg    .begin
1478         or      %g0,%g1,%o4

1480         faddd   %f34,%f36,%f60          ! (3_1) res += dexp_lo;

1482         add     %l2,stridex,%l2         ! px += stridex

1484         ldd     [%fp+tmp4],%f48         ! (3_1) dsqrt_exp = *(double*)&sqrt_exp;
1485         faddd   %f60,%f44,%f60          ! (3_1) res += dexp_hi;

1487         fpadd32 %f48,%f60,%f12          ! (3_1) dtmp0 = vis_fpadd32(dsqrt_exp,re

1489         st      %f12,[%g1]              ! (3_1) ((float*)py)[0] = ((float*)&dtmp

1491         add     %g1,stridey,%i3         ! py += stridey
1492         st      %f13,[%g1+4]            ! (3_1) ((float*)py)[1] = ((float*)&dtmp

1494         ba      .begin
1495         or      %g0,%i3,%o4

1497         .align  16
1498 .spec:
1499         fsqrtd  %f10,%f10
1500         add     %l2,stridex,%l2

1502         st      %f10,[%o4]
1503         st      %f11,[%o4+4]

1505         add     %o4,stridey,%o4
1506         ba      .begin1
1507         sub     counter,1,counter

1509         .align  16
1510 .update0:
1511         cmp     counter,1
1512         ble     .cont0
1513         nop
```



```
1515         sub     %l2,stridex,%i5
1516         stx     %i5,[%fp+tmp_px]

1518         sub     counter,1,counter
1519         st      counter,[%fp+tmp_counter]

1521         ba      .cont0
1522         or      %g0,1,counter

1524         .align  16
1525 .update1:
1526         cmp     counter,1
1527         ble     .cont1
1528         nop

1530         sub     %l2,stridex,%i5
1531         stx     %i5,[%fp+tmp_px]

1533         sub     counter,1,counter
1534         st      counter,[%fp+tmp_counter]

1536         ba      .cont1
1537         or      %g0,1,counter

1539         .align  16
1540 .update2:
1541         cmp     counter,2
1542         ble     .cont2
1543         nop

1545         sub     %l2,stridex,%i5
1546         stx     %i5,[%fp+tmp_px]

1548         sub     counter,2,counter
1549         st      counter,[%fp+tmp_counter]

1551         ba      .cont2
1552         or      %g0,2,counter

1554         .align  16
1555 .update3:
1556         cmp     counter,2
1557         ble     .cont3
1558         nop

1560         sub     %l2,stridex,%i5
1561         stx     %i5,[%fp+tmp_px]

1563         sub     counter,2,counter
1564         st      counter,[%fp+tmp_counter]

1566         ba      .cont3
1567         or      %g0,2,counter

1569         .align  16
1570 .update4:
1571         cmp     counter,3
1572         ble     .cont4
1573         nop

1575         sub     %l2,stridex,%i5
1576         stx     %i5,[%fp+tmp_px]

1578         sub     counter,3,counter
1579         st      counter,[%fp+tmp_counter]
```

```
1581         ba      .cont4
1582         or      %g0,3,counter

1584         .align  16
1585 .update5:
1586         cmp     counter,3
1587         ble     .cont5
1588         nop

1590         sub     %l2,stridex,%i5
1591         stx     %i5,[%fp+tmp_px]

1593         sub     counter,3,counter
1594         st      counter,[%fp+tmp_counter]

1596         ba      .cont5
1597         or      %g0,3,counter

1599         .align  16
1600 .update6:
1601         cmp     counter,4
1602         ble     .cont6
1603         nop

1605         sub     %l2,stridex,%i5
1606         stx     %i5,[%fp+tmp_px]

1608         sub     counter,4,counter
1609         st      counter,[%fp+tmp_counter]

1611         ba      .cont6
1612         or      %g0,4,counter

1614         .align  16
1615 .update7:
1616         cmp     counter,4
1617         ble     .cont7
1618         nop

1620         sub     %l2,stridex,%i5
1621         stx     %i5,[%fp+tmp_px]

1623         sub     counter,4,counter
1624         st      counter,[%fp+tmp_counter]

1626         ba      .cont7
1627         or      %g0,4,counter

1629         .align  16
1630 .update8:
1631         cmp     counter,5
1632         ble     .cont8
1633         nop

1635         sub     %l2,stridex,%i5
1636         stx     %i5,[%fp+tmp_px]

1638         sub     counter,5,counter
1639         st      counter,[%fp+tmp_counter]

1641         ba      .cont8
1642         or      %g0,5,counter

1644         .align  16
1645 .update9:
```



```
1646         cmp     counter,5
1647         ble     .cont9
1648         nop

1650         sub     %l2,stridex,%i5
1651         stx     %i5,[%fp+tmp_px]

1653         sub     counter,5,counter
1654         st      counter,[%fp+tmp_counter]

1656         ba      .cont9
1657         or      %g0,5,counter

1659         .align  16
1660 .update10:
1661         cmp     counter,6
1662         ble     .cont10
1663         nop

1665         sub     %l2,stridex,%i5
1666         stx     %i5,[%fp+tmp_px]

1668         sub     counter,6,counter
1669         st      counter,[%fp+tmp_counter]

1671         ba      .cont10
1672         or      %g0,6,counter

1674         .align  16
1675 .update11:
1676         cmp     counter,6
1677         ble     .cont11
1678         nop

1680         sub     %l2,stridex,%i5
1681         stx     %i5,[%fp+tmp_px]

1683         sub     counter,6,counter
1684         st      counter,[%fp+tmp_counter]

1686         ba      .cont11
1687         or      %g0,6,counter

1689         .align  16
1690 .update12:
1691         cmp     counter,7
1692         ble     .cont12
1693         nop

1695         sub     %l2,stridex,%i5
1696         stx     %i5,[%fp+tmp_px]

1698         sub     counter,7,counter
1699         st      counter,[%fp+tmp_counter]

1701         ba      .cont12
1702         or      %g0,7,counter

1704         .align  16
1705 .update13:
1706         cmp     counter,7
1707         ble     .cont13
1708         nop

1710         sub     %l2,stridex,%i5
1711         stx     %i5,[%fp+tmp_px]
```

```
1713         sub     counter,7,counter
1714         st      counter,[%fp+tmp_counter]

1716         ba      .cont13
1717         or      %g0,7,counter

1719         .align  16
1720 .update14:
1721         cmp     counter,8
1722         ble     .cont14
1723         nop

1725         sub     %l2,stridex,%i5
1726         stx     %i5,[%fp+tmp_px]

1728         sub     counter,8,counter
1729         st      counter,[%fp+tmp_counter]

1731         ba      .cont14
1732         or      %g0,8,counter

1734         .align  16
1735 .update15:
1736         cmp     counter,8
1737         ble     .cont15
1738         nop

1740         sub     %l2,stridex,%i5
1741         stx     %i5,[%fp+tmp_px]

1743         sub     counter,8,counter
1744         st      counter,[%fp+tmp_counter]

1746         ba      .cont15
1747         or      %g0,8,counter

1749         .align  16
1750 .update16:
1751         cmp     counter,9
1752         ble     .cont16
1753         nop

1755         sub     %l2,stridex,%i5
1756         stx     %i5,[%fp+tmp_px]

1758         sub     counter,9,counter
1759         st      counter,[%fp+tmp_counter]

1761         ba      .cont16
1762         or      %g0,9,counter

1764         .align  16
1765 .update17:
1766         cmp     counter,9
1767         ble     .cont17
1768         nop

1770         sub     %l2,stridex,%i5
1771         stx     %i5,[%fp+tmp_px]

1773         sub     counter,9,counter
1774         st      counter,[%fp+tmp_counter]

1776         ba      .cont17
1777         or      %g0,9,counter
```



```
1779         .align  16
1780 .update18:
1781         cmp     counter,10
1782         ble     .cont18
1783         nop

1785         sub     %l2,stridex,%i5
1786         stx     %i5,[%fp+tmp_px]

1788         sub     counter,10,counter
1789         st      counter,[%fp+tmp_counter]

1791         ba      .cont18
1792         or      %g0,10,counter

1794         .align  16
1795 .update19:
1796         cmp     counter,10
1797         ble     .cont19
1798         nop

1800         sub     %l2,stridex,%i5
1801         stx     %i5,[%fp+tmp_px]

1803         sub     counter,10,counter
1804         st      counter,[%fp+tmp_counter]

1806         ba      .cont19
1807         or      %g0,10,counter

1809         .align  16
1810 .update20:
1811         cmp     counter,11
1812         ble     .cont20
1813         nop

1815         sub     %l2,stridex,%i5
1816         stx     %i5,[%fp+tmp_px]

1818         sub     counter,11,counter
1819         st      counter,[%fp+tmp_counter]

1821         ba      .cont20
1822         or      %g0,11,counter

1824         .align  16
1825 .update21:
1826         cmp     counter,11
1827         ble     .cont21
1828         nop

1830         sub     %l2,stridex,%i5
1831         stx     %i5,[%fp+tmp_px]

1833         sub     counter,11,counter
1834         st      counter,[%fp+tmp_counter]

1836         ba      .cont21
1837         or      %g0,11,counter

1839 .exit:
1840         ret
1841         restore

1843         SET_SIZE(__vsqrt)
```

```
**********************************************************
    1372 Sat May 10 12:10:03 2014
new/usr/src/lib/libmvec/common/vis/__vsqrtf.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
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 */

        .file   "__vsqrtf.S"

#include "libm.h"

        .section        ".text"
        .file   "__vsqrtf.S"

        ENTRY(__vsqrtf)

        lda     [%o1]0x82,%f0
        subcc   %o0,1,%o0
        bneg,pn %icc,.exit
        sll     %o2,2,%o2
        ba      .loop
        sll     %o4,2,%o4

        .align  16
.loop:
        fsqrts  %f0,%f2
        lda     [%o1+%o2]0x82,%f0
        add     %o1,%o2,%o1
        subcc   %o0,1,%o0
        st      %f2,[%o3]
        bpos,pt %icc,.loop
        add     %o3,%o4,%o3
.exit:
        retl
        nop

        SET_SIZE(__vsqrtf)
```

```
**********************************************************
   25067 Sat May 10 12:10:03 2014
new/usr/src/lib/libmvec/common/vis/__vsqrtf_ultra3.S
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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        .file   "__vsqrtf_ultra3.S"

#include "libm.h"
#if defined(LIBMVEC_SO_BUILD)
        .weak   __vsqrtf
        .type   __vsqrtf,#function
        __vsqrtf = __vsqrtf_ultra3
#endif

        RO_DATA
        .align  64

.CONST_TBL:
        .word   0x3fe00001, 0x80007e00  ! K1  =  5.00000715259318464227e-01
        .word   0xbfc00003, 0xc0017a01  ! K2  = -1.25000447037521686593e-01
        .word   0x000fffff, 0xffffffff  ! DC0 = 0x000fffffffffffff
        .word   0x3ff00000, 0x00000000  ! DC1 = 0x3ff0000000000000
        .word   0x7ffff000, 0x00000000  ! DC2 = 0x7ffff00000000000

#define DC0             %f6
#define DC1             %f4
#define DC2             %f2
#define K2              %f38
#define K1              %f36
#define TBL             %l2
#define stridex         %l3
#define stridey         %l4
#define _0x1ff0         %l5
#define counter         %l6
#define _0x00800000     %l7
#define _0x7f800000     %o0

#define tmp_px          STACK_BIAS-0x40
```



```
#define tmp_counter     STACK_BIAS-0x38
#define tmp0            STACK_BIAS-0x30
#define tmp1            STACK_BIAS-0x28
#define tmp2            STACK_BIAS-0x20
#define tmp3            STACK_BIAS-0x18
#define tmp4            STACK_BIAS-0x10

! sizeof temp storage - must be a multiple of 16 for V9
#define tmps            0x40

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!      !!!!!   algorithm   !!!!!
!
!  x0 = *px;
!  ax = *(int*)px;
!  px += stridex;
!
!  if( ax >= 0x7f800000 )
!  {
!    *py = sqrtf(x0);
!    py += stridey;
!    continue;
!  }
!  if( ax < 0x00800000 )
!  {
!    *py = sqrtf(x0);
!    py += stridey;
!    continue;
!  }
!
!  db0 = (double)x0;
!  iexp0 = ax >> 24;
!  iexp0 += 0x3c0;
!  lexp0 = (long long)iexp0 << 52;
!
!  db0 = vis_fand(db0,DC0);
!  db0 = vis_for(db0,DC1);
!  hi0 = vis_fand(db0,DC2);
!
!  ax >>= 11;
!  si0 = ax & 0x1ff0;
!  dtmp0 = ((double*)((char*)TBL + si0))[0];
!  xx0 = (db0 - hi0);
!  xx0 *= dtmp0;
!  dtmp0 = ((double*)((char*)TBL + si0))[1]
!  res0 = K2 * xx0;
!  res0 += K1;
!  res0 *= xx0;
!  res0 += DC1;
!  res0 = dtmp0 * res0;
!  dtmp1 = *((double*)&lexp0);
!  res0 *= dtmp1;
!  fres0 = (float)res0;
!  *py = fres0;
!  py += stridey;
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

        ENTRY(__vsqrtf_ultra3)
        save    %sp,-SA(MINFRAME)-tmps,%sp
        PIC_SETUP(l7)
        PIC_SET(l7,.CONST_TBL,o2)
        PIC_SET(l7,__vlibm_TBL_sqrtf,l2)

        st      %i0,[%fp+tmp_counter]
        sll     %i2,2,stridex
        or      %g0,0xff8,%l5
```

```
129         stx     %i1,[%fp+tmp_px]
130         sll     %l5,1,_0x1ff0

132         ldd     [%o2],K1
133         sll     %i4,2,stridey

135         ldd     [%o2+8],K2
136         or      %g0,%i3,%g5

138         ldd     [%o2+16],DC0
139         sethi   %hi(0x7f800000),%o0

141         ldd     [%o2+24],DC1
142         sethi   %hi(0x00800000),%l7

144         ldd     [%o2+32],DC2

146 .begin:
147         ld      [%fp+tmp_counter],counter
148         ldx     [%fp+tmp_px],%i1
149         st      %g0,[%fp+tmp_counter]
150 .begin1:
151         cmp     counter,0
152         ble,pn  %icc,.exit

154         lda     [%i1]0x82,%o2           ! (2_0) ax = *(int*)px;

156         or      %g0,%i1,%o7
157         lda     [%i1]0x82,%f25          ! (2_0) x0 = *px;

159         cmp     %o2,_0x7f800000         ! (2_0) ax ? 0x7f800000
160         bge,pn  %icc,.spec              ! (2_0) if( ax >= 0x7f800000 )
161         nop

163         cmp     %o2,_0x00800000         ! (2_0) ax ? 0x00800000
164         bl,pn   %icc,.spec              ! (2_0) if( ax < 0x00800000 )
165         nop

167         fstod   %f25,%f56               ! (2_0) db0 = (double)x0;

169         lda     [stridex+%o7]0x82,%o1   ! (3_0) ax = *(int*)px;

171         sra     %o2,24,%l1              ! (2_0) iexp0 = ax >> 24;

173         add     %o7,stridex,%i1         ! px += stridex
174         add     %l1,960,%l0             ! (2_0) iexp0 += 0x3c0;
175         lda     [stridex+%o7]0x82,%f0   ! (3_0) x0 = *px;
176         fand    %f56,DC0,%f60           ! (2_0) db0 = vis_fand(db0,DC0);

178         cmp     %o1,_0x7f800000         ! (3_0) ax ? 0x7f800000
179         bge,pn  %icc,.update0           ! (3_0) if( ax >= 0x7f800000 )
180         nop
181 .cont0:
182         sllx    %l0,52,%o3              ! (2_0) lexp0 = (long long)iexp0 << 52;

184         sra     %o2,11,%i2              ! (2_0) ax >>= 11;
185         stx     %o3,[%fp+tmp0]          ! (2_0) dtmp1 = *((double*)&lexp0);
186         for     %f60,DC1,%f40           ! (2_0) db0 = vis_for(db0,DC1);

188         cmp     %o1,_0x00800000         ! (3_0) ax ? 0x00800000
189         bl,pn   %icc,.update1           ! (3_0) if( ax < 0x00800000 )
190         nop
191 .cont1:
192         fstod   %f0,%f48                ! (3_0) db0 = (double)x0;
```



```
194         and     %i2,_0x1ff0,%o3         ! (2_0) si0 = ax & 0x1ff0;
195         lda     [%i1+stridex]0x82,%o2   ! (4_0) ax = *(int*)px;

197         add     %i1,stridex,%i1         ! px += stridex
198         add     %o3,TBL,%i2             ! (2_0) (char*)TBL + si0
199         fand    %f40,DC2,%f46           ! (2_0) hi0 = vis_fand(db0,DC2);

201         sra     %o1,24,%o4              ! (3_0) iexp0 = ax >> 24;

203         lda     [%i1]0x82,%f13          ! (4_0) x0 = *px;
204         fand    %f48,DC0,%f58           ! (3_0) db0 = vis_fand(db0,DC0);

206         add     %o4,960,%i0             ! (3_0) iexp0 += 0x3c0;

208         cmp     %o2,_0x7f800000         ! (4_1) ax ? 0x7f800000
209         bge,pn  %icc,.update2           ! (4_1) if( ax >= 0x7f800000 )
210         nop
211 .cont2:
212         fsubd   %f40,%f46,%f44          ! (2_1) xx0 = (db0 - hi0);
213         sllx    %i0,52,%g1              ! (3_1) lexp0 = (long long)iexp0 << 52;
214         ldd     [%i2],%f40              ! (2_1) dtmp0 = ((double*)((char*)TBL +

216         sra     %o1,11,%l0              ! (3_1) ax >>= 11;
217         stx     %g1,[%fp+tmp1]          ! (3_1) dtmp1 = *((double*)&lexp0);
218         for     %f58,DC1,%f48           ! (3_1) db0 = vis_for(db0,DC1);

220         cmp     %o2,_0x00800000         ! (4_1) ax ? 0x00800000
221         bl,pn   %icc,.update3           ! (4_1) if( ax < 0x00800000 )
222         nop
223 .cont3:
224         fstod   %f13,%f50               ! (4_1) db0 = (double)x0;

226         fmuld   %f44,%f40,%f46          ! (2_1) xx0 *= dtmp0;
227         and     %l0,_0x1ff0,%i0         ! (3_1) si0 = ax & 0x1ff0;
228         lda     [%i1+stridex]0x82,%l1   ! (0_0) ax = *(int*)px;

230         add     %i0,TBL,%l0             ! (3_1) (char*)TBL + si0
231         fand    %f48,DC2,%f62           ! (3_1) hi0 = vis_fand(db0,DC2);

233         sra     %o2,24,%o7              ! (4_1) iexp0 = ax >> 24;

235         add     %i1,stridex,%o4         ! px += stridex
236         add     %o7,960,%o7             ! (4_1) iexp0 += 0x3c0;
237         lda     [%i1+stridex]0x82,%f17  ! (0_0) x0 = *px;
238         fand    %f50,DC0,%f54           ! (4_1) db0 = vis_fand(db0,DC0);

240         fmuld   K2,%f46,%f52            ! (2_1) res0 = K2 * xx0;
241         cmp     %l1,_0x7f800000         ! (0_0) ax ? 0x7f800000
242         bge,pn  %icc,.update4           ! (0_0) if( ax >= 0x7f800000 )
243         fsubd   %f48,%f62,%f42          ! (3_1) xx0 = (db0 - hi0);
244 .cont4:
245         sllx    %o7,52,%o1              ! (4_1) lexp0 = (long long)iexp0 << 52;
246         ldd     [%i0+TBL],%f40          ! (3_1) dtmp0 = ((double*)((char*)TBL +

248         sra     %o2,11,%i5              ! (4_1) ax >>= 11;
249         stx     %o1,[%fp+tmp2]          ! (4_1) dtmp1 = *((double*)&lexp0);
250         for     %f54,DC1,%f34           ! (4_1) db0 = vis_for(db0,DC1);

252         cmp     %l1,_0x00800000         ! (0_0) ax ? 0x00800000
253         bl,pn   %icc,.update5           ! (0_0) if( ax < 0x00800000 )
254         nop
255 .cont5:
256         fstod   %f17,%f56               ! (0_0) db0 = (double)x0;

258         fmuld   %f42,%f40,%f42          ! (3_1) xx0 *= dtmp0;
259         lda     [stridex+%o4]0x82,%i0   ! (1_0) ax = *(int*)px;
```

```
260         faddd   %f52,K1,%f52             ! (2_1) res0 += K1;

262         sra     %l1,24,%g1              ! (0_0) iexp0 = ax >> 24;
263         and     %i5,_0x1ff0,%i5         ! (4_1) si0 = ax & 0x1ff0;
264         fand    %f34,DC2,%f62           ! (4_1) hi0 = vis_fand(db0,DC2);

266         add     %o4,stridex,%i1         ! px += stridex

268         add     %g1,960,%o5             ! (0_0) iexp0 += 0x3c0;
269         add     %i5,TBL,%i3             ! (4_1) (char*)TBL + si0
270         lda     [stridex+%o4]0x82,%f21  ! (1_0) x0 = *px;
271         fand    %f56,DC0,%f32           ! (0_0) db0 = vis_fand(db0,DC0);

273         fmuld   K2,%f42,%f50            ! (3_1) res0 = K2 * xx0;
274         cmp     %i0,_0x7f800000         ! (1_0) ax ? 0x7f800000
275         bge,pn  %icc,.update6           ! (1_0) if( ax >= 0x7f800000 )
276         fsubd   %f34,%f62,%f54          ! (4_1) xx0 = (db0 - hi0);
277 .cont6:
278         fmuld   %f52,%f46,%f52          ! (2_1) res0 *= xx0;
279         sllx    %o5,52,%o7              ! (0_0) lexp0 = (long long)iexp0 << 52;
280         ldd     [TBL+%i5],%f62          ! (4_1) dtmp0 = ((double*)((char*)TBL +

282         sra     %l1,11,%i4              ! (0_0) ax >>= 11;
283         stx     %o7,[%fp+tmp3]          ! (0_0) dtmp1 = *((double*)&lexp0);
284         for     %f32,DC1,%f48           ! (0_0) db0 = vis_for(db0,DC1);

286         cmp     %i0,_0x00800000         ! (1_0) ax ? 0x00800000
287         bl,pn   %icc,.update7           ! (1_0) if( ax < 0x00800000 )
288         nop
289 .cont7:
290         fstod   %f21,%f56               ! (1_0) db0 = (double)x0;

292         fmuld   %f54,%f62,%f46          ! (4_1) xx0 *= dtmp0;
293         and     %i4,_0x1ff0,%g1         ! (0_0) si0 = ax & 0x1ff0;
294         lda     [%i1+stridex]0x82,%o2   ! (2_0) ax = *(int*)px;
295         faddd   %f50,K1,%f62            ! (3_1) res0 += K1;

297         add     %g1,TBL,%i5             ! (0_0) (double*)((char*)TBL + si0
298         fand    %f48,DC2,%f32           ! (0_0) hi0 = vis_fand(db0,DC2);

300         sra     %i0,24,%o4              ! (1_0) iexp0 = ax >> 24;
301         ldd     [%i2+8],%f60            ! (2_1) dtmp0 = ((double*)((char*)TBL +
302         faddd   %f52,DC1,%f58           ! (2_1) res0 += DC1;

304         add     %i1,stridex,%o7         ! px += stridex
305         add     %o4,960,%i2             ! (1_0) iexp0 += 0x3c0;
306         lda     [%i1+stridex]0x82,%f25  ! (2_0) x0 = *px;
307         fand    %f56,DC0,%f34           ! (1_0) db0 = vis_fand(db0,DC0);

309         fmuld   K2,%f46,%f50            ! (4_1) res0 = K2 * xx0;
310         cmp     %o2,_0x7f800000         ! (2_0) ax ? 0x7f800000
311         bge,pn  %icc,.update8           ! (2_0) if( ax >= 0x7f800000 )
312         fsubd   %f48,%f32,%f52          ! (0_0) xx0 = (db0 - hi0);
313 .cont8:
314         fmuld   %f62,%f42,%f54          ! (3_1) res0 *= xx0;
315         sllx    %i2,52,%o4              ! (1_0) lexp0 = (long long)iexp0 << 52;
316         ldd     [TBL+%g1],%f32          ! (0_0) dtmp0 = ((double*)((char*)TBL +

318         fmuld   %f60,%f58,%f60          ! (2_1) res0 = dtmp0 * res0;
319         sra     %i0,11,%g1              ! (1_0) ax >>= 11;
320         stx     %o4,[%fp+tmp4]          ! (1_0) dtmp1 = *((double*)&lexp0);
321         for     %f34,DC1,%f48           ! (1_0) db0 = vis_for(db0,DC1);

323         cmp     %o2,_0x00800000         ! (2_0) ax ? 0x00800000
324         bl,pn   %icc,.update9           ! (2_0) if( ax < 0x00800000 )
325         ldd     [%fp+tmp0],%f40         ! (2_1) dtmp1 = *((double*)&lexp0);
```



```
326         fstod   %f25,%f56               ! (2_0) db0 = (double)x0;
327 .cont9:
328         fmuld   %f52,%f32,%f42          ! (0_0) xx0 *= dtmp0;
329         and     %g1,_0x1ff0,%o5         ! (1_0) si0 = ax & 0x1ff0;
330         lda     [stridex+%o7]0x82,%o1   ! (3_0) ax = *(int*)px;
331         faddd   %f50,K1,%f34            ! (4_1) res0 += K1;

333         add     %o5,TBL,%i4             ! (1_0) (char*)TBL + si0
334         fand    %f48,DC2,%f62           ! (1_0) hi0 = vis_fand(db0,DC2);

336         fmuld   %f60,%f40,%f32          ! (2_1) res0 *= dtmp1;
337         sra     %o2,24,%l1              ! (2_0) iexp0 = ax >> 24;
338         ldd     [%l0+8],%f40            ! (3_1) dtmp0 = ((double*)((char*)TBL +
339         faddd   %f54,DC1,%f58           ! (3_1) res0 += DC1;

341         add     %o7,stridex,%i1         ! px += stridex
342         add     %l1,960,%l0             ! (2_0) iexp0 += 0x3c0;
343         lda     [stridex+%o7]0x82,%f0   ! (3_0) x0 = *px;
344         fand    %f56,DC0,%f60           ! (2_0) db0 = vis_fand(db0,DC0);

346         fmuld   K2,%f42,%f50            ! (0_0) res0 = K2 * xx0;
347         cmp     %o1,_0x7f800000         ! (3_0) ax ? 0x7f800000
348         bge,pn  %icc,.update10          ! (3_0) if( ax >= 0x7f800000 )
349         fsubd   %f48,%f62,%f54          ! (1_0) xx0 = (db0 - hi0);
350 .cont10:
351         fmuld   %f34,%f46,%f52          ! (4_1) res0 *= xx0;
352         sllx    %l0,52,%o3              ! (2_0) lexp0 = (long long)iexp0 << 52;
353         ldd     [TBL+%o5],%f56          ! (1_0) dtmp0 = ((double*)((char*)TBL +

355         fmuld   %f40,%f58,%f34          ! (3_1) res0 = dtmp0 * res0;
356         sra     %o2,11,%i2              ! (2_0) ax >>= 11;
357         stx     %o3,[%fp+tmp0]          ! (2_0) dtmp1 = *((double*)&lexp0);
358         for     %f60,DC1,%f40           ! (2_0) db0 = vis_for(db0,DC1);

360         cmp     %o1,_0x00800000         ! (3_0) ax ? 0x00800000
361         bl,pn   %icc,.update11          ! (3_0) if( ax < 0x00800000 )
362         ldd     [%fp+tmp1],%f62         ! (3_1) dtmp1 = *((double*)&lexp0);
363         fstod   %f0,%f48                ! (3_0) db0 = (double)x0;
364 .cont11:
365         fmuld   %f54,%f56,%f30          ! (1_0) xx0 *= dtmp0;
366         and     %i2,_0x1ff0,%o3         ! (2_0) si0 = ax & 0x1ff0;
367         lda     [%i1+stridex]0x82,%o2   ! (4_0) ax = *(int*)px;
368         faddd   %f50,K1,%f56            ! (0_0) res0 += K1;

370         add     %i1,stridex,%i1         ! px += stridex
371         add     %o3,TBL,%i2             ! (2_0) (char*)TBL + si0
372         fand    %f40,DC2,%f46           ! (2_0) hi0 = vis_fand(db0,DC2);

374         fmuld   %f34,%f62,%f28          ! (3_1) res0 *= dtmp1;
375         sra     %o1,24,%o4              ! (3_0) iexp0 = ax >> 24;
376         ldd     [%i3+8],%f50            ! (4_1) dtmp0 = ((double*)((char*)TBL +
377         faddd   %f52,DC1,%f54           ! (4_1) res0 += DC1;

379         lda     [%i1]0x82,%f13          ! (4_0) x0 = *px;
380         fand    %f48,DC0,%f58           ! (3_0) db0 = vis_fand(db0,DC0);

382         or      %g0,%g5,%i3
383         cmp     counter,5
384         bl,pn   %icc,.tail
385         add     %o4,960,%g5             ! (3_0) iexp0 += 0x3c0;

387         ba      .main_loop
388         sub     counter,5,counter       ! counter

390         .align  16
391 .main_loop:
```

```
392         fmuld   K2,%f30,%f60            ! (1_1) res0 = K2 * xx0;
393         cmp     %o2,_0x7f800000         ! (4_1) ax ? 0x7f800000
394         bge,pn  %icc,.update12          ! (4_1) if( ax >= 0x7f800000 )
395         fsubd   %f40,%f46,%f44          ! (2_1) xx0 = (db0 - hi0);
396 .cont12:
397         fmuld   %f56,%f42,%f52          ! (0_1) res0 *= xx0;
398         sllx    %g5,52,%g5              ! (3_1) lexp0 = (long long)iexp0 << 52;
399         ldd     [%i2],%f40              ! (2_1) dtmp0 = ((double*)((char*)TBL +
400         fdtos   %f32,%f15               ! (2_2) fres0 = (float)res0;

402         fmuld   %f50,%f54,%f42          ! (4_2) res0 = dtmp0 * res0;
403         sra     %o1,11,%l0              ! (3_1) ax >>= 11;
404         stx     %g5,[%fp+tmp1]          ! (3_1) dtmp1 = *((double*)&lexp0);
405         for     %f58,DC1,%f48           ! (3_1) db0 = vis_for(db0,DC1);

407         cmp     %o2,_0x00800000         ! (4_1) ax ? 0x00800000
408         bl,pn   %icc,.update13          ! (4_1) if( ax < 0x00800000 )
409         ldd     [%fp+tmp2],%f56         ! (4_2) dtmp1 = *((double*)&lexp0);
410         fstod   %f13,%f50               ! (4_1) db0 = (double)x0;
411 .cont13:
412         fmuld   %f44,%f40,%f46          ! (2_1) xx0 *= dtmp0;
413         and     %l0,_0x1ff0,%i0         ! (3_1) si0 = ax & 0x1ff0;
414         lda     [%i1+stridex]0x82,%l1   ! (0_0) ax = *(int*)px;
415         faddd   %f60,K1,%f32            ! (1_1) res0 += K1;

417         add     %i0,TBL,%l0             ! (3_1) (char*)TBL + si0
418         add     %i3,stridey,%o3         ! py += stridey
419         st      %f15,[%i3]              ! (2_2) *py = fres0;
420         fand    %f48,DC2,%f62           ! (3_1) hi0 = vis_fand(db0,DC2);

422         fmuld   %f42,%f56,%f44          ! (4_2) res0 *= dtmp1;
423         sra     %o2,24,%o7              ! (4_1) iexp0 = ax >> 24;
424         ldd     [%i5+8],%f58            ! (0_1) dtmp0 = ((double*)((char*)TBL +
425         faddd   %f52,DC1,%f34           ! (0_1) res0 += DC1;

427         add     %i1,stridex,%o4         ! px += stridex
428         add     %o7,960,%o7             ! (4_1) iexp0 += 0x3c0;
429         lda     [%i1+stridex]0x82,%f17  ! (0_0) x0 = *px;
430         fand    %f50,DC0,%f54           ! (4_1) db0 = vis_fand(db0,DC0);

432         fmuld   K2,%f46,%f52            ! (2_1) res0 = K2 * xx0;
433         cmp     %l1,_0x7f800000         ! (0_0) ax ? 0x7f800000
434         bge,pn  %icc,.update14          ! (0_0) if( ax >= 0x7f800000 )
435         fsubd   %f48,%f62,%f42          ! (3_1) xx0 = (db0 - hi0);
436 .cont14:
437         fmuld   %f32,%f30,%f48          ! (1_1) res0 *= xx0;
438         sllx    %o7,52,%o1              ! (4_1) lexp0 = (long long)iexp0 << 52;
439         ldd     [%i0+TBL],%f40          ! (3_1) dtmp0 = ((double*)((char*)TBL +
440         fdtos   %f28,%f19               ! (3_2) fres0 = (float)res0;

442         fmuld   %f58,%f34,%f32          ! (0_1) res0 = dtmp0 * res0;
443         sra     %o2,11,%i5              ! (4_1) ax >>= 11;
444         stx     %o1,[%fp+tmp2]          ! (4_1) dtmp1 = *((double*)&lexp0);
445         for     %f54,DC1,%f34           ! (4_1) db0 = vis_for(db0,DC1);

447         cmp     %l1,_0x00800000         ! (0_0) ax ? 0x00800000
448         bl,pn   %icc,.update15          ! (0_0) if( ax < 0x00800000 )
449         ldd     [%fp+tmp3],%f60         ! (0_1) dtmp1 = *((double*)&lexp0);
450         fstod   %f17,%f56               ! (0_0) db0 = (double)x0;
451 .cont15:
452         fmuld   %f42,%f40,%f42          ! (3_1) xx0 *= dtmp0;
453         add     %o3,stridey,%g5         ! py += stridey
454         lda     [stridex+%o4]0x82,%i0   ! (1_0) ax = *(int*)px;
455         faddd   %f52,K1,%f52            ! (2_1) res0 += K1;

457         sra     %l1,24,%g1              ! (0_0) iexp0 = ax >> 24;
```



```
458         and     %i5,_0x1ff0,%i5         ! (4_1) si0 = ax & 0x1ff0;
459         st      %f19,[%o3]              ! (3_2) *py = fres0;
460         fand    %f34,DC2,%f62           ! (4_1) hi0 = vis_fand(db0,DC2);

462         fmuld   %f32,%f60,%f40          ! (0_1) res0 *= dtmp1;
463         add     %o4,stridex,%i1         ! px += stridex
464         ldd     [%i4+8],%f60            ! (1_1) dtmp0 = ((double*)((char*)TBL +
465         faddd   %f48,DC1,%f58           ! (1_1) res0 += DC1;

467         add     %g1,960,%o5             ! (0_0) iexp0 += 0x3c0;
468         add     %i5,TBL,%i3             ! (4_1) (char*)TBL + si0
469         lda     [stridex+%o4]0x82,%f21  ! (1_0) x0 = *px;
470         fand    %f56,DC0,%f32           ! (0_0) db0 = vis_fand(db0,DC0);

472         fmuld   K2,%f42,%f50            ! (3_1) res0 = K2 * xx0;
473         cmp     %i0,_0x7f800000         ! (1_0) ax ? 0x7f800000
474         bge,pn  %icc,.update16          ! (1_0) if( ax >= 0x7f800000 )
475         fsubd   %f34,%f62,%f54          ! (4_1) xx0 = (db0 - hi0);
476 .cont16:
477         fmuld   %f52,%f46,%f52          ! (2_1) res0 *= xx0;
478         sllx    %o5,52,%o7              ! (0_0) lexp0 = (long long)iexp0 << 52;
479         ldd     [TBL+%i5],%f62          ! (4_1) dtmp0 = ((double*)((char*)TBL +
480         fdtos   %f44,%f23               ! (4_2) fres0 = (float)res0;

482         fmuld   %f60,%f58,%f44          ! (1_1) res0 = dtmp0 * res0;
483         sra     %l1,11,%i4              ! (0_0) ax >>= 11;
484         stx     %o7,[%fp+tmp3]          ! (0_0) dtmp1 = *((double*)&lexp0);
485         for     %f32,DC1,%f48           ! (0_0) db0 = vis_for(db0,DC1);

487         cmp     %i0,_0x00800000         ! (1_0) ax ? 0x00800000
488         bl,pn   %icc,.update17          ! (1_0) if( ax < 0x00800000 )
489         ldd     [%fp+tmp4],%f34         ! (1_1) dtmp1 = *((double*)&lexp0);
490         fstod   %f21,%f56               ! (1_0) db0 = (double)x0;
491 .cont17:
492         fmuld   %f54,%f62,%f46          ! (4_1) xx0 *= dtmp0;
493         and     %i4,_0x1ff0,%g1         ! (0_0) si0 = ax & 0x1ff0;
494         lda     [%i1+stridex]0x82,%o2   ! (2_0) ax = *(int*)px;
495         faddd   %f50,K1,%f62            ! (3_1) res0 += K1;

497         add     %g1,TBL,%i5             ! (0_0) (double*)((char*)TBL + si0
498         add     %g5,stridey,%g5         ! py += stridey
499         st      %f23,[stridey+%o3]      ! (4_2) *py = fres0;
500         fand    %f48,DC2,%f32           ! (0_0) hi0 = vis_fand(db0,DC2);

502         fmuld   %f44,%f34,%f44          ! (1_1) res0 *= dtmp1;
503         sra     %i0,24,%o4              ! (1_0) iexp0 = ax >> 24;
504         ldd     [%i2+8],%f60            ! (2_1) dtmp0 = ((double*)((char*)TBL +
505         faddd   %f52,DC1,%f58           ! (2_1) res0 += DC1;

507         add     %i1,stridex,%o7         ! px += stridex
508         add     %o4,960,%i2             ! (1_0) iexp0 += 0x3c0;
509         lda     [%i1+stridex]0x82,%f25  ! (2_0) x0 = *px;
510         fand    %f56,DC0,%f34           ! (1_0) db0 = vis_fand(db0,DC0);

512         fmuld   K2,%f46,%f50            ! (4_1) res0 = K2 * xx0;
513         cmp     %o2,_0x7f800000         ! (2_0) ax ? 0x7f800000
514         bge,pn  %icc,.update18          ! (2_0) if( ax >= 0x7f800000 )
515         fsubd   %f48,%f32,%f52          ! (0_0) xx0 = (db0 - hi0);
516 .cont18:
517         fmuld   %f62,%f42,%f54          ! (3_1) res0 *= xx0;
518         sllx    %i2,52,%o4              ! (1_0) lexp0 = (long long)iexp0 << 52;
519         ldd     [TBL+%g1],%f32          ! (0_0) dtmp0 = ((double*)((char*)TBL +
520         fdtos   %f40,%f27               ! (0_1) fres0 = (float)res0;

522         fmuld   %f60,%f58,%f60          ! (2_1) res0 = dtmp0 * res0;
523         sra     %i0,11,%g1              ! (1_0) ax >>= 11;
```

```
524         stx     %o4,[%fp+tmp4]          ! (1_0) dtmp1 = *((double*)&lexp0);
525         for     %f34,DC1,%f48           ! (1_0) db0 = vis_for(db0,DC1);

527         cmp     %o2,_0x00800000         ! (2_0) ax ? 0x00800000
528         bl,pn   %icc,.update19          ! (2_0) if( ax < 0x00800000 )
529         ldd     [%fp+tmp0],%f40         ! (2_1) dtmp1 = *((double*)&lexp0);
530         fstod   %f25,%f56               ! (2_0) db0 = (double)x0;
531 .cont19:
532         fmuld   %f52,%f32,%f42          ! (0_0) xx0 *= dtmp0;
533         and     %g1,_0x1ff0,%o5         ! (1_0) si0 = ax & 0x1ff0;
534         lda     [stridex+%o7]0x82,%o1   ! (3_0) ax = *(int*)px;
535         faddd   %f50,K1,%f34            ! (4_1) res0 += K1;

537         add     %o5,TBL,%i4             ! (1_0) (char*)TBL + si0
538         add     %g5,stridey,%g1         ! py += stridey
539         st      %f27,[%g5]              ! (0_1) *py = fres0;
540         fand    %f48,DC2,%f62           ! (1_0) hi0 = vis_fand(db0,DC2);

542         fmuld   %f60,%f40,%f32          ! (2_1) res0 *= dtmp1;
543         sra     %o2,24,%l1              ! (2_0) iexp0 = ax >> 24;
544         ldd     [%l0+8],%f40            ! (3_1) dtmp0 = ((double*)((char*)TBL +
545         faddd   %f54,DC1,%f58           ! (3_1) res0 += DC1;

547         add     %o7,stridex,%i1         ! px += stridex
548         add     %l1,960,%l0             ! (2_0) iexp0 += 0x3c0;
549         lda     [stridex+%o7]0x82,%f0   ! (3_0) x0 = *px;
550         fand    %f56,DC0,%f60           ! (2_0) db0 = vis_fand(db0,DC0);

552         fmuld   K2,%f42,%f50            ! (0_0) res0 = K2 * xx0;
553         cmp     %o1,_0x7f800000         ! (3_0) ax ? 0x7f800000
554         bge,pn  %icc,.update20          ! (3_0) if( ax >= 0x7f800000 )
555         fsubd   %f48,%f62,%f54          ! (1_0) xx0 = (db0 - hi0);
556 .cont20:
557         fmuld   %f34,%f46,%f52          ! (4_1) res0 *= xx0;
558         sllx    %l0,52,%o3              ! (2_0) lexp0 = (long long)iexp0 << 52;
559         ldd     [TBL+%o5],%f56          ! (1_0) dtmp0 = ((double*)((char*)TBL +
560         fdtos   %f44,%f8                ! (1_1) fres0 = (float)res0;

562         fmuld   %f40,%f58,%f34          ! (3_1) res0 = dtmp0 * res0;
563         sra     %o2,11,%i2              ! (2_0) ax >>= 11;
564         stx     %o3,[%fp+tmp0]          ! (2_0) dtmp1 = *((double*)&lexp0);
565         for     %f60,DC1,%f40           ! (2_0) db0 = vis_for(db0,DC1);

567         cmp     %o1,_0x00800000         ! (3_0) ax ? 0x00800000
568         bl,pn   %icc,.update21          ! (3_0) if( ax < 0x00800000 )
569         ldd     [%fp+tmp1],%f62         ! (3_1) dtmp1 = *((double*)&lexp0);
570         fstod   %f0,%f48                ! (3_0) db0 = (double)x0;
571 .cont21:
572         fmuld   %f54,%f56,%f30          ! (1_0) xx0 *= dtmp0;
573         and     %i2,_0x1ff0,%o3         ! (2_0) si0 = ax & 0x1ff0;
574         lda     [%i1+stridex]0x82,%o2   ! (4_0) ax = *(int*)px;
575         faddd   %f50,K1,%f56            ! (0_0) res0 += K1;

577         add     %i1,stridex,%i1         ! px += stridex
578         add     %o3,TBL,%i2             ! (2_0) (char*)TBL + si0
579         st      %f8,[stridey+%g5]       ! (1_1) *py = fres0;
580         fand    %f40,DC2,%f46           ! (2_0) hi0 = vis_fand(db0,DC2);

582         fmuld   %f34,%f62,%f28          ! (3_1) res0 *= dtmp1;
583         sra     %o1,24,%o4              ! (3_0) iexp0 = ax >> 24;
584         ldd     [%i3+8],%f50            ! (4_1) dtmp0 = ((double*)((char*)TBL +
585         faddd   %f52,DC1,%f54           ! (4_1) res0 += DC1;

587         add     %g1,stridey,%i3         ! py += stridey
588         subcc   counter,5,counter       ! counter
589         lda     [%i1]0x82,%f13          ! (4_0) x0 = *px;
```



```
590         fand    %f48,DC0,%f58           ! (3_0) db0 = vis_fand(db0,DC0);

592         bpos,pt %icc,.main_loop
593         add     %o4,960,%g5             ! (3_0) iexp0 += 0x3c0;

595         add     counter,5,counter
596 .tail:
597         subcc   counter,1,counter
598         bneg,a  .begin
599         or      %g0,%i3,%g5

601         fmuld   %f56,%f42,%f52          ! (0_1) res0 *= xx0;
602         fdtos   %f32,%f15               ! (2_2) fres0 = (float)res0;

604         fmuld   %f50,%f54,%f42          ! (4_2) res0 = dtmp0 * res0;

606         ldd     [%fp+tmp2],%f56         ! (4_2) dtmp1 = *((double*)&lexp0);

608         add     %i3,stridey,%o3         ! py += stridey
609         st      %f15,[%i3]              ! (2_2) *py = fres0;

611         subcc   counter,1,counter
612         bneg,a  .begin
613         or      %g0,%o3,%g5

615         fmuld   %f42,%f56,%f44          ! (4_2) res0 *= dtmp1;
616         ldd     [%i5+8],%f58            ! (0_1) dtmp0 = ((double*)((char*)TBL +
617         faddd   %f52,DC1,%f34           ! (0_1) res0 += DC1;

619         fdtos   %f28,%f19               ! (3_2) fres0 = (float)res0;

621         fmuld   %f58,%f34,%f32          ! (0_1) res0 = dtmp0 * res0;

623         ldd     [%fp+tmp3],%f60         ! (0_1) dtmp1 = *((double*)&lexp0);

625         add     %o3,stridey,%g5         ! py += stridey

627         st      %f19,[%o3]              ! (3_2) *py = fres0;

629         subcc   counter,1,counter
630         bneg,a  .begin
631         nop

633         fmuld   %f32,%f60,%f40          ! (0_1) res0 *= dtmp1;

635         fdtos   %f44,%f23               ! (4_2) fres0 = (float)res0;

637         add     %g5,stridey,%g5         ! py += stridey
638         st      %f23,[stridey+%o3]      ! (4_2) *py = fres0;

640         subcc   counter,1,counter
641         bneg,a  .begin
642         nop

644         fdtos   %f40,%f27               ! (0_1) fres0 = (float)res0;

646         st      %f27,[%g5]              ! (0_1) *py = fres0;

648         ba      .begin
649         add     %g5,stridey,%g5

651         .align  16
652 .spec:
653         fsqrts  %f25,%f25
654         sub     counter,1,counter
655         add     %i1,stridex,%i1
```

```
656         st      %f25,[%g5]
657         ba      .begin1
658         add     %g5,stridey,%g5

660         .align  16
661 .update0:
662         cmp     counter,1
663         ble     .cont0
664         fzeros  %f0

666         stx     %i1,[%fp+tmp_px]
667         sethi   %hi(0x7f800000),%o1

669         sub     counter,1,counter
670         st      counter,[%fp+tmp_counter]

672         ba      .cont0
673         or      %g0,1,counter

675         .align  16
676 .update1:
677         cmp     counter,1
678         ble     .cont1
679         fzeros  %f0

681         stx     %i1,[%fp+tmp_px]
682         clr     %o1

684         sub     counter,1,counter
685         st      counter,[%fp+tmp_counter]

687         ba      .cont1
688         or      %g0,1,counter

690         .align  16
691 .update2:
692         cmp     counter,2
693         ble     .cont2
694         fzeros  %f13

696         stx     %i1,[%fp+tmp_px]
697         sethi   %hi(0x7f800000),%o2

699         sub     counter,2,counter
700         st      counter,[%fp+tmp_counter]

702         ba      .cont2
703         or      %g0,2,counter

705         .align  16
706 .update3:
707         cmp     counter,2
708         ble     .cont3
709         fzeros  %f13

711         stx     %i1,[%fp+tmp_px]
712         clr     %o2

714         sub     counter,2,counter
715         st      counter,[%fp+tmp_counter]

717         ba      .cont3
718         or      %g0,2,counter

720         .align  16
721 .update4:
```



```
722         cmp     counter,3
723         ble     .cont4
724         fzeros  %f17

726         stx     %o4,[%fp+tmp_px]
727         sethi   %hi(0x7f800000),%l1

729         sub     counter,3,counter
730         st      counter,[%fp+tmp_counter]

732         ba      .cont4
733         or      %g0,3,counter

735         .align  16
736 .update5:
737         cmp     counter,3
738         ble     .cont5
739         fzeros  %f17

741         stx     %o4,[%fp+tmp_px]
742         clr     %l1

744         sub     counter,3,counter
745         st      counter,[%fp+tmp_counter]

747         ba      .cont5
748         or      %g0,3,counter

750         .align  16
751 .update6:
752         cmp     counter,4
753         ble     .cont6
754         fzeros  %f21

756         stx     %i1,[%fp+tmp_px]
757         sethi   %hi(0x7f800000),%i0

759         sub     counter,4,counter
760         st      counter,[%fp+tmp_counter]

762         ba      .cont6
763         or      %g0,4,counter

765         .align  16
766 .update7:
767         cmp     counter,4
768         ble     .cont7
769         fzeros  %f21

771         stx     %i1,[%fp+tmp_px]
772         clr     %i0

774         sub     counter,4,counter
775         st      counter,[%fp+tmp_counter]

777         ba      .cont7
778         or      %g0,4,counter

780         .align  16
781 .update8:
782         cmp     counter,5
783         ble     .cont8
784         fzeros  %f25

786         stx     %o7,[%fp+tmp_px]
787         sethi   %hi(0x7f800000),%o2
```

```
789         sub     counter,5,counter
790         st      counter,[%fp+tmp_counter]

792         ba      .cont8
793         or      %g0,5,counter

795         .align  16
796 .update9:
797         cmp     counter,5
798         ble     .cont9
799         fzeros  %f25

801         stx     %o7,[%fp+tmp_px]
802         clr     %o2

804         sub     counter,5,counter
805         st      counter,[%fp+tmp_counter]

807         ba      .cont9
808         or      %g0,5,counter

810         .align  16
811 .update10:
812         cmp     counter,6
813         ble     .cont10
814         fzeros  %f0

816         stx     %i1,[%fp+tmp_px]
817         sethi   %hi(0x7f800000),%o1

819         sub     counter,6,counter
820         st      counter,[%fp+tmp_counter]

822         ba      .cont10
823         or      %g0,6,counter

825         .align  16
826 .update11:
827         cmp     counter,6
828         ble     .cont11
829         fzeros  %f0

831         stx     %i1,[%fp+tmp_px]
832         clr     %o1

834         sub     counter,6,counter
835         st      counter,[%fp+tmp_counter]

837         ba      .cont11
838         or      %g0,6,counter

840         .align  16
841 .update12:
842         cmp     counter,2
843         ble     .cont12
844         fzeros  %f13

846         stx     %i1,[%fp+tmp_px]
847         sethi   %hi(0x7f800000),%o2

849         sub     counter,2,counter
850         st      counter,[%fp+tmp_counter]

852         ba      .cont12
853         or      %g0,2,counter
```



```
855         .align  16
856 .update13:
857         cmp     counter,2
858         ble     .cont13
859         fzeros  %f13

861         stx     %i1,[%fp+tmp_px]
862         clr     %o2

864         sub     counter,2,counter
865         st      counter,[%fp+tmp_counter]

867         ba      .cont13
868         or      %g0,2,counter

870         .align  16
871 .update14:
872         cmp     counter,3
873         ble     .cont14
874         fzeros  %f17

876         stx     %o4,[%fp+tmp_px]
877         sethi   %hi(0x7f800000),%l1

879         sub     counter,3,counter
880         st      counter,[%fp+tmp_counter]

882         ba      .cont14
883         or      %g0,3,counter

885         .align  16
886 .update15:
887         cmp     counter,3
888         ble     .cont15
889         fzeros  %f17

891         stx     %o4,[%fp+tmp_px]
892         clr     %l1

894         sub     counter,3,counter
895         st      counter,[%fp+tmp_counter]

897         ba      .cont15
898         or      %g0,3,counter

900         .align  16
901 .update16:
902         cmp     counter,4
903         ble     .cont16
904         fzeros  %f21

906         stx     %i1,[%fp+tmp_px]
907         sethi   %hi(0x7f800000),%i0

909         sub     counter,4,counter
910         st      counter,[%fp+tmp_counter]

912         ba      .cont16
913         or      %g0,4,counter

915         .align  16
916 .update17:
917         cmp     counter,4
918         ble     .cont17
919         fzeros  %f21
```

```
921         stx     %i1,[%fp+tmp_px]
922         clr     %i0

924         sub     counter,4,counter
925         st      counter,[%fp+tmp_counter]

927         ba      .cont17
928         or      %g0,4,counter

930         .align  16
931 .update18:
932         cmp     counter,5
933         ble     .cont18
934         fzeros  %f25

936         stx     %o7,[%fp+tmp_px]
937         sethi   %hi(0x7f800000),%o2

939         sub     counter,5,counter
940         st      counter,[%fp+tmp_counter]

942         ba      .cont18
943         or      %g0,5,counter

945         .align  16
946 .update19:
947         cmp     counter,5
948         ble     .cont19
949         fzeros  %f25

951         stx     %o7,[%fp+tmp_px]
952         clr     %o2

954         sub     counter,5,counter
955         st      counter,[%fp+tmp_counter]

957         ba      .cont19
958         or      %g0,5,counter

960         .align  16
961 .update20:
962         cmp     counter,6
963         ble     .cont20
964         fzeros  %f0

966         stx     %i1,[%fp+tmp_px]
967         sethi   %hi(0x7f800000),%o1

969         sub     counter,6,counter
970         st      counter,[%fp+tmp_counter]

972         ba      .cont20
973         or      %g0,6,counter

975         .align  16
976 .update21:
977         cmp     counter,6
978         ble     .cont21
979         fzeros  %f0

981         stx     %i1,[%fp+tmp_px]
982         clr     %o1

984         sub     counter,6,counter
985         st      counter,[%fp+tmp_counter]
```



```
987         ba      .cont21
988         or      %g0,6,counter

990 .exit:
991         ret
992         restore
993         SET_SIZE(__vsqrtf_ultra3)
```

```
**********************************************************
    1976 Sat May 10 12:10:03 2014
new/usr/src/lib/libmvec/common/vlog_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
/*
 * CDDL HEADER START
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 */

extern void __vlog( int, double *, int, double *, int );

#if !defined(LIBMVEC_SO_BUILD)
#if defined(ARCH_v8plusa) || defined(ARCH_v8plusb) || defined(ARCH_v9a) || defin
#define CHECK_ULTRA3
#endif
#endif  /* !defined(LIBMVEC_SO_BUILD) */

#ifdef CHECK_ULTRA3
#include <strings.h>
#define sysinfo _sysinfo
#include <sys/systeminfo.h>

#define BUFLEN  257

static int use_ultra3 = 0;

extern void __vlog_ultra3( int, double *, int, double *, int );
#endif

#pragma weak vlog_ = __vlog_

/* just invoke the serial function */
void
__vlog_( int *n, double *x, int *stridex, double *y, int *stridey )
{
#ifdef CHECK_ULTRA3
        int             u;
        char    buf[BUFLEN];

        u = use_ultra3;
```



```
        if (!u) {
                /* use __vlog_ultra3 on Cheetah (and ???) */
                if (sysinfo(SI_ISALIST, buf, BUFLEN) > 0 && !strncmp(buf, "sparc
                        u = 3;
                else
                        u = 1;
                use_ultra3 = u;
        }
        if (u & 2)
                __vlog_ultra3( *n, x, *stridex, y, *stridey );
        else
#endif
        __vlog( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1242 Sat May 10 12:10:03 2014
new/usr/src/lib/libmvec/common/vlogf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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 */

extern void __vlogf( int, float *, int, float *, int );

#pragma weak vlogf_ = __vlogf_

/* just invoke the serial function */
void
__vlogf_( int *n, float *x, int *stridex, float *y, int *stridey )
{
        __vlogf( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1295 Sat May 10 12:10:03 2014
new/usr/src/lib/libmvec/common/vpow_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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 */

extern void __vpow( int, double *, int, double *, int, double *, int );

#pragma weak vpow_ = __vpow_

/* just invoke the serial function */
void
__vpow_( int *n, double *x, int *stridex, double *y, int *stridey,
        double *z, int *stridez )
{
        __vpow( *n, x, *stridex, y, *stridey, z, *stridez );
}
```

```
**********************************************************
    1294 Sat May 10 12:10:04 2014
new/usr/src/lib/libmvec/common/vpowf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

extern void __vpowf( int, float *, int, float *, int, float *, int );

#pragma weak vpowf_ = __vpowf_

/* just invoke the serial function */
void
__vpowf_( int *n, float *x, int *stridex, float *y, int *stridey,
        float *z, int *stridez )
{
        __vpowf( *n, x, *stridex, y, *stridey, z, *stridez );
}
```

```
**********************************************************
    1337 Sat May 10 12:10:04 2014
new/usr/src/lib/libmvec/common/vrhypot_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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#include "libm_inlines.h"

extern void __vrhypot( int, double *, int, double *, int, double *, int );

#pragma weak vrhypot_ = __vrhypot_

/* just invoke the serial function */
void
__vrhypot_( int *n, double *x, int *stridex, double *y, int *stridey,
        double *z, int *stridez )
{
        __vrhypot( *n, x, *stridex, y, *stridey, z, *stridez );
}
```

```
**********************************************************
    1336 Sat May 10 12:10:04 2014
new/usr/src/lib/libmvec/common/vrhypotf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

#include "libm_inlines.h"

extern void __vrhypotf( int, float *, int, float *, int, float *, int );

#pragma weak vrhypotf_ = __vrhypotf_

/* just invoke the serial function */
void
__vrhypotf_( int *n, float *x, int *stridex, float *y, int *stridey,
        float *z, int *stridez )
{
        __vrhypotf( *n, x, *stridex, y, *stridey, z, *stridez );
}
```

```
**********************************************************
    1251 Sat May 10 12:10:04 2014
new/usr/src/lib/libmvec/common/vrsqrt_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

extern void __vrsqrt( int, double *, int, double *, int );

#pragma weak vrsqrt_ = __vrsqrt_

/* just invoke the serial function */
void
__vrsqrt_( int *n, double *x, int *stridex, double *y, int *stridey )
{
        __vrsqrt( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1252 Sat May 10 12:10:04 2014
new/usr/src/lib/libmvec/common/vrsqrtf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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/*
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 */

extern void __vrsqrtf( int, float *, int, float *, int );

#pragma weak vrsqrtf_ = __vrsqrtf_

/* just invoke the serial function */
void
__vrsqrtf_( int *n, float *x, int *stridex, float *y, int *stridey )
{
        __vrsqrtf( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1976 Sat May 10 12:10:04 2014
new/usr/src/lib/libmvec/common/vsin_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

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 */

extern void __vsin( int, double *, int, double *, int );

#if !defined(LIBMVEC_SO_BUILD)
#if defined(ARCH_v8plusa) || defined(ARCH_v8plusb) || defined(ARCH_v9a) || defin
#define CHECK_ULTRA3
#endif
#endif  /* !defined(LIBMVEC_SO_BUILD) */

#ifdef CHECK_ULTRA3
#include <strings.h>
#define sysinfo _sysinfo
#include <sys/systeminfo.h>

#define BUFLEN  257

static int use_ultra3 = 0;

extern void __vsin_ultra3( int, double *, int, double *, int );
#endif

#pragma weak vsin_ = __vsin_

/* just invoke the serial function */
void
__vsin_( int *n, double *x, int *stridex, double *y, int *stridey )
{
#ifdef CHECK_ULTRA3
        int             u;
        char    buf[BUFLEN];

        u = use_ultra3;
```



```
        if (!u) {
                /* use __vsin_ultra3 on Cheetah (and ???) */
                if (sysinfo(SI_ISALIST, buf, BUFLEN) > 0 && !strncmp(buf, "sparc
                        u = 3;
                else
                        u = 1;
                use_ultra3 = u;
        }
        if (u & 2)
                __vsin_ultra3( *n, x, *stridex, y, *stridey );
        else
#endif
        __vsin( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1310 Sat May 10 12:10:04 2014
new/usr/src/lib/libmvec/common/vsincos_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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 */

extern void __vsincos( int, double *, int, double *, int, double *, int );

#pragma weak vsincos_ = __vsincos_

/* just invoke the serial function */
void
__vsincos_( int *n, double *x, int *stridex, double *s, int *strides,
        double *c, int *stridec )
{
        __vsincos( *n, x, *stridex, s, *strides, c, *stridec );
}
```

```
**********************************************************
    1309 Sat May 10 12:10:04 2014
new/usr/src/lib/libmvec/common/vsincosf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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```

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extern void __vsincosf( int, float *, int, float *, int, float *, int );

#pragma weak vsincosf_ = __vsincosf_

/* just invoke the serial function */
void
__vsincosf_( int *n, float *x, int *stridex, float *s, int *strides,
        float *c, int *stridec )
{
        __vsincosf( *n, x, *stridex, s, *strides, c, *stridec );
}
```

```
**********************************************************
    1242 Sat May 10 12:10:05 2014
new/usr/src/lib/libmvec/common/vsinf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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 */

extern void __vsinf( int, float *, int, float *, int );

#pragma weak vsinf_ = __vsinf_

/* just invoke the serial function */
void
__vsinf_( int *n, float *x, int *stridex, float *y, int *stridey )
{
        __vsinf( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1246 Sat May 10 12:10:05 2014
new/usr/src/lib/libmvec/common/vsqrt_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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 */

extern void __vsqrt( int, double *, int, double *, int );

#pragma weak vsqrt_ = __vsqrt_

/* just invoke the serial function */
void
__vsqrt_( int *n, double *x, int *stridex, double *y, int *stridey )
{
        __vsqrt( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1986 Sat May 10 12:10:05 2014
new/usr/src/lib/libmvec/common/vsqrtf_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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 */

extern void __vsqrtf( int, float *, int, float *, int );

#if !defined(LIBMVEC_SO_BUILD)
#if defined(ARCH_v8plusa) || defined(ARCH_v8plusb) || defined(ARCH_v9a) || defin
#define CHECK_ULTRA3
#endif
#endif  /* !defined(LIBMVEC_SO_BUILD) */

#ifdef CHECK_ULTRA3
#include <strings.h>
#define sysinfo _sysinfo
#include <sys/systeminfo.h>

#define BUFLEN  257

static int use_ultra3 = 0;

extern void __vsqrtf_ultra3( int, float *, int, float *, int );
#endif

#pragma weak vsqrtf_ = __vsqrtf_

/* just invoke the serial function */
void
__vsqrtf_( int *n, float *x, int *stridex, float *y, int *stridey )
{
#ifdef CHECK_ULTRA3
        int             u;
        char    buf[BUFLEN];

        u = use_ultra3;
```



```
        if (!u) {
                /* use __vsqrtf_ultra3 on Cheetah (and ???) */
                if (sysinfo(SI_ISALIST, buf, BUFLEN) > 0 && !strncmp(buf, "sparc
                        u = 3;
                else
                        u = 1;
                use_ultra3 = u;
        }
        if (u & 2)
                __vsqrtf_ultra3( *n, x, *stridex, y, *stridey );
        else
#endif
        __vsqrtf( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1251 Sat May 10 12:10:05 2014
new/usr/src/lib/libmvec/common/vz_abs_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
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```

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 */

extern void __vz_abs( int, double *, int, double *, int );

#pragma weak vz_abs_ = __vz_abs_

/* just invoke the serial function */
void
__vz_abs_( int *n, double *x, int *stridex, double *y, int *stridey )
{
        __vz_abs( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1280 Sat May 10 12:10:05 2014
new/usr/src/lib/libmvec/common/vz_exp_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
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 *
 * CDDL HEADER END
 */

/*
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 */
/*
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 */

extern void __vz_exp( int, double *, int, double *, int, double * );

#pragma weak vz_exp_ = __vz_exp_

/* just invoke the serial function */
void
__vz_exp_( int *n, double *x, int *stridex, double *y, int *stridey,
        double *tmp )
{
        __vz_exp( *n, x, *stridex, y, *stridey, tmp );
}
```

```
**********************************************************
    1251 Sat May 10 12:10:05 2014
new/usr/src/lib/libmvec/common/vz_log_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
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 */
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 */

extern void __vz_log( int, double *, int, double *, int );

#pragma weak vz_log_ = __vz_log_

/* just invoke the serial function */
void
__vz_log_( int *n, double *x, int *stridex, double *y, int *stridey )
{
        __vz_log( *n, x, *stridex, y, *stridey );
}
```

```
**********************************************************
    1334 Sat May 10 12:10:05 2014
new/usr/src/lib/libmvec/common/vz_pow_.c
patch07 - removed dead code with mtsk.h
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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 */

/*
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 */
/*
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 */

extern void __vz_pow( int, double *, int, double *, int, double *, int,
        double * );

#pragma weak vz_pow_ = __vz_pow_

/* just invoke the serial function */
void
__vz_pow_( int *n, double *x, int *stridex, double *y, int *stridey,
        double *z, int *stridez, double *tmp )
{
        __vz_pow( *n, x, *stridex, y, *stridey, z, *stridez, tmp );
}
```

****
670 Sat May 10 12:10:05 2014
new/usr/src/lib/libmvec/i386/Makefile
patch01 - 693 import Sun Devpro Math Library
****

```
#
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#

#
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#

TARGET_ARCH=    i386

LIBRARY         = libmvec.a
VERS            = .1

OBJECTS         = $(mvecOBJS)

include ../Makefile.com

SRCS            = $(SRCS_mvec)

install: all $(ROOTLIBS) $(ROOTLINKS)

include $(SRC)/lib/libm/Makefile.targ
```

```
**********************************************************
     809 Sat May 10 12:10:05 2014
new/usr/src/lib/libmvec/i386_hwcap1/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  10 #

  12 #
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  14 #

  16 TARGET_ARCH=    i386

  18 LIBRARY         = libmvec_hwcap1.a
  19 VERS            = .1

  21 OBJECTS=        $(mvecOBJS)

  23 include ../Makefile.com

  25 CPPFLAGS        += -D_CMOV_INSN -D_SSE_INSN -D_SSE2_INSN
  26 MAPFILES        += mapfile
  27 CFLAGS          += -xtarget=pentium_pro -xarch=sse2

  29 ROOTLIBDIR      = $(ROOTFS_LIBDIR)/libmvec

  31 install:        all $(ROOTLIBDIR) $(ROOTLIBS)

  33 include $(SRC)/lib/libm/Makefile.targ
```

```
**********************************************************
     531 Sat May 10 12:10:06 2014
new/usr/src/lib/libmvec/i386_hwcap1/mapfile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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   9 # http://www.illumos.org/license/CDDL.
  10 #

  12 #
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  14 #

  16 $mapfile_version 2

  18 CAPABILITY {
  19         hw += fpu cmov sse sse2;
  20 };
```

```
**********************************************************
     681 Sat May 10 12:10:06 2014
new/usr/src/lib/libmvec/sparc/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  10 #

  12 #
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  14 #

  16 TARGET_ARCH=    sparc

  18 LIBRARY         = libmvec.a
  19 VERS            = .1

  21 OBJECTS         = $(mvecOBJS)

  23 include ../Makefile.com

  25 CHIP            = ultra
  26 SRCS            = $(SRCS_mvec)

  28 install:        all $(ROOTLIBS) $(ROOTLINKS)

  30 include $(SRC)/lib/Makefile.targ
```

```
**********************************************************
     839 Sat May 10 12:10:06 2014
new/usr/src/lib/libmvec/sparc_sparcv8plus+vis/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  12 #
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  14 #

  16 LIBRARY         = libmvec_isa.a
  17 VERS            = .1

  19 TARGET_ARCH=    sparc
  20 OBJECTS         = $(mvecvisCOBJS) $(mvecvisSOBJS)

  22 include ../Makefile.com

  24 SRCS            = $(mvecvisCOBJS:%.o=../common/%.c)

  26 CHIP            = vis
  27 XARCH           = sparcvis

  29 MAPFILES        =  ../common/mapfilevis-vers
  30 ROOTLIBDIR      =  $(ROOTFS_LIBDIR)/cpu/sparcv8plus+vis

  32 install:        all $(ROOTLIBDIR) $(ROOTLIBS)

  34 include $(SRC)/lib/libm/Makefile.targ
```

```
**********************************************************
     839 Sat May 10 12:10:06 2014
new/usr/src/lib/libmvec/sparc_sparcv9+vis2/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  14 #

  16 LIBRARY         = libmvec_isa.a
  17 VERS            = .1

  19 TARGET_ARCH=    sparc
  20 OBJECTS         = $(mvecvis2COBJS) $(mvecvis2SOBJS)

  22 include ../Makefile.com

  24 CHIP            = vis
  25 XARCH           = sparcvis2

  27 SRCS            = $(mvecvis2COBJS:%.o=../common/%.c)

  29 MAPFILES        = ../common/mapfilevis2-vers
  30 ROOTLIBDIR      = $(ROOTFS_LIBDIR)/cpu/sparcv9+vis2

  32 install:        all $(ROOTLIBDIR) $(ROOTLIBS)

  34 include $(SRC)/lib/libm/Makefile.targ
```

```
**********************************************************
     729 Sat May 10 12:10:06 2014
new/usr/src/lib/libmvec/sparcv9/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  14 #

  16 TARGET_ARCH     = sparcv9

  18 LIBRARY         = libmvec.a
  19 VERS            = .1

  21 OBJECTS         = $(mvecOBJS)

  23 include ../Makefile.com
  24 include $(SRC)/lib/Makefile.lib.64

  26 CHIP            = ultra

  28 SRCS            = $(SRCS_mvec)

  30 install: all $(ROOTLIBS64) $(ROOTLINKS64)

  32 include $(SRC)/lib/libm/Makefile.targ
```

```
**********************************************************
     885 Sat May 10 12:10:06 2014
new/usr/src/lib/libmvec/sparcv9_sparcv9+vis/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  16 LIBRARY         = libmvec_isa.a
  17 VERS            = .1

  19 TARGET_ARCH=    sparcv9
  20 OBJECTS         = $(mvecvisCOBJS) $(mvecvisSOBJS)

  22 include ../Makefile.com
  23 include $(SRC)/lib/Makefile.lib.64

  25 CHIP            = vis
  26 XARCH           = sparcvis

  28 SRCS            = $(mvicvisCOBJS:%.o=../common/%.c)

  30 MAPFILES        = ../common/mapfilevis-vers
  31 ROOTLIBDIR64    = $(ROOTFS_LIBDIR)/cpu/sparcv9+vis/$(MACH64)

  33 install: all $(ROOTLIBDIR64) $(ROOTLIBS64)

  35 include $(SRC)/lib/libm/Makefile.targ
```

```
**********************************************************
     891 Sat May 10 12:10:06 2014
new/usr/src/lib/libmvec/sparcv9_sparcv9+vis2/Makefile
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  14 #

  16 LIBRARY         = libmvec_isa.a
  17 VERS            = .1

  19 TARGET_ARCH=    sparcv9
  20 OBJECTS         = $(mvecvis2COBJS) $(mvecvis2SOBJS)

  22 include ../Makefile.com
  23 include $(SRC)/lib/Makefile.lib.64

  25 CHIP            = vis
  26 XARCH           = sparcvis2

  28 SRCS            = $(mvecvis2COBJS:%.o=../common/%.c)

  30 MAPFILES        = ../common/mapfilevis2-vers
  31 ROOTLIBDIR64    = $(ROOTFS_LIBDIR)/cpu/sparcv9+vis2/$(MACH64)

  33 install: all $(ROOTLIBDIR64) $(ROOTLIBS64)

  35 include $(SRC)/lib/libm/Makefile.targ
```

```
**********************************************************
    1868 Sat May 10 12:10:07 2014
new/usr/src/man/Makefile
patch11 - added LIBM man pages
**********************************************************
```

```
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#
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#

SUBDIRS=        man1            \
                man1b           \
                man1c           \
                man1has         \
                man1m           \
                man2            \
                man3            \
                man3bsm         \
                man3c           \
                man3c_db        \
                man3cfgadm      \
                man3commputil   \
                man3contract    \
                man3cpc         \
                man3curses      \
                man3dat         \
                man3devid       \
                man3devinfo     \
                man3dlpi        \
                man3dns_sd      \
                man3elf         \
                man3exacct      \
                man3ext         \
                man3fcoe        \
                man3fstyp       \
                man3gen         \
                man3gss         \
                man3head        \
                man3iscsit      \
                man3kstat       \
                man3kvm         \
                man3ldap        \
                man3lgrp        \
                man3lib         \
                man3m           \
                man3mail        \
                man3malloc      \
                man3mp          \
                man3mpapi       \
                man3mvec        \
                man3nsl         \
                man3nvpair      \
                man3pam         \
                man3papi        \
```



```
                man3perl        \
                man3picl        \
                man3picltree    \
                man3pool        \
                man3proc        \
                man3project     \
                man3resolv      \
                man3rpc         \
                man3rsm         \
                man3sasl        \
                man3scf         \
                man3sec         \
                man3secdb       \
                man3sip         \
                man3slp         \
                man3socket      \
                man3stmf        \
                man3sysevent    \
                man3tecla       \
                man3tnf         \
                man3tsol        \
                man3uuid        \
                man3volmgt      \
                man3xcurses     \
                man3xnet        \
                man4            \
                man5            \
                man7            \
                man7d           \
                man7fs          \
                man7i           \
                man7ipp         \
                man7m           \
                man7p           \
                man9            \
                man9e           \
                man9f           \
                man9p           \
                man9s

.PARALLEL: $(SUBDIRS)

all             := TARGET = all
clean           := TARGET = clean
clobber         := TARGET = clobber
install         := TARGET = install

all clean clobber install: $(SUBDIRS)

$(SUBDIRS):     FRC
        @cd $@; pwd; $(MAKE) $(TARGET)

FRC:
```

```
**********************************************************
    2088 Sat May 10 12:10:07 2014
new/usr/src/man/man3m/Makefile
patch11 - added LIBM man pages
**********************************************************
```

```
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include ../../Makefile.master

MANSECT =       3m

MANFILES =      acos.3m \
                acosh.3m \
                asin.3m \
                asinh.3m \
                atan.3m \
                atan2.3m \
                atanh.3m \
                cabs.3m \
                cacos.3m \
                cacosh.3m \
                carg.3m \
                casin.3m \
                casinh.3m \
                catan.3m \
                catanh.3m \
                cbrt.3m \
                ccos.3m \
                ccosh.3m \
                ceil.3m \
                cexp.3m \
                cimag.3m \
                clog.3m \
                conj.3m \
                copysign.3m \
                cos.3m \
                cosh.3m \
                cpow.3m \
                cproj.3m \
                creal.3m \
                csin.3m \
                csinh.3m \
                csqrt.3m \
                ctan.3m \
                ctanh.3m \
                erf.3m \
                erfc.3m \
                exp.3m \
                exp2.3m \
                expm1.3m \
                fabs.3m \
                fdim.3m \
                feclearexcept.3m \
                fegetenv.3m \
                fegetexceptflag.3m \
```



```
                fegetround.3m \
                feholdexcept.3m \
                feraiseexcept.3m \
                fesetprec.3m \
                fetestexcept.3m \
                feupdateenv.3m \
                fex_merge_flags.3m \
                fex_set_handling.3m \
                fex_set_log.3m \
                floor.3m \
                fma.3m \
                fmax.3m \
                fmin.3m \
                fmod.3m \
                fpclassify.3m \
                frexp.3m \
                hypot.3m \
                ilogb.3m \
                isfinite.3m \
                isgreater.3m \
                isgreaterequal.3m \
                isinf.3m \
                isless.3m \
                islessequal.3m \
                islessgreater.3m \
                isnan.3m \
                isnormal.3m \
                isunordered.3m \
                j0.3m \
                ldexp.3m \
                lgamma.3m \
                llrint.3m \
                llround.3m \
                log.3m \
                log10.3m \
                log1p.3m \
                log2.3m \
                logb.3m \
                lrint.3m \
                lround.3m \
                matherr.3m \
                modf.3m \
                nan.3m \
                nearbyint.3m \
                nextafter.3m \
                pow.3m \
                remainder.3m \
                remquo.3m \
                rint.3m \
                round.3m \
                scalb.3m \
                scalbln.3m \
                signbit.3m \
                significand.3m \
                sin.3m \
                sincos.3m \
                sinh.3m \
                sqrt.3m \
                tan.3m \
                tanh.3m \
                tgamma.3m \
                trunc.3m \
                y0.3m

.KEEP_STATE:
```

```
128 include ../Makefile.man
130 install: $(ROOTMANFILES)
```

```
**********************************************************
    4875 Sat May 10 12:10:07 2014
new/usr/src/man/man3m/acos.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH acos 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
acos, acosf, acosl \- arc cosine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBacos\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBacosf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBacosl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the principal value of the arc cosine of \fIx\fR. The
value of \fIx\fR should be in the range [\(mi1,1].
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the arc cosine of \fIx\fR in
the range [0, \c
.if n pi\c
.if t \(*p
\c
] radians.
.sp
.LP
For finite values of  \fIx\fR not in the range [\(mi1,1], a domain error occurs
and NaN is returned.
.sp
.LP
If \fIx\fR is NaN, NaN is returned.
.sp
.LP
If \fIx\fR is +1, +0 is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, a domain error occurs and NaN is returned.
.sp
```



```
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBacos()\fR as specified by SVID3 and XPG3.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is finite and not in the range [-1,1], or is \(+-Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.sp
The \fBacos()\fR function sets \fBerrno\fR to \fBEDOM\fR if \fIx\fR is not
\(+-Inf or NaN and is not in the range [\(mi1,1].
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBacos()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBacosf()\fR
and \fBacosl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcos\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    4219 Sat May 10 12:10:07 2014
new/usr/src/man/man3m/acosh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH acosh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
acosh, acoshf, acoshl \- inverse hyperbolic cosine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBacosh\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBacoshf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBacoshl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the inverse hyperbolic cosine of their argument
\fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the inverse hyperbolic
cosine of their argument.
.sp
.LP
For finite values of  \fIx\fR < 1, a domain error occurs and NaN is returned.
.sp
.LP
If \fIx\fR is NaN, NaN is returned.
.sp
.LP
If \fIx\fR is +1, +0 is returned.
.sp
.LP
If \fIx\fR is +Inf, +Inf is returned.
.sp
.LP
If \fIx\fR is \(miInf, a domain error occurs and NaN is returned.
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBacosh()\fR as specified by SVID3 and XPG3.
.SH ERRORS
```



```
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is finite and less than 1.0, or is \(miInf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.sp
The \fBacosh()\fR function sets \fBerrno\fR to \fBEDOM\fR if \fIx\fR is less
than 1.0.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBacosh()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBacoshf()\fR
and \fBacoshl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcosh\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4932 Sat May 10 12:10:07 2014
new/usr/src/man/man3m/asin.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH asin 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
asin, asinf, asinl \- arc sine function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBasin\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBasinf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBasinl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the principal value of the arc sine of their argument
\fIx\fR. The value of \fIx\fR should be in the range [\(mi1,1].
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the arc sine of \fIx\fR in
the range [\(mi\c
.if n pi\c
.if t \(*p
\c
/2, \c
.if n pi\c
.if t \(*p
\c
/2] radians.
.sp
.LP
For finite values of \fIx\fR not in the range [\(mi1,1], a domain error occurs
and a NaN is returned.
.sp
.LP
If \fIx\fR is NaN, NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, \fIx\fR is returned.
```



```
.sp
.LP
If \fIx\fR is \(+-Inf, a domain error occurs and a NaN is returned.
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBasin()\fR as specified by SVID3 and XPG3.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is finite and not in the range [\(mi1,1], or is \(+-Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.sp
The \fBasin()\fR function sets \fBerrno\fR to \fBEDOM\fR if \fIx\fR is not
\(+-Inf or NaN and is not in the range [\(mi1,1].
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBasin()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBasinf()\fR
and \fBasinl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisnan\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBsin\fR(3M), \fBattributes\fR(5),
```

```
128 \fBstandards\fR(5)
```

```
**********************************************************
    3247 Sat May 10 12:10:07 2014
new/usr/src/man/man3m/asinh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH asinh 3M "1 Sep 2002" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
asinh, asinhf, asinhl \- inverse hyperbolic sine functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBasinh\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBasinhf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBasinhl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the inverse hyperbolic sine of their argument \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the inverse hyperbolic sine
of their argument.
.sp
.LP
If \fIx\fR is NaN, NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or \(+-Inf, \fIx\fR is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
```



```
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBmath.h\fR(3HEAD), \fBsinh\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3520 Sat May 10 12:10:08 2014
new/usr/src/man/man3m/atan.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH atan 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
atan, atanf, atanl \- arc tangent function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBatan\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBatanf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBatanl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the principal value of the arc tangent of \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the arc tangent of \fIx\fR
in the range [\(mi\c
.if n pi\c
.if t \(*p
\c
/2,\c
.if n pi\c
.if t \(*p
\c
/2] radians.
.sp
.LP
If \fIx\fR is NaN, NaN is returned.
.sp
.LP
If x is \(+-0, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, \(+-\c
.if n pi\c
.if t \(*p
```



```
\c
/2 is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBatan2\fR(3M), \fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBtan\fR(3M),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4707 Sat May 10 12:10:08 2014
new/usr/src/man/man3m/atan2.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH atan2 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
atan2, atan2f, atan2l \- arc tangent function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBatan2\fR(\fBdouble\fR \fIy\fR, \fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBatan2f\fR(\fBfloat\fR \fIy\fR, \fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBatan2l\fR(\fBlong double\fR \fIy\fR, \fBlong double\fR \fIx
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the principal value of the arc tangent of \fIy/x\fR,
using the signs of both arguments to determine the quadrant of the return
value.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the arc tangent of
\fIy\fR/\fIx\fR in the range [ \(mi\c
.if n pi\c
.if t \(*p
\c
,\c
.if n pi\c
.if t \(*p
\c
 ] radians.
.sp
.LP
If \fIy\fR is \(+-0 and \fIx\fR is < 0, \(+-\c
.if n pi\c
.if t \(*p
\c
 is returned.
.sp
.LP
```



```
If \fIy\fR is \(+-0 and \fIx\fR is > 0, \(+-0 is returned.
.sp
.LP
If \fIy\fR is < 0 and \fIx\fR is \(+-0, \(mi\c
.if n pi\c
.if t \(*p
\c
/2 is returned.
.sp
.LP
If \fIy\fR is > 0 and \fIx\fR is \(+-0, \c
.if n pi\c
.if t \(*p
\c
/2 is returned.
.sp
.LP
If \fIx\fR is 0, a pole error does not occur.
.sp
.LP
If either \fIx\fR or \fIy\fR is NaN, a NaN is returned.
.sp
.LP
If \fIy\fR is \(+-0 and \fIx\fR is -0, \(+-\c
.if n pi\c
.if t \(*p
\c
 is returned.
.sp
.LP
If \fIy\fR is \(+-0 and \fIx\fR is +0, \(+-0 is returned.
.sp
.LP
For finite values of \(+-\fIy\fR > 0, if x is \(miInf,  \(+-\c
.if n pi\c
.if t \(*p
\c
 is returned.
.sp
.LP
For finite values of \(+-\fIy\fR > 0, if x is +Inf,  \(+-0 is returned.
.sp
.LP
For finite values of \fIx\fR, if \fIy\fR is \(+-Inf, \(+-\c
.if n pi\c
.if t \(*p
\c
/2 is returned.
.sp
.LP
If \fIy\fR is \(+-Inf and \fIx\fR is \(miInf, \(+-3\c
.if n pi\c
.if t \(*p
\c
/4 is returned.
.sp
.LP
If \fIy\fR is \(+-Inf and \fIx\fR is +Inf, \(+-\c
.if n pi\c
.if t \(*p
\c
/4 is returned.
.sp
.LP
If both arguments are 0, a domain error does not occur.
.SH ERRORS
```

```
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBatan\fR(3M), \fBisnan\fR(3M), \fBmath.h\fR(3HEAD)\fBtan\fR(3M),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    5368 Sat May 10 12:10:08 2014
new/usr/src/man/man3m/atanh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH atanh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
atanh, atanhf, atanhl \- inverse hyperbolic tangent functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBatanh\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBatanhf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBatanhl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the inverse hyperbolic tangent of their argument
\fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the inverse hyperbolic
tangent of their argument.
.sp
.LP
If \fIx\fR is \(+-1, a pole error occurs and \fBatanh()\fR, \fBatanhf()\fR, and
\fBatanhl()\fR return the value of the macro \fBHUGE_VAL\fR, \fBHUGE_VALF\fR,
and \fBHUGE_VALL\fR, respectively, with the same sign as the correct value of
the function.
.sp
.LP
For finite |\fIx\fR| > 1, a domain error occurs and a NaN is returned.
.sp
.LP
If \fIx\fR is NaN, NaN is returned.
.sp
.LP
If \fIx\fR is +0, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is +Inf, a domain error occurs and a NaN is returned.
```



```
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBatanh()\fR as specified by SVID3 and XPG3.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is finite and not in the range [-1,1], or is \(+-Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.sp
The \fBatanh()\fR function sets \fBerrno\fR to \fBEDOM\fR if the absolute value
of \fIx\fR is greater than 1.0.
.RE

.sp
.ne 2
.mk
.na
\fBPole Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is \(+-1.
.sp
If the integer expression (math_errhandling & MATH_ERREXCEPT) is non-zero, then
the divide-by-zero floating-point exception is raised.
.sp
The \fBatanh()\fR function sets \fBerrno\fR to \fBERANGE\fR if the absolute
value of \fIx\fR is equal to 1.0.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBatanh()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBatanhf()\fR
and \fBatanhl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
```

```
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBmath.h\fR(3HEAD),
\fBmatherr\fR(3M), \fBtanh\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3188 Sat May 10 12:10:08 2014
new/usr/src/man/man3m/cabs.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cabs 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cabs, cabsf, cabsl \- return a complex absolute value
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble\fR \fBcabs\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat\fR \fBcabsf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double\fR \fBcabsl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex absolute value (also called norm, modulus,
or magnitude) of \fIz\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the complex absolute value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
```



```
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcomplex.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3410 Sat May 10 12:10:08 2014
new/usr/src/man/man3m/cacos.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cacos 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cacos, cacosf, cacosl \- complex arc cosine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcacos\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcacosf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcacosl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex arc cosine of \fIz\fR, with branch cuts
outside the interval [ -1, +1 ] along the real axis.
.SH RETURN VALUES
.sp
.LP
These functions return the complex arc cosine value, in the range of a strip
mathematically unbounded along the imaginary axis and in the interval  [ 0, \c
.if n pi\c
.if t \(*p
\c
 ] along the real axis.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
```



```
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBccos\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3487 Sat May 10 12:10:08 2014
new/usr/src/man/man3m/cacosh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cacosh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cacosh, cacoshf, cacoshl \- complex arc hyperbolic cosine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcacosh\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcacoshf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcacoshl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex arc hyperbolic cosine of \fIz\fR, with a
branch cut at values less than 1 along the real axis.
.SH RETURN VALUES
.sp
.LP
These functions return the complex arc hyperbolic cosine value, in the range of
a half-strip of non-negative values along the real axis and in the interval [
-\fIi\fR\c
.if n pi\c
.if t \(*p
\c
, +\fIi\fR\c
.if n pi\c
.if t \(*p
\c
 ] along the imaginary axis.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBccosh\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3334 Sat May 10 12:10:08 2014
new/usr/src/man/man3m/carg.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH carg 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
carg, cargf, cargl \- complex argument functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble\fR \fBcarg\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat\fR \fBcargf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double\fR \fBcargl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the argument (also called phase angle) of \fIz\fR, with
a branch cut along the negative real axis.
.SH RETURN VALUES
.sp
.LP
These functions return the value of the argument in the interval [ \(mi\c
.if n pi\c
.if t \(*p
\c
, +\c
.if n pi\c
.if t \(*p
\c
 ].
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp


.sp
.TS
```



```
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcimag\fR(3M), \fBcomplex.h\fR(3HEAD), \fBconj\fR(3M), \fBcproj\fR(3M),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3442 Sat May 10 12:10:09 2014
new/usr/src/man/man3m/casin.3m
patch11 - added LIBM man pages
**********************************************************
```

```
'\" te
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.TH casin 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
casin, casinf, casinl \- complex arc sine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcasin\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcasinf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcasinl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex arc sine of \fIz\fR, with branch cuts
outside the interval [ \(mi1, +1 ] along the real axis.
.SH RETURN VALUES
.sp
.LP
These functions return the complex arc sine value, in the range of a strip
mathematically unbounded along the imaginary axis and in the interval [ \(mi\c
.if n pi\c
.if t \(*p
\c
/2, +\c
.if n pi\c
.if t \(*p
\c
/2 ] along the real axis.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
```



```
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcomplex.h\fR(3HEAD), \fBcsin\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3510 Sat May 10 12:10:09 2014
new/usr/src/man/man3m/casinh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH casinh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
casinh, casinhf, casinhl \- complex arc hyperbolic sine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcasinh\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcasinhf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcasinhl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex arc hyperbolic sine of \fIz\fR, with branch
cuts outside the interval [ -\fIi\fR, +\fIi\fR] along the imaginary axis.
.SH RETURN VALUES
.sp
.LP
These functions return the complex arc hyperbolic sine value, in the range of a
strip mathematically unbounded along the real axis and in the interval [
\(mi\fIi\fR\c
.if n pi\c
.if t \(*p
\c
/2, +\fIi\fR\c
.if n pi\c
.if t \(*p
\c
/2 ] along the imaginary axis.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcomplex.h\fR(3HEAD), \fBcsinh\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3528 Sat May 10 12:10:09 2014
new/usr/src/man/man3m/catan.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH catan 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
catan, catanf, catanl \- complex arc tangent functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcatan\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcatanf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcatanl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex arc tangent of \fIz\fR, with branch cuts
outside the interval [ \(mi\fIi\fR, +\fI\c
.if n pi\c
.if t \(*p
\c
\c
.if n pi\c
.if t \(*p
\c
\fIi\fR ] along the imaginary axis.
.SH RETURN VALUES
.sp
.LP
These functions return the complex arc tangent value, in the range of a strip
mathematically unbounded along the imaginary axis and in the interval [ \(mi\c
.if n pi\c
.if t \(*p
\c
/2, +\c
.if n pi\c
.if t \(*p
\c
/2 ] along the real axis.
.SH ERRORS
.sp
.LP
```



```
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcomplex.h\fR(3HEAD), \fBctan\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3506 Sat May 10 12:10:09 2014
new/usr/src/man/man3m/catanh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH catanh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
catanh, catanhf, catanhl \- complex arc hyperbolic tangent functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcatanh\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcatanhf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcatanhl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex arc hyperbolic tangent of \fIz\fR, with
branch cuts outside the interval [ \(mi1, +1 ] along the real axis.
.SH RETURN VALUES
.sp
.LP
These functions return the complex arc hyperbolic tangent value, in the range
of a strip mathematically unbounded along the real axis and in the interval [
\(mi\fIi\fR\c
.if n pi\c
.if t \(*p
\c
/2, +\fIi\fR\c
.if n pi\c
.if t \(*p
\c
/2 ] along the imaginary axis.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcomplex.h\fR(3HEAD), \fBctanh\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3312 Sat May 10 12:10:09 2014
new/usr/src/man/man3m/cbrt.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cbrt 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cbrt, cbrtf, cbrtl \- cube root functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBcbrt\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBcbrtf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBcbrtl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the real cube root of their argument \fIx\fR.
.SH RETURN VALUES
.sp
.LP
On successful completion, these functions return the cube root of \fIx\fR.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or \(+-Inf, \fIx\fR is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
```



```
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3170 Sat May 10 12:10:09 2014
new/usr/src/man/man3m/ccos.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH ccos 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
ccos, ccosf, ccosl \- complex cosine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBccos\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBccosf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBccosl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex cosine of \fIz\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the complex cosine value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```



```
.TE

.SH SEE ALSO
.sp
.LP
\fBcacos\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3211 Sat May 10 12:10:09 2014
new/usr/src/man/man3m/ccosh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH ccosh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
ccosh, ccoshf, ccoshl \- complex hyperbolic cosine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBccosh\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBccoshf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBccoshl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex hyperbolic cosine of \fIz\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the complex hyperbolic cosine value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```



```
.TE

.SH SEE ALSO
.sp
.LP
\fBcacosh\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3768 Sat May 10 12:10:09 2014
new/usr/src/man/man3m/ceil.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH ceil 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
ceil, ceilf, ceill \- ceiling value function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBceil\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBceilf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBceill\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the smallest integral value not less than \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, the \fBceil()\fR, \fBceilf()\fR, and \fBceill()\fR
functions return the smallest integral value not less than \fIx\fR, expressed
as a type \fBdouble\fR, \fBfloat\fR, or \fBlong double\fR, respectively.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or \(+-Inf, \fIx\fR is returned.
.SH USAGE
.sp
.LP
The integral value returned by these functions need not be expressible as an
\fBint\fR or \fBlong int\fR. The return value should be tested before assigning
it to an integer type to avoid the undefined results of an integer overflow.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBfloor\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3214 Sat May 10 12:10:10 2014
new/usr/src/man/man3m/cexp.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cexp 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cexp, cexpf, cexpl \- complex exponential functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcexp\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcexpf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcexpl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex exponent of \fIz\fR, defined as e^\fIz\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the complex exponential value of \fIz\fR.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```



```
.TE

.SH SEE ALSO
.sp
.LP
\fBclog\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3217 Sat May 10 12:10:10 2014
new/usr/src/man/man3m/cimag.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cimag 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cimag, cimagf, cimagl \- complex imaginary functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble\fR \fBcimag\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat\fR \fBcimagf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double\fR \fBcimagl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the imaginary part of \fIz\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the imaginary part value (as a real).
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```



```
.TE

.SH SEE ALSO
.sp
.LP
\fBcarg\fR(3M), \fBcomplex.h\fR(3HEAD), \fBconj\fR(3M), \fBcproj\fR(3M),
\fBcreal\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3404 Sat May 10 12:10:10 2014
new/usr/src/man/man3m/clog.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH clog 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
clog, clogf, clogl \- complex natural logarithm functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBclog\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBclogf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBclogl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex natural (base \fIe\fR) logarithm of
\fIz\fR, with a branch cut along the negative real axis.
.SH RETURN VALUES
.sp
.LP
These functions return the complex natural logarithm value, in the range of a
strip mathematically unbounded along the real axis and in the interval [
-\fIi\fR , +\fIi\fR ] along the imaginary axis.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
```



```
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcexp\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3268 Sat May 10 12:10:10 2014
new/usr/src/man/man3m/conj.3m
patch11 - added LIBM man pages
**********************************************************
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.TH conj 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
conj, conjf, conjl \- complex conjugate functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBconj\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBconjf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBconjl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex conjugate of z, by reversing the sign of
its imaginary part.
.SH RETURN VALUES
.sp
.LP
These functions return the complex conjugate value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
```



```
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcarg\fR(3M), \fBcimag\fR(3M), \fBcomplex.h\fR(3HEAD), \fBcproj\fR(3M),
\fBcreal\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3386 Sat May 10 12:10:10 2014
new/usr/src/man/man3m/copysign.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH copysign 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
copysign, copysignf, copysignl \- number manipulation function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBcopysign\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR);
.fi

.LP
.nf
\fBfloat\fR \fBcopysignf\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIy\fR);
.fi

.LP
.nf
\fBlong double\fR \fBcopysignl\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR \
.fi

.SH DESCRIPTION
.sp
.LP
These functions produce a value with the magnitude of \fIx\fR and the sign of
\fIy\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return a value with the magnitude
of \fIx\fR and the sign of \fIy\fR.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
```



```
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBmath.h\fR(3HEAD), \fBsignbit\fR(3M),\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4131 Sat May 10 12:10:10 2014
new/usr/src/man/man3m/cos.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cos 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cos, cosf, cosl \- cosine function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBcos\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBcosf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBcosl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the cosine of \fIx\fR, measured in radians.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the cosine of \fIx\fR.
.sp
.LP
If \fIx\fR is NaN, NaN is returned.
.sp
.LP
If \fIx\fR is +0, 1.0 is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, a domain error occurs and a NaN is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
```



```
.rt
The \fIx\fR argument is \(+-Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBacos\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBsin\fR(3M), \fBtan\fR(3M),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4841 Sat May 10 12:10:10 2014
new/usr/src/man/man3m/cosh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cosh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cosh, coshf, coshl \- hyperbolic cosine function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBcosh\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBcoshf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBcoshl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the hyperbolic cosine of their argument \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the hyperbolic cosine of
\fIx\fR.
.sp
.LP
If the correct value would cause overflow, a range error occurs and
\fBcosh()\fR, \fBcoshf()\fR, and \fBcoshl()\fR return the value of the macro
\fBHUGE_VAL\fR, \fBHUGE_VALF\fR, and \fBHUGE_VALL\fR, respectively.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, 1.0 is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, \(+-Inf is returned.
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBcosh()\fR as specified by SVID3 and XPG3.
.SH ERRORS
```



```
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 15n
.rt
The result would cause an overflow.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception is raised.
.sp
The \fBcosh()\fR function sets \fBerrno\fR to \fBERANGE\fR if the result would
cause an overflow.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBcosh()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBcoshf()\fR
and \fBcoshl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBacosh\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBsinh\fR(3M),
\fBtanh\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3377 Sat May 10 12:10:10 2014
new/usr/src/man/man3m/cpow.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cpow 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cpow, cpowf, cpowl \- complex power functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcpow\fR(\fBdouble complex\fR \fIx\fR, \fBdouble complex\
.fi

.LP
.nf
\fBfloat complex\fR \fBcpowf\fR(\fBfloat complex\fR \fIx\fR, \fBfloat complex\fR
.fi

.LP
.nf
\fBlong double complex\fR \fBcpowl\fR(\fBlong double complex\fR \fIx\fR,
     \fBlong double complex\fR \fIy\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex power function \fIx\fR^\fIy\fR, with a
branch cut for the first parameter along the negative real axis.
.SH RETURN VALUES
.sp
.LP
These functions return the complex power function value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
```



```
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcabs\fR(3M), \fBcomplex.h\fR(3HEAD), \fBcsqrt\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3582 Sat May 10 12:10:11 2014
new/usr/src/man/man3m/cproj.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH cproj 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
cproj, cprojf, cprojl \- complex projection functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcproj\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcprojf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcprojl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute a projection of \fIz\fR onto the Riemann sphere:
\fIz\fR projects to \fIz\fR, except that all complex infinities (even those
with one infinite part and one NaN part) project to positive infinity on the
real axis. If \fIz\fR has an infinite part, then \fBcproj\fR(\fIz\fR) is
equivalent to:
.sp
.in +2
.nf
INFINITY + I * copysign(0.0, cimag(z))
.fi
.in -2

.SH RETURN VALUES
.sp
.LP
These functions return the value of the projection onto the Riemann sphere.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcarg\fR(3M), \fBcimag\fR(3M), \fBcomplex.h\fR(3HEAD), \fBconj\fR(3M),
\fBcreal\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3296 Sat May 10 12:10:11 2014
new/usr/src/man/man3m/creal.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH creal 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
creal, crealf, creall \- complex real functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble\fR \fBcreal\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat\fR \fBcrealf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double\fR \fBcreall\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the real part of z.
.SH RETURN VALUES
.sp
.LP
These functions return the real part value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
For a variable \fIz\fR of complex type:
.sp
.in +2
.nf
z == creal(z) + cimag(z)*I
.fi
.in -2

.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcarg\fR(3M), \fBcimag\fR(3M), \fBcomplex.h\fR(3HEAD), \fBconj\fR(3M),
\fBcproj\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3164 Sat May 10 12:10:11 2014
new/usr/src/man/man3m/csin.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH csin 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
csin, csinf, csinl \- complex sine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcsin\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcsinf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcsinl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex sine of \fIz\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the complex sine value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```



```
.TE

.SH SEE ALSO
.sp
.LP
\fBcasin\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3205 Sat May 10 12:10:11 2014
new/usr/src/man/man3m/csinh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH csinh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
csinh, csinhf, csinhl \- complex hyperbolic sine functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcsinh\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcsinhf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcsinhl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex hyperbolic sine of \fIz\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the complex hyperbolic sine value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```



```
.TE

.SH SEE ALSO
.sp
.LP
\fBcasinh\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3324 Sat May 10 12:10:11 2014
new/usr/src/man/man3m/csqrt.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH csqrt 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
csqrt, csqrtf, csqrtl \- complex square root functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBcsqrt\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBcsqrtf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBcsqrtl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex square root of \fIz\fR, with a branch cut
along the negative real axis.
.SH RETURN VALUES
.sp
.LP
These functions return the complex square root value, in the range of the right
half-plane (including the imaginary axis).
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
```



```
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcabs\fR(3M), \fBcomplex.h\fR(3HEAD), \fBcpow\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3173 Sat May 10 12:10:11 2014
new/usr/src/man/man3m/ctan.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH ctan 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
ctan, ctanf, ctanl \- complex tangent functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBctan\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBctanf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBctanl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex tangent of \fIz\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the complex tangent value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```



```
.TE

.SH SEE ALSO
.sp
.LP
\fBcatan\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3214 Sat May 10 12:10:11 2014
new/usr/src/man/man3m/ctanh.3m
patch11 - added LIBM man pages
**********************************************************
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.TH ctanh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
ctanh, ctanhf, ctanhl \- complex hyperbolic tangent functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <complex.h>

\fBdouble complex\fR \fBctanh\fR(\fBdouble complex\fR \fIz\fR);
.fi

.LP
.nf
\fBfloat complex\fR \fBctanhf\fR(\fBfloat complex\fR \fIz\fR);
.fi

.LP
.nf
\fBlong double complex\fR \fBctanhl\fR(\fBlong double complex\fR \fIz\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the complex hyperbolic tangent of \fIz\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the complex hyperbolic tangent value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```



```
.TE

.SH SEE ALSO
.sp
.LP
\fBcatanh\fR(3M), \fBcomplex.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    2998 Sat May 10 12:10:11 2014
new/usr/src/man/man3m/erf.3m
patch11 - added LIBM man pages
**********************************************************
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.TH erf 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
erf, erff, erfl \- error function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBerf\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBerff\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBerfl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the error function of their argument \fIx\fR, defined
as:
.sp
2/sqrt(pi)*intregral from 0 to x of exp(-t*t) dt
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the value of the error
function.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, \(+-0 is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, \(+-1 is returned.
.sp
.LP
If \fIx\fR is subnormal, 2/sqrt(\c
.if n pi\c
```



```
.if t \(*p
\c
) * 2 is returned.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBerfc\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3598 Sat May 10 12:10:12 2014
new/usr/src/man/man3m/erfc.3m
patch11 - added LIBM man pages
**********************************************************
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.TH erfc 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
erfc, erfcf, erfcl \- complementary error function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBerfc\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBerfcf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBerfcl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These function compute the complementary error function 1.0 \(mi
\fBerf(\fR\fIx\fR\fB).\fR
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the value of the
complementary error function.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, +1 is returned.
.sp
.LP
If \fIx\fR is \(miInf, +2 is returned.
.sp
.LP
If \fIx\fR is +Inf, 0 is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
```



```
The \fBerfc()\fR function is provided because of the extreme loss of relative
accuracy if \fBerf(\fR\fIx\fR\fB)\fR is called for large \fIx\fR and the result
subtracted from 1.0.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBerf\fR(3M), \fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    4761 Sat May 10 12:10:12 2014
new/usr/src/man/man3m/exp.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH exp 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
exp, expf, expl \- exponential function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBexp\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBexpf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBexpl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the base-\fIe\fR exponential of \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the exponential value of
\fIx\fR.
.sp
.LP
If the correct value would cause overflow, a range error occurs and
\fBexp()\fR, \fBexpf()\fR, and \fBexpl()\fR return \fBHUGE_VAL\fR,
\fBHUGE_VALF\fR, and \fBHUGE_VALL\fR, respectively.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, 1 is returned.
.sp
.LP
If \fIx\fR is +Inf, \fIx\fR is returned.
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBexp()\fR as specified by SVID3 and XPG3. See \fBstandards\fR(5).
.SH ERRORS
```



```
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 15n
.rt
The result overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception is raised.
.sp
The \fBexp()\fR function sets \fBerrno\fR to \fBERANGE\fR if the result
overflows.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBexp()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBexpf()\fR and
\fBexpl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBisnan\fR(3M),
\fBlog\fR(3M), \fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBmp\fR(3MP),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4282 Sat May 10 12:10:12 2014
new/usr/src/man/man3m/exp2.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH exp2 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
exp2, exp2f, exp2l \- exponential base 2 functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBexp2\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBexp2f\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBexp2l\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the base-2 exponential of \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return 2^\fIx\fR.
.sp
.LP
If the correct value would cause overflow, a range error occurs and
\fBexp2()\fR, \fBexp2f()\fR, and \fBexp2l()\fR return the value of the macro
\fBHUGE_VAL\fR, \fBHUGE_VALF\fR, and \fBHUGE_VALL\fR, respectively.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, 1 is returned.
.sp
.LP
If \fIx\fR is \(miInf, +0 is returned.
.sp
.LP
If \fIx\fR is +Inf, \fIx\fR is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
```



```
.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 15n
.rt
The result overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception will be raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBexp\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBlog\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    4682 Sat May 10 12:10:12 2014
new/usr/src/man/man3m/expm1.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH expm1 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
expm1, expm1f, expm1l \- compute exponential function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBexpm1\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBexpm1f\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBexpm1l\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute \fIe\fR^\fIx\fR\(mi1.0.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return \fIe\fR^\fIx\fR\(mi1.0.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, \(+-0 is returned.
.sp
.LP
If \fIx\fR is \(miInf, \(mi1 is returned.
.sp
.LP
If \fIx\fR is +Inf, \fIx\fR is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
```



```
\fBRange Error\fR
.ad
.RS 15n
.rt
The result overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
The value of \fBexpm1(\fR\fIx\fR\fB)\fR can be more accurate than
\fBexp(\fIx\fR)\fR\(mi1.0 for small values of \fIx\fR.
.sp
.LP
The \fBexpm1()\fR and \fBlog1p\fR(3M) functions are useful for financial
calculations of ((1+\fIx\fR)^\fIn\fR\(mi1)/\fIx\fR, namely:
.sp
.in +2
.nf
\fBexpm1(\fIn\fR * log1p(\fIx\fR))\|/\|\fR\fIx\fR
.fi
.in -2

.sp
.LP
when \fIx\fR is very small (for example, when performing calculations with a
small daily interest rate).  These functions also simplify writing accurate
inverse hyperbolic functions.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBexp\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBilogb\fR(3M), \fBlog1p\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3369 Sat May 10 12:10:12 2014
new/usr/src/man/man3m/fabs.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fabs 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fabs, fabsf, fabsl \- absolute value function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBfabs\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBfabsf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBfabsl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the absolute value of \fIx\fR, |\fIx\fR|.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the absolute value of
\fIx\fR.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, +0 is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, +Inf is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4414 Sat May 10 12:10:12 2014
new/usr/src/man/man3m/fdim.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fdim 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fdim, fdimf, fdiml \- compute positive difference between two floating-point
numbers
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBfdim\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR);
.fi

.LP
.nf
\fBfloat\fR \fBfdimf\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIy\fR);
.fi

.LP
.nf
\fBlong double\fR \fBfdiml\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR \fIy\
.fi

.SH DESCRIPTION
.sp
.LP
These functions determine the positive difference between their arguments. If
\fIx\fR is greater than \fIy\fR, \fIx\fR\(mi\fIy\fR is returned. If \fIx\fR is
less than or equal to \fIy\fR, +0 is returned.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the positive difference
value.
.sp
.LP
If \fIx\fR\(mi\fIy\fR is positive and overflows, a range error occurs and
\fBfdim()\fR, \fBfdimf()\fR, and \fBfdiml()\fR returns the value of the macro
\fBHUGE_VAL\fR, \fBHUGE_VALF\fR, and \fBHUGE_VALL\fR, respectively.
.sp
.LP
If \fIx\fR or \fIy\fR is NaN, a NaN is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBRange Error\fR
```



```
.ad
.RS 15n
.rt
The result overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception will be raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBfmax\fR(3M),
\fBfmin\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3267 Sat May 10 12:10:12 2014
new/usr/src/man/man3m/feclearexcept.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH feclearexcept 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
feclearexcept \- clear floating-point exception
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfeclearexcept\fR(\fBint\fR \fIexcepts\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBfeclearexcept()\fR function attempts to clear the supported
floating-point exceptions represented by \fIexcepts\fR.
.SH RETURN VALUES
.sp
.LP
If \fIexcepts\fR is 0 or if all the specified exceptions were successfully
cleared, \fBfeclearexcept()\fR returns 0. Otherwise, it returns a non-zero
value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfenv.h\fR(3HEAD), \fBfegetexceptflag\fR(3M), \fBferaiseexcept\fR(3M),
\fBfesetexceptflag\fR(3M), \fBfetestexcept\fR(3M), \fBattributes\fR(5),
```



```
\fBstandards\fR(5)
```

```
**********************************************************
    4718 Sat May 10 12:10:12 2014
new/usr/src/man/man3m/fegetenv.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fegetenv 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fegetenv, fesetenv \- get and set current floating-point environment
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfegetenv\fR(\fBfenv_t *\fR\fIenvp\fR);
.fi

.LP
.nf
\fBint\fR \fBfesetenv\fR(\fBconst fenv_t *\fR\fIenvp\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBfegetenv()\fR function attempts to store the current floating-point
environment in the object pointed to by \fIenvp\fR.
.sp
.LP
The \fBfesetenv()\fR function attempts to establish the floating-point
environment represented by the object pointed to by \fIenvp\fR. The \fIenvp\fR
argument points to an object set by a call to \fBfegetenv()\fR or
\fBfeholdexcept\fR(3M), or equals a floating-point environment macro. The
\fBfesetenv()\fR function does not raise floating-point exceptions, but only
installs the state of the floating-point status flags represented through its
argument.
.SH RETURN VALUES
.sp
.LP
If the representation was successfully stored, fegetenv returns 0. Otherwise,
it returns a non-zero value.
.sp
.LP
If the environment was successfully established, fesetenv returns 0. Otherwise,
it returns a non-zero value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
```



```
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeholdexcept\fR(3M), \fBfenv.h\fR(3HEAD), \fBfeupdateenv\fR(3M),
\fBattributes\fR(5), \fBstandards\fR(5)
.SH NOTES
.sp
.LP
In a multithreaded program, the \fBfegetenv()\fR and \fBfegetenv()\fR functions
affect the floating point environment only for the calling thread.
.sp
.LP
These functions automatically install and deinstall \fBSIGFPE\fR handlers and
set and clear the trap enable mode bits in the floating point status register
as needed. If a program uses these functions and attempts to install a
\fBSIGFPE\fR handler or control the trap enable mode bits independently, the
resulting behavior is not defined.
.sp
.LP
As described in \fBfex_set_handling\fR(3M)\fB\fR, when a handling function
installed in \fBFEX_CUSTOM\fR mode is invoked, all exception traps are disabled
(and will not be reenabled while \fBSIGFPE\fR is blocked). Thus, attempting to
change the environment from within a handler by calling \fBfesetenv\fR or
\fBfeupdateenv\fR(3M) might not produce the expected results.
```

```
**********************************************************
    4111 Sat May 10 12:10:13 2014
new/usr/src/man/man3m/fegetexceptflag.3m
patch11 - added LIBM man pages
**********************************************************
```

```
'\" te
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.TH fegetexceptflag 3M "1 Sep 2002" "SunOS 5.11" "Mathematical Library Functions
.SH NAME
fegetexceptflag, fesetexceptflag \- get and set floating-point status flags
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfegetexceptflag\fR(\fBfexcept_t *\fR\fIflagp\fR, \fBint\fR \fIexcep
.fi

.LP
.nf
\fBint\fR \fBfesetexceptflag\fR(\fBconst fexcept_t *\fR\fIflagp\fR, \fBint\fR \f
.fi

.SH DESCRIPTION
.sp
.LP
The \fBfegetexceptflag()\fR function attempts to store an
implementation-defined representation of the states of the floating-point
status flags indicated by the \fIexcepts\fR argument in the object pointed to
by the \fIflagp\fR argument.
.sp
.LP
The \fBfesetexceptflag()\fR function attempts to set the floating-point status
flags indicated by the \fIexcepts\fR argument to the states stored in the
object pointed to by \fIflagp\fR. The value pointed to by \fIflagp\fR will have
been set by a previous call to \fBfegetexceptflag()\fR whose second argument
represented at least those floating-point exceptions represented by the
\fIexcepts\fR argument. This function does not raise floating-point exceptions
but only sets the state of the flags.
.SH RETURN VALUES
.sp
.LP
If the representation was successfully stored, \fBfegetexceptflag()\fR returns
0. Otherwise, it returns a non-zero value.
.sp
.LP
If the excepts argument is 0 or if all the specified exceptions were
successfully set, \fBfesetexceptflag()\fR returns 0. Otherwise, it returns a
non-zero value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfenv.h\fR(3HEAD), \fBfeclearexcept\fR(3M), \fBferaiseexcept\fR(3M),
\fBfesetexceptflag\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4148 Sat May 10 12:10:13 2014
new/usr/src/man/man3m/fegetround.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fegetround 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fegetround, fesetround \- get and set current rounding direction
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfegetround\fR(\fBvoid\fR);
.fi

.LP
.nf
\fBint\fR \fBfesetround\fR(\fBint\fR \fIround\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The fegetround function gets the current rounding direction.
.sp
.LP
The fesetround function establishes the rounding direction represented by its
argument round. If the argument is not equal to the value of a rounding
direction macro, the rounding direction is not changed.
.SH RETURN VALUES
.sp
.LP
The fegetround function returns the value of the rounding direction macro
representing the current rounding direction, or a negative value if there is no
such rounding direction macro or the current rounding direction is not
determinable.
.sp
.LP
The fesetround function returns a 0 value if and only if the requested rounding
direction was established.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH EXAMPLES
.sp
.LP
The following example saves, sets, and restores the rounding direction,
reporting an error and aborting if setting the rounding direction fails:
.LP
\fBExample 1 \fRSave, set, and restore the rounding direction.
.sp
.in +2
.nf
```



```
#include <fenv.h>
#include <assert.h>
void f(int round_dir)
{
      #pragma STDC FENV_ACCESS ON
      int save_round;
      int setround_ok;
      save_round = fegetround();
      setround_ok = fesetround(round_dir);
      assert(setround_ok == 0);
      /* ... */
      fesetround(save_round);
      /* ... */
}
.fi
.in -2

.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfenv.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3864 Sat May 10 12:10:13 2014
new/usr/src/man/man3m/feholdexcept.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH feholdexcept 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
feholdexcept \- save current floating-point environment
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfeholdexcept\fR(\fBfenv_t *\fR\fIenvp\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBfeholdexcept()\fR function saves the current floating-point environment
in the object pointed to by \fIenvp\fR, clears the floating-point status flags,
and then installs a non-stop (continue on floating-point exceptions) mode, if
available, for all floating-point exceptions.
.SH RETURN VALUES
.sp
.LP
The \fBfeholdexcept()\fR function returns 0 if and only if non-stop
floating-point exception handling was successfully installed.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfegetenv\fR(3M), \fBfenv.h\fR(3HEAD), \fBfeupdateenv\fR(3M),
```



```
\fBattributes\fR(5), \fBstandards\fR(5)
.SH NOTES
.sp
.LP
In a multithreaded program, the \fBfeholdexcept()\fR function affects the
floating point environment only for the calling thread.
.sp
.LP
The \fBfeholdexcept()\fR function automatically installs and deinstalls
\fBSIGFPE\fR handlers and sets and clears the trap enable mode bits in the
floating point status register as needed. If a program uses these functions and
attempts to install a \fBSIGFPE\fR handler or control the trap enable mode bits
independently, the resulting behavior is not defined.
```

```
**********************************************************
    3541 Sat May 10 12:10:13 2014
new/usr/src/man/man3m/feraiseexcept.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH feraiseexcept 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
feraiseexcept \- raise floating-point exception
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBferaiseexcept\fR(\fBint\fR \fIexcepts\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBferaiseexcept()\fR function attempts to raise the supported
floating-point exceptions represented by the \fIexcepts\fR argument. The order
in which these floating-point exceptions are raised is unspecified.
.SH RETURN VALUES
.sp
.LP
If \fIexcepts\fR is 0 or if all the specified exceptions were successfully
raised, \fBferaiseexcept()\fR returns 0. Otherwise, it returns a non-zero
value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
The effect is intended to be similar to that of floating-point exceptions
raised by arithmetic operations. Hence, enabled traps for floating-point
exceptions raised by this function are taken.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```



```
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfegetexceptflag\fR(3M), \fBfenv.h\fR(3HEAD),
\fBfetestexcept\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    2946 Sat May 10 12:10:13 2014
new/usr/src/man/man3m/fesetprec.3m
patch11 - added LIBM man pages
**********************************************************
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.TH fesetprec 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fesetprec, fegetprec \- control floating point rounding precision modes
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... -lm [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfesetprec\fR(\fBint\fR \fIprec\fR);
.fi

.LP
.nf
\fBint\fR \fBfegetprec\fR(\fBvoid\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The IEEE 754 standard defines rounding precision modes for systems that always
deliver intermediate results to destinations in extended double precision
format. These modes allow such systems to deliver correctly rounded single and
double precision results (in the absence of underflow and overflow) with only
one rounding.
.sp
.LP
The \fBfesetprec()\fR function sets the current rounding precision to the
precision specified by \fIprec\fR, which must be one of the following values
defined in <\fBfenv.h\fR>:
.sp
.ne 2
.mk
.na
\fB\fBFE_FLTPREC\fR\fR
.ad
.RS 15n
.rt
round to single precision
.RE

.sp
.ne 2
.mk
.na
\fB\fBFE_DBLPREC\fR\fR
.ad
.RS 15n
.rt
round to double precision
.RE

.sp
.ne 2
.mk
.na
```



```
\fB\fBFE_LDBLPREC\fR\fR
.ad
.RS 15n
.rt
round to extended double precision
.RE

.sp
.LP
The default rounding precision when a program starts is \fBFE_LDBLPREC\fR.
.sp
.LP
The \fBfegetprec()\fR function returns the current rounding precision.
.SH RETURN VALUES
.sp
.LP
The \fBfesetprec()\fR function returns a non-zero value if the requested
rounding precision is established and 0 otherwise.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
lw(2.75i) lw(2.75i)
lw(2.75i) lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
Architecture^GIntel (see below)
Availability^GSUNWlibms
Interface Stability^GStable
MT-Level^GMT-Safe
.TE

.sp
.LP
These functions are not available on SPARC systems because SPARC processors
deliver intermediate results to destinations in single or double format as
determined by each floating point instruction.
.SH SEE ALSO
.sp
.LP
\fBfegetenv\fR(3M), \fBfesetround\fR(3M), \fBattributes\fR(5)
.sp
.LP
\fINumerical\fR \fIComputation\fR \fIGuide\fR
```

```
**********************************************************
    3945 Sat May 10 12:10:13 2014
new/usr/src/man/man3m/fetestexcept.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fetestexcept 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fetestexcept \- test floating-point exception flags
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfetestexcept\fR(\fBint\fR \fIexcepts\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBfetestexcept()\fR function determines which of a specified subset of the
floating-point exception flags are currently set. The \fIexcepts\fR argument
specifies the floating-point status flags to be queried.
.SH RETURN VALUES
.sp
.LP
The \fBfetestexcept()\fR function returns the value of the bitwise-inclusive OR
of the floating-point exception macros corresponding to the currently set
floating-point exceptions included in \fIexcepts\fR.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH EXAMPLES
.LP
\fBExample 1 \fRExample using \fBfetestexcept()\fR
.sp
.LP
The following example calls function \fIf\fR( ) if an invalid exception is set,
and then function \fIg\fR( ) if an overflow exception is set:

.sp
.in +2
.nf
#include <fenv.h>
/* ... */
{
#     pragma STDC FENV_ACCESS ON
      int set_excepts;
      feclearexcept(FE_INVALID | FE_OVERFLOW);
      // maybe raise exceptions
      set_excepts = fetestexcept(FE_INVALID | FE_OVERFLOW);
      if (set_excepts & FE_INVALID) f();
      if (set_excepts & FE_OVERFLOW) g();
      /* ... */
}
```



```
.fi
.in -2

.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfegetexceptflag\fR(3M), \fBfenv.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    5218 Sat May 10 12:10:13 2014
new/usr/src/man/man3m/feupdateenv.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH feupdateenv 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
feupdateenv \- update floating-point environment
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfeupdateenv\fR(\fBconst fenv_t *\fR\fIenvp\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBfeupdateenv()\fR function attempts to save the currently raised
floating-point exceptions in its automatic storage, attempts to install the
floating-point environment represented by the object pointed to by \fIenvp\fR,
and then attempts to raise the saved floating-point exceptions. The \fIenvp\fR
argument points to an object set by a call to \fBfegetenv\fR(3M) or
\fBfeholdexcept\fR(3M), or equals a floating-point environment macro.
.SH RETURN VALUES
.sp
.LP
The \fBfeupdateenv()\fR function returns 0 if and only if all the required
actions were successfully carried out.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH EXAMPLES
.sp
.LP
The following example demonstrates sample code to hide spurious underflow
floating-point exceptions:
.LP
\fBExample 1 \fRHide spurious underflow floating-point exceptions.
.sp
.in +2
.nf
#include <fenv.h>
double f(double x)
{
#   pragma STDC FENV_ACCESS ON
    double result;
    fenv_t save_env;
    feholdexcept(&save_env);
    // compute result
    if (/* test spurious underflow */)
    feclearexcept(FE_UNDERFLOW);
    feupdateenv(&save_env);
```



```
    return result;
}
.fi
.in -2

.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfegetenv\fR(3M), \fBfeholdexcept\fR(3M), \fBfenv.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
.SH NOTES
.sp
.LP
In a multithreaded program, the \fBfeupdateenv()\fR function affects the
floating point environment only for the calling thread.
.sp
.LP
When the \fBFEX_CUSTOM\fR handling mode is in effect for an exception, raising
that exception using \fBfeupdateenv()\fR causes the handling function to be
invoked. The handling function can then modify the exception flags to be set as
described in \fBfex_set_handling\fR(3M).  Any result value the handler supplies
will be ignored.
.sp
.LP
The \fBfeupdateenv()\fR function automatically installs and deinstalls
\fBSIGFPE\fR handlers and sets and clears the trap enable mode bits in the
floating point status register as needed. If a program uses these functions and
attempts to install a \fBSIGFPE\fR handler or control the trap enable mode bits
independently, the resulting behavior is not defined.
.sp
.LP
As described in \fBfex_set_handling\fR(3M), when a handling function installed
in \fBFEX_CUSTOM\fR mode is invoked, all exception traps are disabled (and will
not be reenabled while \fBSIGFPE\fR is blocked). Thus, attempting to change the
environment from within a handler by calling \fBfesetenv\fR(3M) or
\fBfeupdateenv\fR might not produce the expected results.
```

```
**********************************************************
    2692 Sat May 10 12:10:13 2014
new/usr/src/man/man3m/fex_merge_flags.3m
patch11 - added LIBM man pages
**********************************************************
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.TH fex_merge_flags 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Function
.SH NAME
fex_merge_flags \- manage the floating point environment
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... -lm [ \fIlibrary\fR... ]
#include <fenv.h>

\fBvoid\fR \fBfex_merge_flags\fR(\fBconst fenv_t *\fR\fIenvp\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBfex_merge_flags()\fR function copies into the current environment those
exception flags that are set in the environment represented by the object
pointed to by \fIenvp\fR.  The argument \fIenvp\fR must point to an object set
by a call to \fBfeholdexcept\fR(3M) or \fBfegetenv\fR(3M) or equal to the macro
\fBFE_DFL_ENV\fR.  The \fBfex_merge_flags()\fR function does not raise any
exceptions, but only sets its flags.
.SH RETURN VALUES
.sp
.LP
The \fBfex_merge_flags\fR function does not return a value.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
lw(2.75i) lw(2.75i)
lw(2.75i) lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
Availability^GSUNWlibms, SUNWlmsx
Interface Stability^GStable
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfegetenv\fR(3M), \fBfesetround\fR(3M),
\fBfesetprec\fR(3M), \fBfex_set_handling\fR(3M), \fBfex_set_log\fR(3M),
\fBattributes\fR(5)
.sp
.LP
\fINumerical Computation Guide\fR
.SH NOTES
.sp
.LP
In a multithreaded program, the \fBfex_merge_flags()\fR function affects the
```



```
floating point environment only for the calling thread.
.sp
.LP
The \fBfex_merge_flags()\fR function automatically installs and deinstalls
\fBSIGFPE\fR handlers and sets and clears the trap enable mode bits in the
floating point status register as needed.  If a program uses these functions
and attempts to install a \fBSIGFPE\fR handler or control the trap enable mode
bits independently, the resulting behavior is not defined.
```

```
**********************************************************
   10578 Sat May 10 12:10:13 2014
new/usr/src/man/man3m/fex_set_handling.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fex_set_handling 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functio
.SH NAME
fex_set_handling, fex_get_handling, fex_getexcepthandler, fex_setexcepthandler
\- control floating point exception handling modes
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... -lm [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfex_set_handling\fR(\fBint\fR \fIex\fR, \fBint\fR \fImode\fR, \fBvo
.fi

.LP
.nf
\fBint\fR \fBfex_get_handling\fR(\fBint\fR \fIex\fR);
.fi

.LP
.nf
\fBvoid\fR \fBfex_getexcepthandler\fR(\fBfex_handler_t *\fR\fIbuf\fR, \fBint\fR
.fi

.LP
.nf
\fBvoid\fR \fBfex_setexcepthandler\fR(\fBconst fex_handler_t *\fR\fIbuf\fR, \fBi
.fi

.SH DESCRIPTION
.sp
.LP
These functions provide control of floating point exception handling modes. For
each function, the \fIex\fR argument specifies one or more exceptions indicated
by a bitwise-OR of any of the following values defined in <\fBfenv.h\fR>:
.sp
.ne 2
.mk
.na
\fB\fBFEX_INEXACT\fR\fR
.ad
.RS 17n
.rt

.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_UNDERFLOW\fR\fR
.ad
.RS 17n
.rt

.RE
```



```
.sp
.ne 2
.mk
.na
\fB\fBFEX_OVERFLOW\fR\fR
.ad
.RS 17n
.rt

.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_DIVBYZERO\fR\fR
.ad
.RS 17n
.rt
division by zero
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_INV_ZDZ\fR\fR
.ad
.RS 17n
.rt
0/0 invalid operation
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_INV_IDI\fR\fR
.ad
.RS 17n
.rt
infinity/infinity invalid operation
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_INV_ISI\fR\fR
.ad
.RS 17n
.rt
infinity-infinity invalid operation
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_INV_ZMI\fR\fR
.ad
.RS 17n
.rt
0*infinity invalid operation
.RE
```

```
.sp
.ne 2
.mk
.na
\fB\fBFEX_INV_SQRT\fR\fR
.ad
.RS 17n
.rt
square root of negative operand
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_INV_SNAN\fR\fR
.ad
.RS 17n
.rt
signaling NaN
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_INV_INT\fR\fR
.ad
.RS 17n
.rt
invalid integer conversion
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_INV_CMP\fR\fR
.ad
.RS 17n
.rt
invalid comparison
.RE

.sp
.LP
For convenience, the following combinations of values are also defined:
.sp
.ne 2
.mk
.na
\fB\fBFEX_NONE\fR\fR
.ad
.RS 15n
.rt
no exceptions
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_INVALID\fR\fR
.ad
.RS 15n
.rt
```



```
all invalid operation exceptions
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_COMMON\fR\fR
.ad
.RS 15n
.rt
overflow, division by zero, and invalid operation
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_ALL\fR\fR
.ad
.RS 15n
.rt
all exceptions
.RE

.sp
.LP
The \fBfex_set_handling()\fR function establishes the specified \fImode\fR for
handling the floating point exceptions identified by \fIex\fR.  The selected
\fImode\fR determines the action to be taken when one of the indicated
exceptions occurs.  It must be one of the following values:
.sp
.ne 2
.mk
.na
\fB\fBFEX_NOHANDLER\fR\fR
.ad
.RS 17n
.rt
Trap but do not otherwise handle the exception, evoking instead whatever
ambient behavior would normally be in effect.  This is the default behavior
when the exception's trap is enabled. The \fIhandler\fR parameter is ignored.
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_NONSTOP\fR\fR
.ad
.RS 17n
.rt
Provide the IEEE 754 default result for the operation that caused the
exception, set the exception's flag, and continue execution. This is the
default behavior when the exception's trap is disabled.  The \fIhandler\fR
parameter is ignored.
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_ABORT\fR\fR
.ad
.RS 17n
.rt
```

```
Call \fBabort\fR(3C). The \fIhandler\fR parameter is ignored.
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_SIGNAL\fR\fR
.ad
.RS 17n
.rt
Invoke the function *\fIhandler\fR with the parameters normally supplied to a
signal handler installed with \fBsigfpe\fR(3C).
.RE

.sp
.ne 2
.mk
.na
\fB\fBFEX_CUSTOM\fR\fR
.ad
.RS 17n
.rt
Invoke the function *\fIhandler\fR as described in the next paragraph.
.RE

.sp
.LP
In \fBFEX_CUSTOM\fR mode, when a floating point exception occurs, the handler
function is invoked as though its prototype were:
.sp
.in +2
.nf
#include <fenv.h>
void handler(int ex, fex_info_t *info);
.fi
.in -2

.sp
.LP
On entry, \fIex\fR is the value (of the first twelve listed above)
corresponding to the exception that occurred, \fBinfo->op\fR indicates the
operation that caused the exception, \fBinfo->op1\fR and \fBinfo->op2\fR
contain the values of the operands, \fBinfo->res\fR contains the default
untrapped result value, and \fBinfo->flags\fR reflects the exception flags that
the operation would have set had it not been trapped.  If the handler returns,
the value contained in \fBinfo->res\fR on exit is substituted for the result of
the operation, the flags indicated by \fBinfo->flags\fR are set, and execution
resumes at the point where the exception occurred.  The handler might modify
\fBinfo->res\fR and \fBinfo->flags\fR to supply any desired result value and
flags.  Alternatively, if the exception is underflow or overflow, the hander
might set
.sp
.LP
info->res.type = fex_nodata;
.sp
.LP
which causes the exponent-adjusted result specified by IEEE 754 to be
substituted.  If the handler does not modify \fBinfo->res\fR or
\fBinfo->flags\fR, the effect is the same as if the exception had not been
trapped.
.sp
.LP
Although the default untrapped result of an exceptional operation is always
available to a \fBFEX_CUSTOM\fR handler, in some cases, one or both operands
may not be.  In these cases, the handler may be invoked with \fBinfo->op1.type
```



```
== fex_nodata\fR or \fBinfo->op2.type == fex_nodata\fR to indicate that the
respective data structures do not contain valid data.  (For example,
\fBinfo->op2.type == fex_nodata\fR if the exceptional operation is a unary
operation.)  Before accessing the operand values, a custom handler should
always examine the \fBtype\fR field of the operand data structures to ensure
that they contain valid data in the appropriate format.
.sp
.LP
The \fBfex_get_handling()\fR function returns the current handling mode for the
exception specified by \fIex\fR, which must be one of the first twelve
exceptions listed above.
.sp
.LP
The \fBfex_getexcepthandler()\fR function saves the current handling modes and
associated data for the exceptions specified by \fIex\fR in the data structure
pointed to by \fIbuf\fR. The type \fBfex_handler_t\fR is defined in
<\fBfenv.h\fR>.
.sp
.LP
The \fBfex_setexcepthandler()\fR function restores the handling modes and
associated data for the exceptions specified by \fIex\fR from the data
structure pointed to by \fIbuf\fR.  This data structure must have been set by a
previous call to \fBfex_getexcepthandler()\fR. Otherwise the effect on the
indicated modes is undefined.
.SH RETURN VALUES
.sp
.LP
The \fBfex_set_handling()\fR function returns a non-zero value if the requested
exception handling mode is established. Otherwise, it returns 0.
.SH EXAMPLES
.sp
.LP
The following example demonstrates how to substitute a predetermined value for
the result of a 0/0 invalid operation.
.sp
.in +2
.nf
#include <math.h>
#include <fenv.h>

double k;

void presub(int ex, fex_info_t *info) {
        info->res.type = fex_double;
        info->res.val.d = k;
}

int main() {
        double x, w;
        int i;
        fex_handler_t buf;
/*
 * save current 0/0 handler
 */
        (void) fex_getexcepthandler(&buf, FEX_INV_ZDZ);
/*
 * set up presubstitution handler for 0/0
 */
        (void) fex_set_handling(FEX_INV_ZDZ, FEX_CUSTOM, presub);
/*
 *  compute (k*x)/sin(x) for k=2.0, x=0.5, 0.4, ..., 0.1, 0.0
 */
        k = 2.0;
        (void) printf("Evaluating f(x) = (k*x)/sin(x)\en\en");
        for (i = 5; i >= 0; i--) {
                x = (double) i * 0.1;
```

```
392                 w = (k * x) / sin(x);
393                 (void) printf("\etx=%3.3f\et f(x) = % 1.20e\en", x, w);
394         }
395 /*
396  * restore old 0/0 handler
397  */
398         (void) fex_setexcepthandler(&buf, FEX_INV_ZDZ);
399         return 0;
400 }
401 .fi
402 .in -2

404 .sp
405 .LP
406 The output from the preceding program reads:
407 .sp
408 .in +2
409 .nf
410 Evaluating f(x) = (k*x)/sin(x)

412         x=0.500  f(x) =  2.08582964293348816000e+00
413         x=0.400  f(x) =  2.05434596443822626000e+00
414         x=0.300  f(x) =  2.03031801709447368000e+00
415         x=0.200  f(x) =  2.01339581906893761000e+00
416         x=0.100  f(x) =  2.00333722632695554000e+00
417         x=0.000  f(x) =  2.00000000000000000000e+00
418 .fi
419 .in -2

421 .sp
422 .LP
423 When \fIx\fR = 0, \fIf(x)\fR is computed as 0/0 and an invalid operation
424 exception occurs.  In this example, the value 2.0 is substituted for the
425 result.
426 .SH ATTRIBUTES
427 .sp
428 .LP
429 See \fBattributes\fR(5) for descriptions of the following attributes:
430 .sp

432 .sp
433 .TS
434 tab(^G) box;
435 lw(2.75i) lw(2.75i)
436 lw(2.75i) lw(2.75i)
437 .
438 ATTRIBUTE TYPE^GATTRIBUTE VALUE
439 Availability^GSUNWlibms, SUNWlmxs
440 Interface Stability^GStable
441 MT-Level^GMT-Safe (see Notes)
442 .TE

444 .SH SEE ALSO
445 .sp
446 .LP
447 \fBsigfpe\fR(3C), \fBfeclearexcept\fR(3M), \fBfegetenv\fR(3M),
448 \fBfex_set_log\fR(3M), \fBattributes\fR(5)
449 .sp
450 .LP
451 \fINumerical Computation Guide\fR
452 .SH NOTES
453 .sp
454 .LP
455 In a multithreaded application, the preceding functions affect exception
456 handling modes only for the calling thread.
457 .sp
```



```
458 .LP
459 The functions described on this page automatically install and deinstall
460 \fBSIGFPE\fR handlers and set and clear the trap enable mode bits in the
461 floating point status register as needed.  If a program uses these functions
462 and attempts to install a \fBSIGFPE\fR handler or control the trap enable mode
463 bits independently, the resulting behavior is not defined.
464 .sp
465 .LP
466 All traps are disabled before a handler installed in \fBFEX_CUSTOM\fR mode is
467 invoked.  When the \fBSIGFPE\fR signal is blocked, as it is when such a handler
468 is invoked, the floating point environment, exception flags, and retrospective
469 diagnostic functions described in \fBfeclearexcept\fR(3M), \fBfegetenv\fR(3M),
470 and \fBfex_set_log\fR(3M) do not re-enable traps.  Thus, the handler itself
471 always runs in \fBFEX_NONSTOP\fR mode with logging of retrospective diagnostics
472 disabled.  Attempting to change these modes within the handler may not produce
473 the expected results.
```

```
**********************************************************
    7495 Sat May 10 12:10:14 2014
new/usr/src/man/man3m/fex_set_log.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fex_set_log 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fex_set_log, fex_get_log, fex_set_log_depth, fex_get_log_depth, fex_log_entry
\- log retrospective diagnostics for floating point exceptions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... -lm [ \fIlibrary\fR... ]
#include <fenv.h>

\fBint\fR \fBfex_set_log\fR(\fBFILE *\fR\fIfp\fR);
.fi

.LP
.nf
\fBFILE *\fR\fBfex_get_log\fR(\fBvoid\fR);
.fi

.LP
.nf
\fBint\fR \fBfex_set_log_depth\fR(\fBint\fR \fIdepth\fR);
.fi

.LP
.nf
\fBint\fR \fBfex_get_log_depth\fR(\fBvoid\fR);
.fi

.LP
.nf
\fBvoid\fR \fBfex_log_entry\fR(\fBconst char *\fR\fImsg\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBfex_set_log()\fR function enables logging of retrospective diagnostic
messages regarding floating point exceptions to the file specified by \fIfp\fR.
If \fIfp\fR is \fINULL\fR, logging is disabled.  When a program starts, logging
is initially disabled.
.sp
.LP
The occurrence of any of the twelve exceptions listed in
\fBfex_set_handling\fR(3M) constitutes an event that can be logged.  To prevent
the log from becoming exhorbitantly long, the logging mechanism eliminates
redundant entries by two methods.  First, each exception is associated with a
\fIsite\fR in the program.  The site is identified by the address of the
instruction that caused the exception together with a stack trace.  Only the
first exception of a given type to occur at a given site will be logged.
Second, when \fBFEX_NONSTOP\fR handling mode is in effect for some exception,
only those occurrences of that exception that set its previously clear flag are
logged.  Clearing a flag using \fBfeclearexcept()\fR allows the next occurrence
of the exception to be logged provided it does not occur at a site at which it
was previously logged.
.sp
.LP
```



```
Each of the different types of invalid operation exceptions can be logged at
the same site.  Because all invalid operation exceptions share the same flag,
however, of those types for which \fBFEX_NONSTOP\fR mode is in effect, only the
first exception to set the flag will be logged.  When the invalid operation
exception is raised by a call to \fBferaiseexcept\fR(3M) or
\fBfeupdateenv\fR(3M), which type of invalid operation is logged depends on the
implementation.
.sp
.LP
If an exception results in the creation of a log entry, the entry is created at
the time the exception occurs and before any exception handling actions
selected with \fBfex_set_handling()\fR are taken.  In particular, the log entry
is available even if the program terminates as a result of the exception.  The
log entry shows the type of exception, the address of the instruction that
caused it, how it will be handled, and the stack trace. If symbols are
available, the address of the excepting instruction and the addresses in the
stack trace are followed by the names of the corresponding symbols.
.sp
.LP
The \fBfex_get_log()\fR function returns the current log file.
.sp
.LP
The \fBfex_set_log_depth()\fR sets the maximum depth of the stack trace
recorded with each exception to \fIdepth\fR stack frames.  The default depth is
100.
.sp
.LP
The\fBfex_get_log_depth()\fR function returns the current maximum stack trace
depth.
.sp
.LP
The \fBfex_log_entry()\fR function adds a user-supplied entry to the log.  The
entry includes the string pointed to by \fImsg\fR and the stack trace.  Like
entries for floating point exceptions, redundant user-supplied entries are
eliminated: only the first user-supplied entry with a given \fImsg\fR to be
requested from a given site will be logged.  For the purpose of a user-supplied
entry, the site is defined only by the stack trace, which begins with the
function that called \fBfex_log_entry()\fR.
.SH RETURN VALUES
.sp
.LP
The \fBfex_set_log()\fR function returns a non-zero value if logging is enabled
or disabled accordingly and returns 0 otherwise.  The \fBfex_set_log_depth()\fR
returns a non-zero value if the requested stack trace depth is established
(regardless of whether logging is enabled) and returns 0 otherwise.
.SH EXAMPLES
.sp
.LP
The following example demonstrates the output generated when a floating point
overflow occurs in \fBsscanf\fR(3C).
.sp
.in +2
.nf
#include <fenv.h>

int
main() {
        double x;
/*
 * enable logging of retrospective diagnostics
 */
        (void) fex_set_log(stdout);
/*
 * establish default handling for overflows
 */
        (void) fex_set_handling(FEX_OVERFLOW, FEX_NONSTOP, NULL);
```

```
/*
 * trigger an overflow in sscanf
 */
        (void) sscanf("1.0e+400", "%lf", &x);
        return 0;
}
.fi
.in -2

.sp
.LP
The output from the preceding program reads:
.sp
.in +2
.nf
Floating point overflow at 0xef71cac4 __base_conversion_set_exceptio
n, nonstop mode
   0xef71cacc  __base_conversion_set_exception
   0xef721820  _decimal_to_double
   0xef75aba8  number
   0xef75a94c  __doscan_u
   0xef75ecf8  sscanf
   0x00010f20  main
.fi
.in -2

.sp
.LP
Recompiling the program or running it on another system can produce different
text addresses from those shown above.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
lw(2.75i) lw(2.75i)
lw(2.75i) lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
Availability^GSUNWlibms, SUNWlmxs
Interface Stability^GStable
MT-Level^GMT-Safe (see NOTES)
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfegetenv\fR(3M), \fBferaiseexcept\fR(3M),
\fBfeupdateenv\fR(3M), \fBfex_set_handling\fR(3M), \fBattributes\fR(5)
.sp
.LP
\fINumerical Computation Guide\fR
.SH NOTES
.sp
.LP
All threads in a process share the same log file.  Each call to
\fBfex_set_log()\fR preempts the previous one.
.sp
.LP
In addition to the log file itself, two additional file descriptors are used
during the creation of a log entry in order to obtain symbol names from the
executable and any shared objects it uses.  These file descriptors are
```



```
relinquished once the log entry is written.  If the file descriptors cannot be
allocated, symbols names are omitted from the stack trace.
.sp
.LP
The functions described on this page automatically install and deinstall
\fBSIGFPE\fR handlers and set and clear the trap enable mode bits in the
floating point status register as needed.  If a program uses these functions
and attempts to install a \fBSIGFPE\fR handler or control the trap enable mode
bits independently, the resulting behavior is not defined.
.sp
.LP
As described in \fBfex_set_handling()\fR, when a handling function installed in
\fBFEX_CUSTOM\fR mode is invoked, all exception traps are disabled (and will
not be reenabled while \fBSIGFPE\fR is blocked).  Thus, retrospective
diagnostic messages are not logged for exceptions that occur within such a
handler.
```

```
**********************************************************
    3506 Sat May 10 12:10:14 2014
new/usr/src/man/man3m/floor.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH floor 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
floor, floorf, floorl \- floor function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBfloor\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBfloorf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBfloorl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the largest integral value not greater than \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the largest integral value
not greater than \fIx\fR, expressed as a \fBdouble\fR, \fBfloat\fR, or \fBlong
double\fR, as appropriate for the return type of the function.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-Inf or \(+-0, \fIx\fR is returned.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
```



```
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBceil\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4955 Sat May 10 12:10:14 2014
new/usr/src/man/man3m/fma.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fma 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fma, fmaf, fmal \- floating-point multiply-add
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBfma\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR, \fBdouble\fR
.fi

.LP
.nf
\fBfloat\fR \fBfmaf\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIy\fR, \fBfloat\fR \fI
.fi

.LP
.nf
\fBlong double\fR \fBfmal\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR \fIy\f
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute (\fIx\fR * \fIy\fR) + \fIz\fR, rounded as one ternary
operation. They compute the value (as if) to infinite precision and round once
to the result format, according to the rounding mode characterized by the value
of \fBFLT_ROUNDS\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return (\fIx\fR * \fIy\fR) +
\fIz\fR, rounded as one ternary operation.
.sp
.LP
If \fIx\fR or \fIy\fR are NaN, a NaN is returned.
.sp
.LP
If \fIx\fR multiplied by \fIy\fR is an exact infinity and \fIz\fR is also an
infinity but with the opposite sign, a domain error occurs and a NaN is
returned.
.sp
.LP
If one of \fIx\fR and \fIy\fR is infinite, the other is 0, and \fIz\fR is not a
NaN, a domain error occurs and a NaN is returned.
.sp
.LP
If \fIx\fR*\fIy\fR is not 0*Inf nor Inf*0 and \fIz\fR is a NaN, a NaN is
returned.
.SH ERRORS
.sp
```



```
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The value of \fIx\fR*\fIy\fR+\fIz\fR is invalid or the value \fIx\fR*\fIy\fR is
invalid.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception will be raised.
.RE

.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 16n
.rt
The result overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception will be raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3566 Sat May 10 12:10:14 2014
new/usr/src/man/man3m/fmax.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fmax 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fmax, fmaxf, fmaxl \- determine maximum numeric value of two floating-point
numbers
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBfmax\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR);
.fi

.LP
.nf
\fBfloat\fR \fBfmaxf\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIy\fR);
.fi

.LP
.nf
\fBlong double\fR \fBfmaxl\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR \fIy\
.fi

.SH DESCRIPTION
.sp
.LP
These functions determine the maximum numeric value of their arguments. NaN
arguments are treated as missing data: if one argument is a NaN and the other
numeric, these functions choose the numeric value.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the maximum numeric value of
their arguments.
.sp
.LP
If just one argument is a NaN, the other argument is returned.
.sp
.LP
If \fIx\fR and \fIy\fR are NaN, a NaN is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
```



```
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfdim\fR(3M), \fBfmin\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3572 Sat May 10 12:10:14 2014
new/usr/src/man/man3m/fmin.3m
patch11 - added LIBM man pages
**********************************************************
```

```
   1 '\" te
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  11 .TH fmin 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
  12 .SH NAME
  13 fmin, fminf, fminl \- determine minimum numeric value of two floating-point
  14 numbers
  15 .SH SYNOPSIS
  16 .LP
  17 .nf
  18 c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
  19 #include <math.h>

  21 \fBdouble\fR \fBfmin\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR);
  22 .fi

  24 .LP
  25 .nf
  26 \fBfloat\fR \fBfminf\fR(\fBfloat float\fR \fIx\fR, \fBfloat\fR \fIy\fR);
  27 .fi

  29 .LP
  30 .nf
  31 \fBlong double\fR \fBfminl\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR \fIy\
  32 .fi

  34 .SH DESCRIPTION
  35 .sp
  36 .LP
  37 These functions determine the minimum numeric value of their arguments. NaN
  38 arguments are treated as missing data: if one argument is a NaN and the other
  39 numeric, these functions choose the numeric value.
  40 .SH RETURN VALUES
  41 .sp
  42 .LP
  43 Upon successful completion, these functions return the minimum numeric value of
  44 their arguments.
  45 .sp
  46 .LP
  47 If just one argument is a NaN, the other argument is returned.
  48 .sp
  49 .LP
  50 If \fIx\fR and \fIy\fR are NaN, a NaN is returned.
  51 .SH ERRORS
  52 .sp
  53 .LP
  54 No errors are defined.
  55 .SH ATTRIBUTES
  56 .sp
  57 .LP
  58 See \fBattributes\fR(5) for descriptions of the following attributes:
  59 .sp

  61 .sp
```



```
  62 .TS
  63 tab(^G) box;
  64 cw(2.75i) |cw(2.75i)
  65 lw(2.75i) |lw(2.75i)
  66 .
  67 ATTRIBUTE TYPE^GATTRIBUTE VALUE
  68 _
  69 Interface Stability^GStandard
  70 _
  71 MT-Level^GMT-Safe
  72 .TE

  74 .SH SEE ALSO
  75 .sp
  76 .LP
  77 \fBfdim\fR(3M), \fBfmax\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5),
  78 \fBstandards\fR(5)
```

```
**********************************************************
    4557 Sat May 10 12:10:14 2014
new/usr/src/man/man3m/fmod.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fmod 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fmod, fmodf, fmodl \- floating-point remainder value function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBfmod\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR);
.fi

.LP
.nf
\fBfloat\fR \fBfmodf\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIy\fR);
.fi

.LP
.nf
\fBlong double\fR \fBfmodl\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR \fIy\
.fi

.SH DESCRIPTION
.sp
.LP
These functions return the floating-point remainder of the division of \fIx\fR
by \fIy\fR.
.SH RETURN VALUES
.sp
.LP
These functions return the value \fIx\fR \(mi \fIi\fR * \fIy\fR, for some
integer \fIi\fR such that, if \fIy\fR is non-zero, the result has the same sign
as \fIx\fR and magnitude less than the magnitude of \fIy\fR.
.sp
.LP
If \fIx\fR or \fIy\fR is NaN, a NaN is returned.
.sp
.LP
If \fIy\fR is 0, a domain error occurs and a NaN is returned.
.sp
.LP
If \fIx\fR is infinite, a domain error occurs and a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 and \fIy\fR is not 0, \(+-0 is returned.
.sp
.LP
If \fIx\fR is not infinite and \fIy\fR is \(+-Inf, \fIx\fR is returned.
.SH ERRORS
.sp
```



```
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is infinite or \fIy\fR is 0.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBisnan\fR(3M),
\fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3363 Sat May 10 12:10:14 2014
new/usr/src/man/man3m/fpclassify.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH fpclassify 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
fpclassify \- classify real floating type
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBfpclassify\fR(\fBreal-floating\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBfpclassify()\fR macro classifies its argument value as NaN, infinite,
normal, subnormal, or zero. First, an argument represented in a format wider
than its semantic type is converted to its semantic type. Then classification
is based on the type of the argument.
.SH RETURN VALUES
.sp
.LP
The \fBfpclassify()\fR macro returns the value of the number classification
macro appropriate to the value of its argument.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisfinite\fR(3M), \fBisinf\fR(3M), \fBisnan\fR(3M), \fBisnormal\fR(3M),
```



```
\fBmath.h\fR(3HEAD), \fBsignbit\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3860 Sat May 10 12:10:14 2014
new/usr/src/man/man3m/frexp.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH frexp 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
frexp, frexpf, frexpl \- extract mantissa and exponent from a floating-point
number
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBfrexp\fR(\fBdouble\fR \fInum\fR, \fBint *\fR\fIexp\fR);
.fi

.LP
.nf
\fBfloat\fR \fBfrexpf\fR(\fBfloat\fR \fInum\fR, \fBint *\fR\fIexp\fR);
.fi

.LP
.nf
\fBlong double\fR \fBfrexpl\fR(\fBlong double\fR \fInum\fR, \fBint *\fR\fIexp\fR
.fi

.SH DESCRIPTION
.sp
.LP
These functions break a floating-point number into a normalized fraction and an
integral power of 2. They store the integer exponent in the \fBint\fR object
pointed to by \fIexp\fR.
.SH RETURN VALUES
.sp
.LP
For finite arguments, these functions return the value \fIx\fR, such that
\fIx\fR is a \fBdouble\fR with magnitude in the interval [\(12, 1) or 0, and
\fInum\fR equals \fIx\fR times 2 raised to the power *\fIexp\fR.
.sp
.LP
If \fInum\fR is NaN, NaN is returned and the value of *\fIexp\fR is
unspecified.
.sp
.LP
If \fInum\fR is \(+- 0, \(+- 0 is returned and the value of *\fIexp\fR is 0.
.sp
.LP
If \fInum\fR is \(+-Inf, \fInum\fR is returned and the value of *\fIexp\fR is
unspecified.
.SH ATTRIBUTES
.sp
.LP
```



```
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisnan\fR(3M), \fBldexp\fR(3M), \fBmodf\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    4891 Sat May 10 12:10:15 2014
new/usr/src/man/man3m/hypot.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH hypot 3M "1 Sep 2002" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
hypot, hypotf, hypotl \- Euclidean distance function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBhypot\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR);
.fi

.LP
.nf
\fBfloat\fR \fBhypotf\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIy\fR);
.fi

.LP
.nf
\fBlong double\fR \fBhypotl\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR \fIy
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the length of the square root of \fIx\fR^2 + \fIy\fR^2
without undue overflow or underflow.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the length of the hypotenuse
of a right angled triangle with sides of length \fIx\fR^2 and \fIy\fR^2.
.sp
.LP
If the correct value would cause overflow, a range error occurs and
\fBhypot()\fR, \fBhypotf()\fR, and \fBhypotl()\fR return the value of the macro
\fBHUGE_VAL\fR, \fBHUGE_VALF\fR, and \fBHUGE_VALL\fR, respectively.
.sp
.LP
If \fIx\fR or \fIy\fR is \(+-Inf, +Inf is returned even if one of \fIx\fR or
\fIy\fR is NaN.
.sp
.LP
If \fIx\fR or \fIy\fR is NaN and the other is not \(+-Inf, a NaN is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
```



```
.mk
.na
\fBRange Error\fR
.ad
.RS 15n
.rt
The result overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
\fBhypot\fR(\fIx\fR,\fIy\fR), \fBhypot\fR(\fIy\fR,\fIx\fR), and
\fBhypot\fR(\fIx\fR, \(mi\fIy\fR) are equivalent.
.sp
.LP
\fBhypot\fR(\fIx\fR, \(+-0) is equivalent to \fBfabs\fR(\fIx\fR).
.sp
.LP
These functions takes precautions against underflow and overflow during
intermediate steps of the computation.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfabs\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBsqrt\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    4783 Sat May 10 12:10:15 2014
new/usr/src/man/man3m/ilogb.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH ilogb 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
ilogb, ilogbf, ilogbl \- return an unbiased exponent
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBilogb\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBint\fR \fBilogbf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBint\fR \fBilogbl\fR(\fBlong double\fR \fIx\fR);
.fi

.LP
.nf
cc [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBilogb\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBint\fR \fBilogbf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBint\fR \fBilogbl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions return the exponent part of their argument \fIx\fR.  Formally,
the return value is the integral part of  \fBlog\fR(r)| \fIx\fR | as a signed
integral value, for non-zero \fIx\fR, where \fIr\fR is the radix of the
machine's floating point arithmetic, which is the value of \fBFLT_RADIX\fR
defined in <\fBfloat.h\fR>.
.SH RETURN VALUES
.sp
```



```
.LP
Upon successful completion, these functions return the exponent part of \fIx\fR
as a signed integer value. They are equivalent to calling the corresponding
\fBlogb\fR(3M) function and casting the returned value to type \fBint\fR.
.sp
.LP
If \fIx\fR is 0, the value \fBFP_ILOGB0\fR is returned. For SUSv3-conforming
applications compiled with the \fBc99\fR compiler driver (see
\fBstandards\fR(5)), a domain error occurs.
.sp
.LP
If \fIx\fR is \(+-Inf, the value \fBINT_MAX\fR is returned. For
SUSv3-conforming applications compiled with the \fBc99\fR compiler driver, a
domain error occurs.
.sp
.LP
If \fIx\fR is NaN, the value \fBFP_ILOGBNAN\fR is returned. For
SUSv3-conforming applications compiled with the \fBc99\fR compiler driver, a
domain error occurs.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is zero, NaN, or \(+-Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception is raised.
.RE

.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBlimits.h\fR(3HEAD),
\fBlogb\fR(3M), \fBmath.h\fR(3HEAD), \fBscalb\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3356 Sat May 10 12:10:15 2014
new/usr/src/man/man3m/isfinite.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH isfinite 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
isfinite \- test for finite value
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBisfinite\fR(\fBreal-floating\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBisfinite()\fR macro determines whether its argument has a finite value
(zero, subnormal, or normal, and not infinite or NaN). First, an argument
represented in a format wider than its semantic type is converted to its
semantic type. Then determination is based on the type of the argument.
.SH RETURN VALUES
.sp
.LP
The \fBisfinite()\fR macro returns a non-zero value if and only if its argument
has a finite value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfpclassify\fR(3M), \fBisinf\fR(3M), \fBisnan\fR(3M), \fBisnormal\fR(3M),
```



```
\fBmath.h\fR(3HEAD), \fBsignbit\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4270 Sat May 10 12:10:15 2014
new/usr/src/man/man3m/isgreater.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH isgreater 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
isgreater \- test if x greater than y
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBisgreater\fR(\fBreal-floating\fR \fIx\fR, \fBreal-floating\fR \fIy\
.fi

.SH DESCRIPTION
.sp
.LP
The \fBisgreater()\fR macro determines whether its first argument is greater
than its second argument. The value of \fBisgreater\fR(\fIx\fR, \fIy\fR) is
equal to (\fIx\fR) > (\fIy\fR); however, unlike (\fIx\fR) > (\fIy\fR),
\fBisgreater\fR(\fIx\fR, \fIy\fR) does not raise the invalid floating-point
exception when \fIx\fR and \fIy\fR are unordered.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, the \fBisgreater()\fR macro returns the value of
(\fIx\fR) > (\fIy\fR).
.sp
.LP
If x or y is NaN, 0 is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
The relational and equality operators support the usual mathematical
relationships between numeric values. For any ordered pair of numeric values,
exactly one of the relationships (less, greater, and equal) is true. Relational
operators can raise the invalid floating-point exception when argument values
are NaNs. For a NaN and a numeric value, or for two NaNs, just the unordered
relationship is true. This macro is a quiet (non-floating-point exception
raising) version of a relational operator. It facilitates writing efficient
code that accounts for quiet NaNs without suffering the invalid floating-point
exception. In the \fBSYNOPSIS\fR section, \fBreal-floating\fR indicates that
the argument is an expression of \fBreal-floating\fR type.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisgreaterequal\fR(3M), \fBisless\fR(3M), \fBislessequal\fR(3M),
\fBislessgreater\fR(3M), \fBisunordered\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4345 Sat May 10 12:10:15 2014
new/usr/src/man/man3m/isgreaterequal.3m
patch11 - added LIBM man pages
**********************************************************
```

```
'\" te
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.TH isgreaterequal 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions
.SH NAME
isgreaterequal \- test if x greater than or equal to y
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBisgreaterequal\fR(\fBreal-floating\fR \fIx\fR, \fBreal-floating\fR
.fi

.SH DESCRIPTION
.sp
.LP
The \fBisgreaterequal()\fR macro determines whether its first argument is
greater than or equal to its second argument. The value of
\fBisgreaterequal\fR(\fIx\fR, \fIy\fR) is equal to (\fIx\fR) \(>= (\fIy\fR);
however, unlike (\fIx\fR) \(>= (\fIy\fR), \fBisgreaterequal\fR(\fIx\fR,
\fIy\fR) does not raise the invalid floating-point exception when \fIx\fR and
\fIy\fR are unordered.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, the \fBisgreaterequal()\fR macro returns the value
of (\fIx\fR) \(>= (\fIy\fR).
.sp
.LP
If \fIx\fR or \fIy\fR is NaN, 0 is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
The relational and equality operators support the usual mathematical
relationships between numeric values. For any ordered pair of numeric values,
exactly one of the relationships (less, greater, and equal) is true. Relational
operators can raise the invalid floating-point exception when argument values
are NaNs. For a NaN and a numeric value, or for two NaNs, just the unordered
relationship is true. This macro is a quiet (non-floating-point exception
raising) version of a relational operator. It facilitates writing efficient
code that accounts for quiet NaNs without suffering the invalid floating-point
exception. In the \fBSYNOPSIS\fR section, \fBreal-floating\fR indicates that
the argument is an expression of \fBreal-floating\fR type.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisgreater\fR(3M), \fBisless\fR(3M), \fBislessequal\fR(3M),
\fBislessgreater\fR(3M), \fBisunordered\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3318 Sat May 10 12:10:15 2014
new/usr/src/man/man3m/isinf.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH isinf 3M "17 Nov 2008" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
isinf \- test for infinity
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBisinf\fR(\fBreal-floating\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBisinf()\fR macro determines whether its argument value is an infinity
(positive or negative). First, an argument represented in a format wider than
its semantic type is converted to its semantic type. Then determination is
based on the type of the argument.
.SH RETURN VALUES
.sp
.LP
The \fBisinf()\fR macro returns a non-zero value if and only if its argument
has an infinite value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
```



```
\fBfpclassify\fR(3M), \fBisfinite\fR(3M), \fBisnan\fR(3M), \fBisnormal\fR(3M),
\fBmath.h\fR(3HEAD), \fBsignbit\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4262 Sat May 10 12:10:15 2014
new/usr/src/man/man3m/isless.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH isless 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
isless \- test if x is less than y
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBisless\fR(\fBreal-floating\fR \fIx\fR, \fBreal-floating\fR \fIy\fR)
.fi

.SH DESCRIPTION
.sp
.LP
The \fBisless()\fR macro determines whether its first argument is less than its
second argument.  The value of \fBisless\fR(\fIx\fR, \fIy\fR) is equal to
(\fIx\fR) < (\fIy\fR); however, unlike (\fIx\fR) < (\fIy\fR),
\fBisless\fR(\fIx\fR, \fIy\fR) does not raise the invalid floating-point
exception when \fIx\fR and \fIy\fR are unordered.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, the \fBisless()\fR macro returns the value of
(\fIx\fR) < (\fIy\fR).
.sp
.LP
If \fIx\fR or \fIy\fR is NaN, 0 is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
The relational and equality operators support the usual mathematical
relationships between numeric values. For any ordered pair of numeric values,
exactly one of the relationships (less, greater, and equal) is true. Relational
operators can raise the invalid floating-point exception when argument values
are NaNs. For a NaN and a numeric value, or for two NaNs, just the unordered
relationship is true. This macro is a quiet (non-floating-point exception
raising) version of a relational operator. It facilitates writing efficient
code that accounts for quiet NaNs without suffering the invalid floating-point
exception. In the \fBSYNOPSIS\fR section, \fBreal-floating\fR indicates that
the argument is an expression of \fBreal-floating\fR type.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisgreater\fR(3M), \fBisgreaterequal\fR(3M), \fBislessequal\fR(3M),
\fBislessgreater\fR(3M), \fBisunordered\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4324 Sat May 10 12:10:15 2014
new/usr/src/man/man3m/islessequal.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH islessequal 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
islessequal \- test if x is less than or equal to y
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBislessequal\fR(\fBreal-floating\fR \fIx\fR, \fBreal-floating\fR \fI
.fi

.SH DESCRIPTION
.sp
.LP
The \fBislessequal()\fR macro determines whether its first argument is less
than or equal to its second argument. The value of \fBislessequal\fR(\fIx\fR,
\fIy\fR) is equal to (\fIx\fR) \(<= (\fIy\fR); however, unlike (\fIx\fR) \(<=
(\fIy\fR), \fBislessequal\fR(\fIx\fR, \fIy\fR) does not raise the invalid
floating-point exception when \fIx\fR and \fIy\fR are unordered.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, the \fBislessequal()\fR macro returns the value of
(\fIx\fR) \(<= (\fIy\fR).
.sp
.LP
If \fIx\fR or \fIy\fR is NaN, 0 is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
The relational and equality operators support the usual mathematical
relationships between numeric values. For any ordered pair of numeric values,
exactly one of the relationships (less, greater, and equal) is true. Relational
operators can raise the invalid floating-point exception when argument values
are NaNs. For a NaN and a numeric value, or for two NaNs, just the unordered
relationship is true. This macro is a quiet (non-floating-point exception
raising) version of a relational operator. It facilitates writing efficient
code that accounts for quiet NaNs without suffering the invalid floating-point
exception. In the \fBSYNOPSIS\fR section, \fBreal-floating\fR indicates that
the argument is an expression of \fBreal-floating\fR type.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisgreater\fR(3M), \fBisgreaterequal\fR(3M), \fBisless\fR(3M),
\fBislessgreater\fR(3M), \fBisunordered\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4391 Sat May 10 12:10:16 2014
new/usr/src/man/man3m/islessgreater.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH islessgreater 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
islessgreater \- test if x is less than or greater than y
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBislessgreater\fR(\fBreal-floating\fR \fIx\fR, \fBreal-floating\fR \
.fi

.SH DESCRIPTION
.sp
.LP
The \fBislessgreater()\fR macro determines whether its first argument is less
than or greater than its second argument. The \fBislessgreater\fR(\fIx\fR,
\fIy\fR) macro is similar to (\fIx\fR) < (\fIy\fR) || (\fIx\fR) > (\fIy\fR);
however, \fBislessgreater\fR(\fIx\fR, \fIy\fR) does not raise the invalid
floating-point exception when x and y are unordered (nor does it evaluate
\fIx\fR and \fIy\fR twice).
.SH RETURN VALUES
.sp
.LP
Upon successful completion, the \fBislessgreater()\fR macro returns the value
of (\fIx\fR) < (\fIy\fR) || (\fIx\fR) > (\fIy\fR).
.sp
.LP
If \fIx\fR or \fIy\fR is NaN, 0 is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
The relational and equality operators support the usual mathematical
relationships between numeric values. For any ordered pair of numeric values,
exactly one of the relationships (less, greater, and equal) is true. Relational
operators can raise the invalid floating-point exception when argument values
are NaNs. For a NaN and a numeric value, or for two NaNs, just the unordered
relationship is true. This macro is a quiet (non-floating-point exception
raising) version of a relational operator. It facilitates writing efficient
code that accounts for quiet NaNs without suffering the invalid floating-point
exception. In the \fBSYNOPSIS\fR section, \fBreal-floating\fR indicates that
the argument is an expression of \fBreal-floating\fR type.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisgreater\fR(3M), \fBisgreaterequal\fR(3M), \fBisless\fR(3M),
\fBislessequal\fR(3M), \fBisunordered\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3784 Sat May 10 12:10:16 2014
new/usr/src/man/man3m/isnan.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH isnan 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
isnan \- test for NaN
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBisnan\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBisnan\fR(\fBreal\(emfloating\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
In C90 mode, the \fBisnan()\fR function tests whether \fIx\fR is NaN.
.sp
.LP
In C99 mode, the \fBisnan()\fR macro determines whether its argument value is
NaN. First, an argument represented in a format wider than its semantic type is
converted to its semantic type. The determination is then based on the type of
the argument.
.SH RETURN VALUES
.sp
.LP
Both the \fBisnan()\fR function and macro return non-zero if and only if
\fIx\fR is NaN.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH WARNINGS
.sp
.LP
In C99 mode, the practice of explicitly supplying a prototype for \fBisnan()\fR
after the line
.sp
.in +2
.nf
#include <math.h>
.fi
.in -2
```



```
.sp
.LP
is obsolete and will no longer work.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfpclassify\fR(3M), \fBisfinite\fR(3M), \fBisinf\fR(3M), \fBisnormal\fR(3M),
\fBmath.h\fR(3HEAD), \fBsignbit\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3346 Sat May 10 12:10:16 2014
new/usr/src/man/man3m/isnormal.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH isnormal 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
isnormal \- test for a normal value
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBisnormal\fR(\fBreal-floating\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBisnormal()\fR macro determines whether its argument value is normal
(neither zero, subnormal, infinite, nor NaN). First, an argument represented in
a format wider than its semantic type is converted to its semantic type. Then
determination is based on the type of the argument.
.SH RETURN VALUES
.sp
.LP
The \fBisnormal()\fR macro returns a non-zero value if and only if its argument
has a normal value.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfpclassify\fR(3M), \fBisfinite\fR(3M), \fBisinf\fR(3M), \fBisnan\fR(3M),
```



```
\fBmath.h\fR(3HEAD), \fBsignbit\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3990 Sat May 10 12:10:16 2014
new/usr/src/man/man3m/isunordered.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH isunordered 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
isunordered \- test if arguments are unordered
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBisunordered\fR(\fBreal-floating\fR \fIx\fR, \fBreal-floating\fR \fI
.fi

.SH DESCRIPTION
.sp
.LP
The \fBisunordered()\fR macro determines whether its arguments are unordered.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, the \fBisunordered()\fR macro returns 1 if its
arguments are unordered and 0 otherwise.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
The relational and equality operators support the usual mathematical
relationships between numeric values. For any ordered pair of numeric values,
exactly one of the relationships (less, greater, and equal) is true. Relational
operators can raise the invalid floating-point exception when argument values
are NaNs. For a NaN and a numeric value, or for two NaNs, just the unordered
relationship is true. This macro is a quiet (non-floating-point exception
raising) version of a relational operator. It facilitates writing efficient
code that accounts for quiet NaNs without suffering the invalid floating-point
exception. In the \fBSYNOPSIS\fR section, \fBreal-floating\fR indicates that
the argument shall be an expression of \fBreal-floating\fR type.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
```



```
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBisgreater\fR(3M), \fBisgreaterequal\fR(3M), \fBisless\fR(3M),
\fBislessequal\fR(3M), \fBislessgreater\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3993 Sat May 10 12:10:16 2014
new/usr/src/man/man3m/j0.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH j0 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
j0, j0f, j0l, j1, j1f, j1l, jn, jnf, jnl \- Bessel functions of the first kind
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBj0\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBj0f\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBj0l\fR(\fBlong double\fR \fIx\fR);
.fi

.LP
.nf
\fBdouble\fR \fBj1\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBj1f\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBj1l\fR(\fBlong double\fR \fIx\fR);
.fi

.LP
.nf
\fBdouble\fR \fBjn\fR(\fBint\fR \fIn\fR, \fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBjnf\fR(\fBint\fR \fIn\fR, \fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBjnl\fR(\fBint\fR \fIn\fR, \fBlong double\fR \fIx\fR);
```



```
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute Bessel functions of \fIx\fR of the first kind of orders
0, 1 and \fIn\fR respectively.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the relevant Bessel value of
\fIx\fR of the first kind.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GSee below.
_
MT-Level^GMT-Safe
.TE

.sp
.LP
The \fBj0()\fR, \fBj1()\fR, and \fBjn()\fR functions are Standard. The
\fBj0f()\fR, \fBj0l()\fR, \fBj1f()\fR, \fBj1l()\fR, \fBjnf()\fR, and
\fBjnl()\fR functions are Stable.
.SH SEE ALSO
.sp
.LP
\fBisnan\fR(3M), \fBy0\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    4662 Sat May 10 12:10:16 2014
new/usr/src/man/man3m/ldexp.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH ldexp 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
ldexp, ldexpf, ldexpl \- load exponent of a floating point number
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBldexp\fR(\fBdouble\fR x, \fBint\fR exp);
.fi

.LP
.nf
\fBfloat\fR \fBldexpf\fR(\fBfloat\fR x, \fBint\fR exp);
.fi

.LP
.nf
\fBlong double\fR \fBldexpl\fR(\fBlong double\fR x, \fBint\fR exp);
.fi

.SH DESCRIPTION
.sp
.LP
These functions computes the quantity x\|* 2^exp.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return \fIx\fR multiplied by 2
raised to the power \fIexp\fR.
.sp
.LP
If these functions would cause overflow, a range error occurs and
\fBldexp()\fR, \fBldexpf()\fR, and \fBldexpl()\fR return \fB\(+-HUGE_VAL\fR,
\fB\(+-HUGE_VALF\fR, and \fB\(+-HUGE_VALL\fR (according to the sign of
\fIx\fR), respectively.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or \(+-Inf, \fIx\fR is returned.
.sp
.LP
If \fIexp\fR  is 0, \fIx\fR is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
```



```
.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 15n
.rt
The result overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception is raised.
.sp
The \fBldexp()\fR function sets \fBerrno\fR to \fBERANGE\fR if the result
overflows.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBldexp()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBldexpf()\fR
and \fBldexpl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfrexp\fR(3M), \fBisnan\fR(3M), \fBmodf\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    6211 Sat May 10 12:10:16 2014
new/usr/src/man/man3m/lgamma.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH lgamma 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
lgamma, lgammaf, lgammal, lgamma_r, lgammaf_r, lgammal_r, gamma, gammaf,
gammal, gamma_r, gammaf_r, gammal_r \- log gamma function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

extern int signgam;

\fBdouble\fR \fBlgamma\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBlgammaf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBlgammal\fR(\fBlong double\fR \fIx\fR);
.fi

.LP
.nf
\fBdouble\fR \fBgamma\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBgammaf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBgammal\fR(\fBlong double\fR \fIx\fR);
.fi

.LP
.nf
\fBdouble\fR \fBlgamma_r\fR(\fBdouble\fR \fIx\fR, \fBint *\fR\fIsigngamp\fR);
.fi

.LP
.nf
```



```
\fBfloat\fR \fBlgammaf_r\fR(\fBfloat\fR \fIx\fR, \fBint *\fR\fIsigngamp\fR);
.fi

.LP
.nf
\fBlong double\fR \fBlgammal_r\fR(\fBlong double\fR \fIx\fR, \fBint *\fR\fIsigng
.fi

.LP
.nf
\fBdouble\fR \fBgamma_r\fR(\fBdouble\fR \fIx\fR, \fBint *\fR\fIsigngamp\fR);
.fi

.LP
.nf
\fBfloat\fR \fBgammaf_r\fR(\fBfloat\fR \fIx\fR, \fBint *\fR\fIsigngamp\fR);
.fi

.LP
.nf
\fBlong double\fR \fBgammal_r\fR(\fBlong double\fR \fIx\fR, \fBint *\fR\fIsignga
.fi

.SH DESCRIPTION
.sp
.LP
These functions return
.sp
ln||~(x)|
.sp
.LP
where
.sp
|~(x) = integral from 0 to +Infinity of pow(t,x-1)*exp(-t) dt
.sp
.LP
for x > 0 and
.sp
|~(x) = n/(|~(1-x)sin(nx))
.sp
.LP
for x < 1.
.sp
.LP
These functions use the external integer \fBsigngam\fR to return the sign of
\fB|~(x)\fR while \fBlgamma_r()\fR and \fBgamma_r()\fR use the user-allocated
space addressed by \fBsigngamp\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the logarithmic gamma of
\fIx\fR.
.sp
.LP
If \fIx\fR is a non-positive integer, a pole error occurs and these functions
return +\fBHUGE_VAL\fR, +\fBHUGE_VALF\fR, and +\fBHUGE_VALL\fR, respectively.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is 1 or 2, +0 shall be returned.
.sp
.LP
If \fIx\fR is \(+-Inf, +Inf is returned.
.SH ERRORS
```

```
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBPole Error\fR
.ad
.RS 14n
.rt
The \fIx\fR argument is a negative integer or 0.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the divide-by-zero floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
In the case of \fBlgamma()\fR, do not use the expression
\fBsigngam*exp(lgamma(x))\fR to compute
.sp
'g  := |~(x)'
.sp
.LP
Instead compute \fBlgamma()\fR first:
.sp
.LP
\fBlg = lgamma(x); g = signgam*exp(lg);\fR
.sp
.LP
only after \fBlgamma()\fR has returned can \fBsigngam\fR be correct. Note that
\fB|~(x)\fR must overflow when \fIx\fR is large enough, underflow when
\(mi\fIx\fR is large enough, and generate a division by 0 exception at the
singularities \fIx\fR a nonpositive integer.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GSee below.
_
MT-Level^GSee below.
.TE

.sp
.LP
The \fBlgamma()\fR, \fBlgammaf()\fR, \fBlgammal()\fR, and \fBgamma()\fR
```



```
functions are Standard. The \fBlgamma_r()\fR, \fBlgammaf_r()\fR,
\fBlgammal_r()\fR, \fBgamma_r()\fR, \fBgammaf_r()\fR, and \fBgammal_r()\fR,
functions are Stable.
.sp
.LP
The \fBlgamma()\fR, \fBlgammaf()\fR, \fBlgammal()\fR, \fBgamma()\fR,
\fBgammaf()\fR, and \fBgammal()\fR functions are Unsafe in multithreaded
applications. The \fBlgamma_r()\fR, \fBlgammaf_r()\fR, \fBlgammal_r()\fR,
\fBgamma_r()\fR, \fBgammaf_r()\fR, and \fBgammal_r()\fR functions are MT-Safe
and should be used instead.
.SH SEE ALSO
.sp
.LP
\fBexp\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
.SH NOTES
.sp
.LP
When compiling multithreaded applications, the \fB_REENTRANT\fR flag must be
defined on the compile line.  This flag should only be used in multithreaded
applications.
```

```
**********************************************************
    5032 Sat May 10 12:10:16 2014
new/usr/src/man/man3m/llrint.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH llrint 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
llrint, llrintf, llrintl \- round to nearest integer value using current
rounding direction
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBlong long\fR \fBllrint\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBlong long\fR \fBllrintf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong long\fR \fBllrintl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions round their argument to the nearest integer value, rounding
according to the current rounding direction.
.SH RETURN VALUES
.sp
.LP
 Upon successful completion, these functions return the rounded integer value.
.sp
.LP
If \fIx\fR is NaN, a domain error occurs and an unspecified value is returned.
.sp
.LP
If \fIx\fR is +Inf, a domain error occurs and an unspecified value is returned.
.sp
.LP
If \fIx\fR is -Inf, a domain error occurs and an unspecified value is returned.
.sp
.LP
If the correct value is positive and too large to represent as a \fBlong
long\fR, a domain error occurs and an unspecified value is returned.
.sp
.LP
 If the correct value is negative and too large to represent as a \fBlong
long\fR, a domain error occurs and an unspecified value is returned.
.SH ERRORS
.sp
```



```
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is NaN or \(+-Inf, or the correct value is not
representable as an integer.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception will be raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
These functions provide floating-to-integer conversions. They round according
to the current rounding direction. If the rounded value is outside the range of
the return type, the numeric result is unspecified and the invalid
floating-point exception is raised. When they raise no other floating-point
exception and the result differs from the argument, they raise the inexact
floating-point exception.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBlrint\fR(3M),
\fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4965 Sat May 10 12:10:16 2014
new/usr/src/man/man3m/llround.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH llround 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
llround, llroundf, llroundl \- round to nearest integer value
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBlong long\fR \fBllround\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBlong long\fR \fBllroundf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong long\fR \fBllroundl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions rounds their argument to the nearest integer value, rounding
halfway cases away from 0 regardless of the current rounding direction.
.SH RETURN VALUES
.sp
.LP
 Upon successful completion, these functions return the rounded integer value.
.sp
.LP
If \fIx\fR is NaN, a domain error occurs and an unspecified value is returned.
.sp
.LP
If \fIx\fR is +Inf, a domain error occurs and an unspecified value is returned.
.sp
.LP
If \fIx\fR is -Inf, a domain error occurs and an unspecified value is returned.
.sp
.LP
If the correct value is positive and too large to represent as a \fBlong
long\fR, a domain error occurs and an unspecified value is returned.
.sp
.LP
 If the correct value is negative and too large to represent as a \fBlong
long\fR, a domain error occurs and an unspecified value is returned.
.SH ERRORS
.sp
.LP
```



```
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is NaN or \(+-Inf, or the correct value is not
representable as an integer.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception will be raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
These functions differ from the \fBllrint\fR(3M) functions in that the default
rounding direction for the \fBllround()\fR functions round halfway cases away
from 0 and need not raise the inexact floating-point exception for non-integer
arguments that round to within the range of the return type.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBllrint\fR(3M),
\fBlrint\fR(3M), \fBlround\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    5186 Sat May 10 12:10:17 2014
new/usr/src/man/man3m/log.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH log 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
log, logf, logl \- natural logarithm function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBlog\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBlogf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBlogl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the natural logarithm of their argument \fIx\fR,
log(\fIe\fR)(\fIx\fR).
.SH RETURN VALUES
.sp
.LP
Upon successful completion, \fBlog()\fR returns the natural logarithm of
\fIx\fR.
.sp
.LP
If \fIx\fR is \(+-0, a pole error occurs and \fBlog()\fR, \fBlogf()\fR, and
\fBlogl()\fR return \(mi\fBHUGE_VAL\fR, \(mi\fBHUGE_VALF\fR, and
\(mi\fBHUGE_VALL\fR, respectively.
.sp
.LP
For finite values of \fIx\fR that are less than 0, or if \fIx\fR is \(miInf, a
domain error occurs and a NaN is returned.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is 1, +0 is returned.
.sp
.LP
If \fIx\fR is +Inf, \fIx\fR is returned.
```



```
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBlog()\fR as specified by SVID3 and XPG3.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The finite value of \fIx\fR is negative, or \fIx\fR is -Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.sp
The \fBlog()\fR function sets \fBerrno\fR to \fBEDOM\fR if the value of \fIx\fR
is negative.
.RE

.sp
.ne 2
.mk
.na
\fBPole Error\fR
.ad
.RS 16n
.rt
The value of \fIx\fR is 0.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the divide-by-zero floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBlog()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBlogf()\fR and
\fBlogl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
```

```
128 _
129 Interface Stability^GStandard
130 _
131 MT-Level^GMT-Safe
132 .TE

134 .SH SEE ALSO
135 .sp
136 .LP
137 \fBexp\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
138 \fBisnan\fR(3M), \fBlog10\fR(3M), \fBlog1p\fR(3M), \fBmath.h\fR(3HEAD),
139 \fBmatherr\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    5179 Sat May 10 12:10:17 2014
new/usr/src/man/man3m/log10.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH log10 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
log10, log10f, log10l \- base 10 logarithm function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBlog10\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBlog10f\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBlog10l\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the base 10 logarithm of \fIx\fR, log(10)(\fIx\fR).
.SH RETURN VALUES
.sp
.LP
Upon successful completion, \fBlog10()\fR returns the base 10 logarithm of
\fIx\fR.
.sp
.LP
If \fIx\fR is \(+-0, a pole error occurs and \fBlog10()\fR, \fBlog10f()\fR, and
\fBlog10l()\fR return \(mi\fBHUGE_VAL\fR, \(mi\fBHUGE_VALF\fR, and
\(mi\fBHUGE_VALL\fR, respectively.
.sp
.LP
For finite values of \fIx\fR that are less than 0, or if \fIx\fR is \(miInf, a
domain error occurs and a NaN is returned.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is 1, +0 is returned.
.sp
.LP
If \fIx\fR is +Inf, \fIx\fR is returned.
.sp
```



```
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBlog10()\fR as specified by SVID3 and XPG3.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The finite value of \fIx\fR is negative, or \fIx\fR is -Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.sp
The \fBlog10()\fR function sets \fBerrno\fR to \fBEDOM\fR if the value of
\fIx\fR is negative.
.RE

.sp
.ne 2
.mk
.na
\fBPole Error\fR
.ad
.RS 16n
.rt
The value of \fIx\fR is 0.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the divide-by-zero floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBlog10()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBlog10f()\fR
and \fBlog10l()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
```

```
128 Interface Stability^GStandard
129 _
130 MT-Level^GMT-Safe
131 .TE

133 .SH SEE ALSO
134 .sp
135 .LP
136 \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBisnan\fR(3M),
137 \fBlog\fR(3M), \fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBpow\fR(3M),
138 \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    5114 Sat May 10 12:10:17 2014
new/usr/src/man/man3m/log1p.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH log1p 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
log1p, log1pf, log1pl \- compute natural logarithm
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBlog1p\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBlog1pf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBlog1pl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute log(e)(1.0 + \fIx\fR).
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the natural logarithm of 1.0
+ \fIx\fR.
.sp
.LP
If \fIx\fR is \(mi1, a pole error occurs and \fBlog1p()\fR, \fBlog1pf()\fR, and
\fBlog1pl()\fR return \(mi\fBHUGE_VAL\fR, \(mi\fBHUGE_VALF\fR, and
\(mi\fBHUGE_VALL\fR, respectively.
.sp
.LP
For finite values of \fIx\fR that are less than \(mi1, or if \fIx\fR is
\(miInf, a domain error occurs and a NaN is returned.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or +Inf, \fIx\fR is returned.
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBlog1p()\fR as specified by SVID3 and XPG3.
```



```
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The finite value of \fIx\fR is less than \(mi1, or \fIx\fR is -Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.sp
The \fBlog1p()\fR function sets \fBerrno\fR to \fBEDOM\fR if the value of
\fIx\fR is less than \(mi1.
.RE

.sp
.ne 2
.mk
.na
\fBPole Error\fR
.ad
.RS 16n
.rt
The value of \fIx\fR is \(mi1.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the divide-by-zero floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBlog1p()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBlog1pf()\fR
and \fBlog1pl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
```

```
128 .TE

130 .SH SEE ALSO
131 .sp
132 .LP
133 \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBlog\fR(3M),
134 \fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4639 Sat May 10 12:10:17 2014
new/usr/src/man/man3m/log2.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH log2 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
log2, log2f, log2l \- compute base 2 logarithm functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBlog2\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBlog2f\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBlog2l\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the base 2 logarithm of their argument \fIx\fR,
\fBlog2\fR(\fIx\fR).
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the base 2 logarithm of
\fIx\fR.
.sp
.LP
If \fIx\fR is \(+-0, a pole error occurs and \fBlog2()\fR, \fBlog2f()\fR, and
\fBlog2l()\fR return \(mi\fBHUGE_VAL\fR, \(mi\fBHUGE_VALF\fR, and
\(mi\fBHUGE_VALL\fR, respectively.
.sp
.LP
For finite values of \fIx\fR that are less than 0,  or if \fIx\fR is \(miInf a
domain error occurs and a NaN is returned.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is 1, +0 is returned.
.sp
.LP
If \fIx\fR is +Inf, \fIx\fR is returned.
.SH ERRORS
```



```
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The finite value of \fIx\fR is less than 0, or \fIx\fR is \(miInf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception is raised.
.RE

.sp
.ne 2
.mk
.na
\fBPole Error\fR
.ad
.RS 16n
.rt
The value of \fIx\fR is 0.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the divide-by-zero floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBlog\fR(3M),
\fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    5520 Sat May 10 12:10:17 2014
new/usr/src/man/man3m/logb.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH logb 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
logb, logbf, logbl \- radix-independent exponent
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBlogb\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBlogbf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBlogbl\fR(\fBlong double\fR \fIx\fR);
.fi

.LP
.nf
cc [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBlogb\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBlogbf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBlogbl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the exponent of \fIx\fR, which is the integral part of
log(\fIr\fR) |\fIx\fR|, as a signed floating point value, for non-zero \fIx\fR,
where \fIr\fR is the radix of the machine's floating-point arithmetic, which is
the value of \fBFLT_RADIX\fR defined in the <\fBfloat.h\fR> header.
.SH RETURN VALUES
.sp
.LP
```



```
Upon successful completion, these functions return the exponent of \fIx\fR.
.sp
.LP
If \fIx\fR is subnormal:
.RS +4
.TP
.ie t \(bu
.el o
For SUSv3-conforming applications compiled with the \fBc99\fR compiler driver
(see \fBstandards\fR(5)), the exponent of \fIx\fR as if \fIx\fR were normalized
is returned.
.RE
.RS +4
.TP
.ie t \(bu
.el o
Otherwise, if compiled with the \fBcc\fR compiler driver, \(mi1022, \(mi126,
and \(mi16382 are returned for \fBlogb()\fR, \fBlogbf()\fR, and \fBlogbl()\fR,
respectively.
.RE
.sp
.LP
If \fIx\fR is \(+-0, a pole error occurs and \fBlogb()\fR, \fBlogbf()\fR, and
\fBlogbl()\fR return \(mi\fBHUGE_VAL\fR, \(mi\fBHUGE_VALF\fR, and
\(mi\fBHUGE_VALL\fR, respectively.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, +Inf is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBPole Error\fR
.ad
.RS 14n
.rt
The value of \fIx\fR is \(+-0.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the divide-by-zero floating-point exception is raised.
.sp
The \fBlogb()\fR function sets \fBerrno\fR to \fBEDOM\fR if the value of
\fIx\fR is 0.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBlogb()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBlogbf()\fR
and \fBlogbl()\fR functions do not set \fBerrno\fR.
```

```
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBilogb\fR(3M),
\fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBscalb\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    4588 Sat May 10 12:10:17 2014
new/usr/src/man/man3m/lrint.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH lrint 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
lrint, lrintf, lrintl \- round to nearest integer value using current rounding
direction
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBlong\fR \fBlrint\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBlong\fR \fBlrintf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong\fR \fBlrintl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions round their argument to the nearest integer value, rounding
according to the current rounding direction.
.SH RETURN VALUES
.sp
.LP
 Upon successful completion, these functions return the rounded integer value.
.sp
.LP
If \fIx\fR is NaN, a domain error occurs and an unspecified value is returned.
.sp
.LP
If \fIx\fR is +Inf, a domain error occurs and an unspecified value is returned.
.sp
.LP
If \fIx\fR is \(miInf, a domain error occurs and an unspecified value is
returned.
.sp
.LP
If the correct value is positive and too large to represent as a \fBlong\fR, a
domain error occurs and an unspecified value is returned.
.sp
.LP
If the correct value is negative and too large to represent as a \fBlong\fR, a
domain error occurs and an unspecified value is returned.
.SH ERRORS
```



```
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is NaN or \(+-Inf, or the correct value is not
representable as an integer.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBllrint\fR(3M),
\fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4594 Sat May 10 12:10:17 2014
new/usr/src/man/man3m/lround.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH lround 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
lround, lroundf, lroundl \- round to nearest integer value
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBlong\fR \fBlround\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBlong\fR \fBlroundf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong\fR \fBlroundl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions round their argument to the nearest integer value, rounding
halfway cases away from zero, regardless of the current rounding direction.
.SH RETURN VALUES
.sp
.LP
 Upon successful completion, these functions return the rounded integer value.
.sp
.LP
If \fIx\fR is NaN, a domain error occurs and an unspecified value is returned.
.sp
.LP
If \fIx\fR is +Inf, a domain error occurs and an unspecified value is returned.
.sp
.LP
If \fIx\fR is \(miInf, a domain error occurs and an unspecified value is
returned.
.sp
.LP
If the correct value is positive and too large to represent as a \fBlong\fR, a
domain error occurs and an unspecified value is returned.
.sp
.LP
If the correct value is negative and too large to represent as a \fBlong\fR, a
domain error occurs and an unspecified value is returned.
.SH ERRORS
.sp
```



```
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is NaN or \(+-Inf, or the correct value is not
representable as an integer.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBllround\fR(3M),
\fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
   11309 Sat May 10 12:10:17 2014
new/usr/src/man/man3m/matherr.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH matherr 3M "23 Sep 1997" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
matherr \- math library exception-handling function
.SH SYNOPSIS
.LP
.nf
#include <math.h>

\fBint\fR \fBmatherr\fR(\fBstruct exception *\fR\fIexc\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The System V Interface Definition, Third Edition (SVID3) specifies that certain
\fBlibm\fR functions call \fBmatherr()\fR when exceptions are detected. Users
may define their own mechanisms for handling exceptions, by including a
function named \fBmatherr()\fR in their programs. The \fBmatherr()\fR function
is of the form described above. When an exception occurs, a pointer to the
exception structure \fIexc\fR will be passed to the user-supplied
\fBmatherr()\fR function.  This structure, which is defined in the
\fB<math.h>\fR header file, is as follows:
.sp
.in +2
.nf
struct exception {
        int type;
        char *name;
        double arg1, arg2, retval;
};
.fi
.in -2

.sp
.LP
The \fBtype\fR member is an integer describing the type of exception that has
occurred, from the following list of constants (defined in the header file):
.sp
.ne 2
.mk
.na
\fB\fBDOMAIN\fR\fR
.ad
.RS 13n
.rt
argument domain exception
.RE

.sp
.ne 2
.mk
.na
\fB\fBSING\fR\fR
.ad
.RS 13n
.rt
```



```
argument singularity
.RE

.sp
.ne 2
.mk
.na
\fB\fBOVERFLOW\fR\fR
.ad
.RS 13n
.rt
overflow range exception
.RE

.sp
.ne 2
.mk
.na
\fB\fBUNDERFLOW\fR\fR
.ad
.RS 13n
.rt
underflow range exception
.RE

.sp
.ne 2
.mk
.na
\fB\fBTLOSS\fR\fR
.ad
.RS 13n
.rt
total loss of significance
.RE

.sp
.ne 2
.mk
.na
\fB\fBPLOSS\fR\fR
.ad
.RS 13n
.rt
partial loss of significance
.RE

.sp
.LP
Both \fBTLOSS\fR and \fBPLOSS\fR reflect limitations of particular algorithms
for trigonometric functions that suffer abrupt declines in accuracy at definite
boundaries. Since the implementation does not suffer such abrupt declines,
\fBPLOSS\fR is never signaled. \fBTLOSS\fR is signaled for Bessel functions
\fIonly\fR to satisfy SVID3 requirements.
.sp
.LP
The \fBname\fR member points to a string containing the name of the function
that incurred the exception. The \fBarg1\fR and \fBarg2\fR members are the
arguments with which the function was invoked. \fBretval\fR is set to the
default value that will be returned by the function unless the user's
\fBmatherr()\fR sets it to a different value.
.sp
.LP
If the user's \fBmatherr()\fR function returns non-zero, no exception message
will be printed and \fBerrno\fR is not set.
.SH SVID3 STANDARD CONFORMANCE
```

```
.sp
.LP
When an application is built as a SVID3 conforming application (see
\fBstandards\fR(5)), if \fBmatherr()\fR is not supplied by the user, the
default matherr exception-handling mechanisms, summarized in the table below,
are invoked upon exception:
.sp
.ne 2
.mk
.na
\fB\fBDOMAIN\fR\fR
.ad
.RS 13n
.rt
0.0 is usually returned, \fBerrno\fR is set to \fBEDOM\fR and a message is
usually printed on standard error.
.RE

.sp
.ne 2
.mk
.na
\fB\fBSING\fR\fR
.ad
.RS 13n
.rt
The largest finite single-precision number, \fBHUGE\fR of appropriate sign, is
returned, \fBerrno\fR is set to \fBEDOM\fR, and a message is printed on
standard error.
.RE

.sp
.ne 2
.mk
.na
\fB\fBOVERFLOW\fR\fR
.ad
.RS 13n
.rt
The largest finite single-precision number, \fBHUGE\fR of appropriate sign, is
usually returned and \fBerrno\fR is set to \fBERANGE\fR.
.RE

.sp
.ne 2
.mk
.na
\fB\fBUNDERFLOW\fR\fR
.ad
.RS 13n
.rt
0.0 is returned and \fBerrno\fR is set to \fBERANGE\fR.
.RE

.sp
.ne 2
.mk
.na
\fB\fBTLOSS\fR\fR
.ad
.RS 13n
.rt
0.0 is returned, \fBerrno\fR is set to \fBERANGE\fR, and a message is printed
on standard error.
.RE
```



```
.sp
.LP
In general, \fBerrno\fR is not a reliable error indicator because it can be
unexpectedly set by a function in a handler for an asynchronous signal.
.SS "SVID3 ERROR HANDLING PROCEDURES (compile with cc \e-Xt)"
.sp

.sp
.TS
tab(^G) box;
cw(1.29i) |cw(.81i) |cw(.79i) |cw(.87i) |cw(1.03i) |cw(.71i)
lw(1.29i) |lw(.81i) |lw(.79i) |lw(.87i) |lw(1.03i) |lw(.71i)
.
<math.h> type^GDOMAIN^GSING^GOVERFLOW^GUNDERFLOW^GTLOSS
_
\fBerrno\fR^GEDOM^GEDOM^GERANGE^GERANGE^GERANGE
_
IEEE Exception^GInvalid Operation^GDivision by Zero^GOverflow^GUnderflow^G\(mi
_
fp_exception_type^Gfp_invalid^Gfp_division^Gfp_overflow^Gfp_underflow^G\(mi
_
ACOS, ASIN\|(|x| > 1):^GMd, 0.0^G\(mi^G\(mi^G\(mi^G\(mi
_
ACOSH\|(x < 1), ATANH\|(|x| > 1):^GNaN^G\(mi^G\(mi^G\(mi^G\(mi
_
ATAN2\|(0,0):^GMd, 0.0^G\(mi^G\(mi^G\(mi^G\(mi
_
COSH, SINH:^G\(mi^G\(mi^G\(+-HUGE^G\(mi^G\(mi
_
EXP:^G\(mi^G\(mi^G+HUGE^G0.0^G\(mi
_
FMOD\|(x,0):^Gx^G\(mi^G\(mi^G\(mi^G\(mi
_
HYPOT:^G\(mi^G\(mi^G+HUGE^G\(mi^G\(mi
_
J0, J1, JN\|(|x| > X_TLOSS):^G\(mi^G\(mi^G\(mi^G\(mi^GMt, 0.0
_
LGAMMA:^G^G^G^G^G
 usual cases^G\(mi^G\(mi^G+HUGE^G\(mi^G\(mi
 (x = 0 or \(miinteger) ^G\(mi^GMs, +HUGE^G\(mi^G\(mi^G\(mi
_
LOG, LOG10:^G^G^G^G^G
 (x < 0)^GMd, \(miHUGE^G\(mi^G \(mi^G\(mi^G\(mi
 (x = 0)^G\(mi^GMs, \(miHUGE^G\(mi^G\(mi^G\(mi
_
POW:^G^G^G^G^G
 usual cases^G\(mi^G\(mi^G\(+-HUGE^G\(+-0.0^G\(mi
 (x < 0) ** (y not an integer)^GMd, 0.0^G\(mi^G\(mi^G\(mi^G\(mi
 0 ** 0^GMd, 0.0^G\(mi^G\(mi^G\(mi^G\(mi
 0 ** (y < 0)^GMd, 0.0^G\(mi^G\(mi^G\(mi^G
_
REMAINDER\|(x,0):^GNaN^G\(mi^G\(mi^G\(mi^G\(mi
_
SCALB:^G\(mi^G\(mi^G\(+-HUGE_VAL^G\(+-0.0^G\(mi
_
SQRT\|(x < 0):^GMd, 0.0^G\(mi^G\(mi^G\(mi^G\(mi
_
Y0, Y1, YN:^G^G^G^G^G
 (x < 0)^GMd, \(miHUGE^G\(mi^G\(mi^G\(mi^G\(mi
 (x = 0)^G\(mi^GMd, \(miHUGE^G\(mi^G\(mi^G\(mi
 (x > X_TLOSS)^G\(mi^G\(mi^G\(mi^G\(mi^GMt, 0.0
.TE

.SS "Abbreviations"
.sp
.ne 2
```

```
.mk
.na
\fBMd\fR
.ad
.RS 12n
.rt
Message is printed (DOMAIN error).
.RE

.sp
.ne 2
.mk
.na
\fBMs\fR
.ad
.RS 12n
.rt
Message is printed (SING error).
.RE

.sp
.ne 2
.mk
.na
\fBMt\fR
.ad
.RS 12n
.rt
Message is printed (TLOSS error).
.RE

.sp
.ne 2
.mk
.na
\fBNaN\fR
.ad
.RS 12n
.rt
IEEE NaN result and invalid operation exception.
.RE

.sp
.ne 2
.mk
.na
\fBHUGE\fR
.ad
.RS 12n
.rt
Maximum finite single-precision floating-point number.
.RE

.sp
.ne 2
.mk
.na
\fBHUGE_VAL\fR
.ad
.RS 12n
.rt
IEEE \(if result and division-by-zero exception.
.RE

.sp
.ne 2
```



```
.mk
.na
\fBX_TLOSS\fR
.ad
.RS 12n
.rt
The value X_TLOSS is defined in <values.h>.
.RE

.sp
.LP
The interaction of IEEE arithmetic and \fBmatherr()\fR is not defined when
executing under IEEE rounding modes other than the default round to nearest:
\fBmatherr()\fR is not always called on overflow or underflow and can return
results that differ from those in this table.
.SH X/OPEN COMMON APPLICATION ENVIRONMENT (CAE) SPECIFICATIONS CONFORMANCE
.sp
.LP
The X/Open System Interfaces and Headers (XSH) Issue 3 and later revisions of
that specification no longer sanctions the use of the \fBmatherr\fR interface.
The following table summarizes the values returned in the exceptional cases.
In general, XSH dictates that as long as one of the input argument(s) is a NaN,
NaN is returned. In particular, \fBpow(NaN,0)\fR = NaN.
.SS "CAE SPECIFICATION ERROR HANDLING PROCEDURES (compile with cc \fB-Xa\fR)"
.sp

.sp
.TS
tab(^G) box;
cw(.82i) |cw(1.03i) |cw(1i) |cw(.97i) |cw(.96i) |cw(.72i)
lw(.82i) |lw(1.03i) |lw(1i) |lw(.97i) |lw(.96i) |lw(.72i)
.
<math.h> type^GDOMAIN^GSING^GOVERFLOW^GUNDERFLOW^GTLOSS
_
\fBerrno\fR^GEDOM^GEDOM^GERANGE^GERANGE^GERANGE
_
ACOS, ASIN\|(|x| > 1):^G0.0^G\(mi^G\(mi^G\(mi^G\(mi
_
ATAN2\|(0,0):^G0.0^G\(mi^G\(mi^G\(mi^G\(mi
_
COSH, SINH:^G\(mi^G\(mi^G{\(+-HUGE_VAL}^G\(mi^G\(mi
_
EXP:^G\(mi^G\(mi^G{+HUGE_VAL}^G{0.0}^G\(mi
_
FMOD\|(x,0):^G{NaN}^G\(mi^G\(mi^G\(mi^G\(mi
_
HYPOT:^G\(mi^G\(mi^G{+HUGE_VAL}^G\(mi^G\(mi
_
J0, J1, JN\|(|x| > X_TLOSS):^G\(mi^G\(mi^G\(mi^G\(mi^G{0.0}
_
LGAMMA:^G^G^G^G^G
 usual cases^G\(mi^G\(mi^G{+HUGE_VAL}^G\(mi^G\(mi
 (x = 0 or \(miinteger) ^G\(mi^G+HUGE_VAL^G\(mi^G\(mi^G\(mi
_
LOG, LOG10:^G^G^G^G^G
 (x < 0)^G\fB-HUGE_VAL\fR^G\(mi^G\(mi^G\(mi^G\(mi
 (x = 0)^G\(mi^G\fB-HUGE_VAL\fR^G\(mi^G\(mi^G\(mi
_
POW:^G^G^G^G^G
 usual cases^G\(mi^G\(mi^G\(+-HUGE_VAL^G\(+-0.0^G\(mi
 (x < 0) ** (y not an integer)^G0.0^G\(mi^G\(mi^G\(mi^G\(mi
 0 ** 0^G{1.0}^G\(mi^G\(mi^G\(mi^G\(mi
 0 ** (y < 0)^G{\fB-HUGE_VAL\fR}^G\(mi^G\(mi^G\(mi^G\(mi
_
SQRT\|(x < 0):^G0.0^G\(mi^G\(mi^G\(mi^G\(mi
_
```

```
Y0, Y1, YN:^G^G^G^G^G
 (x < 0)^G{\fB-HUGE_VAL\fR}^G\(mi^G\(mi^G\(mi^G\(mi
 (x = 0)^G\(mi^G{\fB-HUGE_VAL\fR}^G\(mi^G\(mi^G\(mi
 (x > X_TLOSS)^G\(mi^G\(mi^G\(mi^G\(mi^G0.0
.TE

.SS "Abbreviations"
.sp
.ne 2
.mk
.na
\fB{...}\fR
.ad
.RS 12n
.rt
\fBerrno\fR is not to be relied upon in all braced cases.
.RE

.sp
.ne 2
.mk
.na
\fBNaN\fR
.ad
.RS 12n
.rt
IEEE NaN result and invalid operation exception.
.RE

.sp
.ne 2
.mk
.na
\fBHUGE_VAL\fR
.ad
.RS 12n
.rt
IEEE \(if result and division-by-zero exception.
.RE

.sp
.ne 2
.mk
.na
\fBX_TLOSS\fR
.ad
.RS 12n
.rt
The value X_TLOSS is defined in <\fBvalues.h\fR>.
.RE

.SH ANSI/ISO-C STANDARD CONFORMANCE
.sp
.LP
The ANSI/ISO-C standard covers a small subset of the CAE specification.
.sp
.LP
The following table summarizes the values returned in the exceptional cases.
.SS "ANSI/ISO-C ERROR HANDLING PROCEDURES (compile with cc \fB-Xc\fR)"
.sp

.sp
.TS
tab(^G) box;
cw(1.1i) |cw(1.1i) |cw(1.1i) |cw(1.1i) |cw(1.11i)
lw(1.1i) |lw(1.1i) |lw(1.1i) |lw(1.1i) |lw(1.11i)
```



```
.
<math.h> type^GDOMAIN^GSING^GOVERFLOW^GUNDERFLOW
_
\fBerrno\fR^GEDOM^GEDOM^GERANGE^GERANGE
_
ACOS, ASIN\|(|x| > 1):^G0.0^G\(mi^G\(mi^G\(mi
_
ATAN2\|(0,0):^G0.0^G\(mi^G\(mi^G\(mi
_
EXP:^G\(mi^G\(mi^G+HUGE_VAL^G0.0
_
FMOD\|(x,0):^GNaN^G\(mi^G\(mi^G\(mi
_
LOG, LOG10:^G^G^G^G
 (x < 0)^G\fB-HUGE_VAL\fR^G\(mi^G\(mi^G\(mi
 (x = 0)^G\(mi^G\fB-HUGE_VAL\fR^G\(mi^G\(mi
_
POW:^G^G^G^G
 usual cases^G\(mi^G\(mi^G\(+-HUGE_VAL^G\(+-0.0
 (x < 0) ** (y not an integer)^G0.0^G\(mi^G\(mi^G\(mi
 0 ** (y < 0)^G\fB-HUGE_VAL\fR^G\(mi^G\(mi^G\(mi
_
SQRT\|(x < 0):^G0.0^G\(mi^G\(mi^G\(mi
.TE

.SS "ABBREVIATIONS"
.sp
.ne 2
.mk
.na
\fBNaN\fR
.ad
.RS 12n
.rt
IEEE NaN result and invalid operation exception.
.RE

.sp
.ne 2
.mk
.na
\fBHUGE_VAL\fR
.ad
.RS 12n
.rt
IEEE \(if result and division-by-zero.
.RE

.SH EXAMPLES
.LP
\fBExample 1 \fRExample of \fBmatherr()\fR function
.sp
.in +2
.nf
#include <stdio.h>
#include <stdlib.h>
#include <math.h>

int
matherr(struct exception *x) {
    switch (x\(mi>type) {
        case DOMAIN:
            /* change sqrt to return sqrt(\(miarg1), not NaN */
   if (!strcmp(x\(mi>name, "sqrt")) {
    x\(mi>retval = sqrt(\(mix\(mi>arg1);
    return (0); /* print message and set errno */
```

```
   } /* FALLTHRU */
  case SING:
   /* all other domain or sing exceptions, print message and */
   /* abort */
   fprintf(stderr, "domain exception in %s\en", x\(mi>name);
   abort( );
   break;
  }
  return (0); /* all other exceptions, execute default procedure */
 }
.fi
.in -2

.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3918 Sat May 10 12:10:18 2014
new/usr/src/man/man3m/modf.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH modf 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
modf, modff, modfl \- decompose floating-point number
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBmodf\fR(\fBdouble\fR \fIx\fR, \fBdouble *\fR\fIiptr\fR);
.fi

.LP
.nf
\fBfloat\fR \fBmodff\fR(\fBfloat\fR \fIx\fR, \fBfloat *\fR\fIiptr\fR);
.fi

.LP
.nf
\fBlong double\fR \fBmodfl\fR(\fBlong double\fR \fIx\fR, \fBlong double *\fR\fIi
.fi

.SH DESCRIPTION
.sp
.LP
These functions break the argument \fIx\fR into integral and fractional parts,
each of which has the same sign as the argument. It stores the integral part as
a \fBdouble\fR for the \fBmodf()\fR function, a float for the \fBmodff()\fR
function, or a long double for the\fBmodfl()\fR function in the object pointed
to by \fIiptr\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the signed fractional part
of \fIx\fR.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned and *\fIiptr\fR is set to NaN.
.sp
.LP
If \fIx\fR is \(+-Inf, \(+-0 is returned and *\fIiptr\fR is set to \(+-Inf.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH USAGE
.sp
.LP
These functions compute the function result and *\fIiptr\fR such that:
.sp
```



```
.in +2
.nf
a = modf(x, &iptr) ;
x == a+*iptr ;
.fi
.in -2

.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfrexp\fR(3M), \fBisnan\fR(3M), \fBldexp\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
```

```
**********************************************************
    3664 Sat May 10 12:10:18 2014
new/usr/src/man/man3m/nan.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH nan 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
nan, nanf, nanl \- return quiet NaN
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBnan\fR(\fBconst char *\fR\fItagp\fR);
.fi

.LP
.nf
\fBfloat\fR \fBnanf\fR(\fBconst char *\fR\fItagp\fR);
.fi

.LP
.nf
\fBlong double\fR \fBnanl\fR(\fBconst char *\fR\fItagp\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The function call \fBnan\fR("\fIn\fR-char-sequence") is equivalent to:
.sp
.in +2
.nf
strtod("NAN(n-char-sequence)", (char **) NULL);
.fi
.in -2

.sp
.LP
The function call \fBnan\fR(" ") is equivalent to:
.sp
.in +2
.nf
strtod("NAN()", (char **) NULL)
.fi
.in -2

.sp
.LP
If \fItagp\fR does not point to an \fIn\fR-char sequence or an empty string,
the function call is equivalent to:
.sp
.in +2
.nf
strtod("NAN", (char **) NULL)
```



```
.fi
.in -2

.sp
.LP
Function calls to \fBnanf()\fR and \fBnanl()\fR are equivalent to the
corresponding function calls to \fBstrtof()\fR and \fBstrtold()\fR. See
\fBstrtod\fR(3C).
.SH RETURN VALUES
.sp
.LP
These functions return a quiet NaN.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBmath.h\fR(3HEAD), \fBstrtod\fR(3C), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3448 Sat May 10 12:10:18 2014
new/usr/src/man/man3m/nearbyint.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH nearbyint 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
nearbyint, nearbyintf, nearbyintl \- floating-point rounding functions
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBnearbyint\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBnearbyintf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBnearbyintl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions round their argument to an integer value in floating-point
format, using the current rounding direction and without raising the inexact
floating-point exception.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the rounded integer value.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, \(+-0 is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, \fIx\fR is returned.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
```



```
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    6331 Sat May 10 12:10:18 2014
new/usr/src/man/man3m/nextafter.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH nextafter 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
nextafter, nextafterf, nextafterl, nexttoward, nexttowardf, nexttowardl \- next
representable double-precision floating-point number
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBnextafter\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR);
.fi

.LP
.nf
\fBfloat\fR \fBnextafterf\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIy\fR);
.fi

.LP
.nf
\fBlong double\fR \fBnextafterl\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR
.fi

.LP
.nf
\fBdouble\fR \fBnexttoward\fR(\fBdouble\fR \fIx\fR, \fBlong double\fR \fIy\fR);
.fi

.LP
.nf
\fBfloat\fR \fBnexttowardf\fR(\fBfloat\fR \fIx\fR, \fBlong double\fR \fIy\fR);
.fi

.LP
.nf
\fBlong double\fR \fBnexttowardl\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR
.fi

.SH DESCRIPTION
.sp
.LP
The \fBnextafter()\fR, \fBnextafterf()\fR, and \fBnextafterl()\fR functions
compute the next representable floating-point value following \fIx\fR in the
direction of \fIy\fR. Thus, if \fIy\fR is less than \fIx\fR, \fBnextafter()\fR
returns the largest representable floating-point number less than \fIx\fR. The
\fBnextafter()\fR, \fBnextafterf()\fR, and \fBnextafterl()\fR functions return
\fIy\fR if \fIx\fR equals \fIy\fR.
.sp
.LP
The \fBnexttoward()\fR, \fBnexttowardf()\fR, and \fBnexttowardl()\fR functions
```



```
are equivalent to the corresponding \fBnextafter()\fR functions, except that
the second parameter has type \fBlong double\fR and the functions return
\fIy\fR converted to the type of the function if \fIx\fR equals \fIy\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the next representable
floating-point value following \fIx\fR in the direction of \fIy\fR.
.sp
.LP
If \fIx\fR == \fIy\fR, \fIy\fR (of the type \fIx\fR) is returned.
.sp
.LP
If \fIx\fR is finite and the correct function value would overflow, a range
error occurs and \(+-\fBHUGE_VAL\fR, \(+-\fBHUGE_VALF\fR, and
\(+-\fBHUGE_VALL\fR (with the same sign as \fIx\fR) is returned as appropriate
for the return type of the function.
.sp
.LP
If \fIx\fR or \fIy\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR != \fIy\fR and the correct function value is subnormal, zero, or
underflows, a range error occurs and either the correct function value (if
representable) or 0.0 is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 15n
.rt
The correct value overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception is raised.
.sp
The \fBnextafter()\fR function sets \fBerrno\fR to \fBERANGE\fR if the correct
value would overflow.
.RE

.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 15n
.rt
The correct value underflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the underflow floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
```

```
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBnextafter()\fR.
On return, if \fBerrno\fR is non-zero, an error has occurred. The
\fBnextafterf()\fR, \fBnextafterl()\fR. \fBnexttoward()\fR,
\fBnexttowardf()\fR, and \fBnexttowardl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    8208 Sat May 10 12:10:18 2014
new/usr/src/man/man3m/pow.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH pow 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
pow, powf, powl \- power function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBpow\fR(\fBdouble\fR x, \fBdouble\fR y);
.fi

.LP
.nf
\fBfloat\fR \fBpowf\fR(\fBfloat\fR x, \fBfloat\fR y);
.fi

.LP
.nf
\fBlong double\fR \fBpowl\fR(\fBlong double\fR x, \fBlong double\fR y);
.fi

.LP
.nf
cc [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBpow\fR(\fBdouble\fR x, \fBdouble\fR y);
.fi

.LP
.nf
\fBfloat\fR \fBpowf\fR(\fBfloat\fR x, \fBfloat\fR y);
.fi

.LP
.nf
\fBlong double\fR \fBpowl\fR(\fBlong double\fR x, \fBlong double\fR y);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the value of \fIx\fR raised to the power \fIy,\fR
\fIx\fR^y>. If \fIx\fR is negative, \fIy\fR must be an integer value.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the value of \fIx\fR raised
to the power \fIy\fR.
```



```
.sp
.LP
For finite values of \fIx\fR < 0, and finite non-integer values of \fIy\fR, a
domain error occurs and either a NaN (if representable), or an
implementation-defined value is returned.
.sp
.LP
If the correct value would cause overflow, a range error occurs and
\fBpow()\fR, \fBpowf()\fR, and \fBpowl()\fR return \fBHUGE_VAL\fR,
\fBHUGE_VALF\fR, and \fBHUGE_VALL\fR, respectively.
.sp
.LP
If \fIx\fR or \fIy\fR is a NaN, a NaN is returned unless:
.RS +4
.TP
.ie t \(bu
.el o
If \fIx\fR is +1 and \fIy\fR is NaN and the application was compiled with the
\fBc99\fR compiler driver and is therefore SUSv3-conforming (see
\fBstandards\fR(5)), 1.0 is returned.
.RE
.RS +4
.TP
.ie t \(bu
.el o
For any value of \fIx\fR (including NaN), if \fIy\fR is +0, 1.0 is returned.
.RE
.sp
.LP
For any odd integer value of \fIy\fR > 0, if \fIx\fR is \(+-0, \(+-0 is
returned.
.sp
.LP
For \fIy\fR > 0 and not an odd integer, if \fIx\fR is \(+-0, +0 is returned.
.sp
.LP
If \fIx\fR is \(+-1 and \fIy\fR is \(+-Inf, and the application was compiled
with the \fBcc\fR compiler driver, NaN is returned. If, however, the
application was compiled with the \fBc99\fR compiler driver and is therefore
SUSv3-conforming (see\fBstandards\fR(5)), 1.0 is returned.
.sp
.LP
For |\fIx\fR| < 1, if \fIy\fR is \(miInf, +Inf is returned.
.sp
.LP
For |\fIx\fR| > 1, if \fIy\fR is \(miInf, +0 is returned.
.sp
.LP
For |\fIx\fR| < 1, if \fIy\fR is +Inf, +0 is returned.
.sp
.LP
For |\fIx\fR| > 1, if \fIy\fR is +Inf, +Inf is returned.
.sp
.LP
For \fIy\fR an odd integer < 0, if \fIx\fR is \(miInf, \(mi0 is returned.
.sp
.LP
For \fIy\fR < 0 and not an odd integer, if \fIx\fR is \(miInf, +0 is returned.
.sp
.LP
For \fIy\fR an odd integer > 0, if \fIx\fR is \(miInf, \(miInf is returned.
.sp
.LP
For \fIy\fR > 0 and not an odd integer, if \fIx\fR is \(miInf, +Inf is
returned.
.sp
```

```
.LP
For \fIy\fR < 0, if \fIx\fR is +Inf, +0 is returned.
.sp
.LP
For \fIy\fR > 0, if \fIx\fR is +Inf, +Inf is returned.
.sp
.LP
For \fIy\fR an odd integer < 0, if \fIx\fR is \(+-0, a pole error occurs and
\(+-\fBHUGE_VAL\fR, \(+-\fBHUGE_VALF\fR, and \(+-\fBHUGE_VALL\fR are returned
for \fBpow()\fR, \fBpowf()\fR, and \fBpowl()\fR, respectively.
.sp
.LP
For \fIy\fR < 0 and not an odd integer, if \fIx\fR is \(+-0, a pole error
occurs and \fBHUGE_VAL\fR, \fBHUGE_VALF\fR, and \fBHUGE_VALL\fR are returned
for \fBpow()\fR, \fBpowf()\fR, and \fBpowl()\fR, respectively.
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBpow()\fR as specified by SVID3 and XPG3.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The value of \fIx\fR is negative and \fIy\fR is a finite non-integer.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.sp
The \fBpow()\fR function sets \fBerrno\fR to \fBEDOM\fR if the value of \fIx\fR
is negative and \fIy\fR is non-integral.
.RE

.sp
.ne 2
.mk
.na
\fBPole Error\fR
.ad
.RS 16n
.rt
The value of \fIx\fR is 0 and \fIy\fR is negative.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the divide-by-zero floating-point exception is raised.
.RE

.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 16n
.rt
The result overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception is raised.
```



```
.sp
The \fBpow()\fR function sets \fBerrno\fR to \fBEDOM\fR if the value to be
returned would cause overflow.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBpow()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBpowf()\fR and
\fBpowl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBexp\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBattributes\fR(5),
\fBstandards\fR(5)
.SH NOTES
.sp
.LP
Prior to Solaris 2.6,  there was a conflict between the \fBpow()\fR function in
this library and the \fBpow()\fR function in the \fBlibmp\fR library. This
conflict was resolved by prepending \fBmp_\fR to all functions in the
\fBlibmp\fR library. See \fBmp\fR(3MP) for more information.
```

```
**********************************************************
    4636 Sat May 10 12:10:18 2014
new/usr/src/man/man3m/remainder.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH remainder 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
remainder, remainderf, remainderl \- remainder function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBremainder\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR);
.fi

.LP
.nf
\fBfloat\fR \fBremainderf\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIy\fR);
.fi

.LP
.nf
\fBlong double\fR \fBremainderl\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR
.fi

.SH DESCRIPTION
.sp
.LP
These functions return the floating point remainder \fIr\fR = \fIx\fR \(mi
\fIn\fR\fIy\fR when \fIy\fR is non-zero. The value \fIn\fR is the integral
value nearest the exact value \fIx\fR/\fIy\fR. When |\fIn\fR \(mi
\fIx\fR/\fIy\fR\|| = \(12, the value \fIn\fR is chosen to be even.
.sp
.LP
The behavior of \fBremainder()\fR is independent of the rounding mode.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the floating point remainder
\fIr\fR = \fIx\fR \(mi \fIn\fR\fIy\fR when \fIy\fR is non-zero.
.sp
.LP
If \fIx\fR or \fIy\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is infinite or \fIy\fR is 0 and the other is non-NaN, a domain error
occurs and a NaN is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
```



```
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The \fIx\fR argument is \(+-Inf, or the \fIy\fR argument is \(+-0 and the other
argument is non-NaN.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception is raised.
.sp
The \fBremainder()\fR function sets \fBerrno\fR to \fBEDOM\fR if \fIy\fR
argument is 0 or the \fIx\fR argument is positive or negative infinity.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for error situations can set \fBerrno\fR to 0
before calling \fBremainder()\fR. On return, if \fBerrno\fR is non-zero, an
error has occurred. The \fBremainderf()\fR and \fBremainderl()\fR functions do
not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBabs\fR(3C), \fBdiv\fR(3C), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4647 Sat May 10 12:10:18 2014
new/usr/src/man/man3m/remquo.3m
patch11 - added LIBM man pages
**********************************************************
   1 '\" te
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  11 .TH remquo 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
  12 .SH NAME
  13 remquo, remquof, remquol \- remainder functions
  14 .SH SYNOPSIS
  15 .LP
  16 .nf
  17 c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
  18 #include <math.h>

  20 \fBdouble\fR \fBremquo\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIy\fR, \fBint *\f
  21 .fi

  23 .LP
  24 .nf
  25 \fBfloat\fR \fBremquof\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIy\fR, \fBint *\fR\
  26 .fi

  28 .LP
  29 .nf
  30 \fBlong double\fR \fBremquol\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR \fI
  31 .fi

  33 .SH DESCRIPTION
  34 .sp
  35 .LP
  36 The \fBremquo()\fR, \fBremquof()\fR, and \fBremquol()\fR functions compute the
  37 same remainder as the \fBremainder()\fR, \fBremainderf()\fR, and
  38 \fBremainderl()\fR functions, respectively. See \fBremainder\fR(3M). In the
  39 object pointed to by \fIquo\fR, they store a value whose sign is the sign of
  40 \fIx\fR/\fIy\fR and whose magnitude is congruent modulo 2^\fIn\fR to the
  41 magnitude of the integral quotient of \fIx\fR/\fIy\fR, where \fIn\fR is an
  42 integer greater than or equal to 3.
  43 .SH RETURN VALUES
  44 .sp
  45 .LP
  46 These functions return \fIx\fR REM \fIy\fR.
  47 .sp
  48 .LP
  49 If \fIx\fR or \fIy\fR is NaN, a NaN is returned.
  50 .sp
  51 .LP
  52 If \fIx\fR is \(+-Inf or \fIy\fR is 0 and the other argument is non-NaN, a
  53 domain error occurs and a NaN is returned.
  54 .SH ERRORS
  55 .sp
  56 .LP
  57 These functions will fail if:
  58 .sp
  59 .ne 2
  60 .mk
  61 .na
```



```
  62 \fBDomain Error\fR
  63 .ad
  64 .RS 16n
  65 .rt
  66 The \fIx\fR argument is Inf or the \fIy\fR argument is 0 and the other argument
  67 is non-NaN.
  68 .sp
  69 If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
  70 non-zero, then the invalid floating-point exception is raised.
  71 .RE

  73 .SH USAGE
  74 .sp
  75 .LP
  76 An application wanting to check for exceptions should call
  77 \fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
  78 return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
  79 \fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
  80 raised. An application should either examine the return value or check the
  81 floating point exception flags to detect exceptions.
  82 .SH ATTRIBUTES
  83 .sp
  84 .LP
  85 See \fBattributes\fR(5) for descriptions of the following attributes:
  86 .sp

  88 .sp
  89 .TS
  90 tab(^G) box;
  91 cw(2.75i) |cw(2.75i)
  92 lw(2.75i) |lw(2.75i)
  93 .
  94 ATTRIBUTE TYPE^GATTRIBUTE VALUE
  95 _
  96 Interface Stability^GStandard
  97 _
  98 MT-Level^GMT-Safe
  99 .TE

 101 .SH SEE ALSO
 102 .sp
 103 .LP
 104 \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBmath.h\fR(3HEAD),
 105 \fBremainder\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4034 Sat May 10 12:10:19 2014
new/usr/src/man/man3m/rint.3m
patch11 - added LIBM man pages
**********************************************************
```

```
   1 '\" te
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  12 .TH rint 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
  13 .SH NAME
  14 rint, rintf, rintl \- round-to-nearest integral value
  15 .SH SYNOPSIS
  16 .LP
  17 .nf
  18 c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
  19 #include <math.h>

  21 \fBdouble\fR \fBrint\fR(\fBdouble\fR \fIx\fR);
  22 .fi

  24 .LP
  25 .nf
  26 \fBfloat\fR \fBrintf\fR(\fBfloat\fR \fIx\fR);
  27 .fi

  29 .LP
  30 .nf
  31 \fBlong double\fR \fBrintl\fR(\fBlong double\fR \fIx\fR);
  32 .fi

  34 .SH DESCRIPTION
  35 .sp
  36 .LP
  37 These functions return the integral value (represented as a \fBdouble\fR)
  38 nearest \fIx\fR in the direction of the current rounding mode.
  39 .sp
  40 .LP
  41 If the current rounding mode rounds toward negative infinity, \fBrint()\fR is
  42 equivalent to \fBfloor\fR(3M). If the current rounding mode rounds toward
  43 positive infinity, \fBrint()\fR is equivalent to \fBceil\fR(3M).
  44 .sp
  45 .LP
  46 These functions differ from the \fBnearbyint\fR(3M), \fBnearbyintf()\fR, and
  47 \fBnearbyintl()\fR functions only in that they might raise the inexact
  48 floating-point exception if the result differs in value from the argument.
  49 .SH RETURN VALUES
  50 .sp
  51 .LP
  52 Upon successful completion, these functions return the integer (represented as
  53 a double precision number) nearest \fIx\fR in the direction of the current
  54 rounding mode.
  55 .sp
  56 .LP
  57 If \fIx\fR is NaN, a NaN is returned.
  58 .sp
  59 .LP
  60 If \fIx\fR is \(+-0 or \(+-Inf, \fIx\fR is returned.
  61 .SH ATTRIBUTES
```



```
  62 .sp
  63 .LP
  64 See \fBattributes\fR(5) for descriptions of the following attributes:
  65 .sp

  67 .sp
  68 .TS
  69 tab(^G) box;
  70 cw(2.75i) |cw(2.75i)
  71 lw(2.75i) |lw(2.75i)
  72 .
  73 ATTRIBUTE TYPE^GATTRIBUTE VALUE
  74 _
  75 Interface Stability^GStandard
  76 _
  77 MT-Level^GMT-Safe
  78 .TE

  80 .SH SEE ALSO
  81 .sp
  82 .LP
  83 \fBabs\fR(3C), \fBceil\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
  84 \fBfloor\fR(3M), \fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBnearbyint\fR(3M),
  85 \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3400 Sat May 10 12:10:19 2014
new/usr/src/man/man3m/round.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH round 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
round, roundf, roundl \- round to nearest integer value in floating-point
format
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBround\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBroundf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBroundl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions round their argument to the nearest integer value in
floating-point format, rounding halfway cases away from 0, regardless of the
current rounding direction.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the rounded integer value.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or \(+- Inf, \fIx\fR is returned.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
```



```
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBmath.h\fR(3HEAD),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    5454 Sat May 10 12:10:19 2014
new/usr/src/man/man3m/scalb.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH scalb 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
scalb, scalbf, scalbl \- load exponent of a radix-independent floating-point
number
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBscalb\fR(\fBdouble\fR \fIx\fR, \fBdouble\fR \fIn\fR);
.fi

.LP
.nf
\fBfloat\fR \fBscalbf\fR(\fBfloat\fR \fIx\fR, \fBfloat\fR \fIn\fR);
.fi

.LP
.nf
\fBlong double\fR \fBscalbl\fR(\fBlong double\fR \fIx\fR, \fBlong double\fR \fIn
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute x * \fIr\fR^n, where \fIr\fR is the radix of the
machine's floating point arithmetic. When \fIr\fR is 2, \fBscalb()\fR is
equivalent to \fBldexp\fR(3M). The value of \fIr\fR is \fBFLT_RADIX\fR which is
defined in <\fBfloat.h\fR>.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, the \fBscalb()\fR function returns \fIx\fR *
\fIr\fR^n.
.sp
.LP
If \fIx\fR or \fIn\fR is NaN, a NaN is returned.
.sp
.LP
If \fIn\fR is 0, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is \(+-Inf and \fIn\fR is not \(miInf, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is \(+-0 and \fIn\fR is not +Inf, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is \(+-0 and \fIn\fR is +Inf, a domain error occurs and a NaN is
```



```
returned.
.sp
.LP
If \fIx\fR is \(+-Inf and \fIn\fR is \(miInf, a domain error occurs and a NaN
is returned.
.sp
.LP
If the result would cause an overflow, a range error occurs and
\(+-\fBHUGE_VAL\fR (according to the sign of \fIx\fR) is returned.
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBscalb()\fR as specified by SVID3 and XPG3. See \fBstandards\fR(5).
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
If \fIx\fR is 0 and \fIn\fR is +Inf, or \fIx\fR is Inf and \fIn\fR is \(miInf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception is raised.
.RE

.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 16n
.rt
The result would overflow.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the overflow floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
```

```
128 ATTRIBUTE TYPE^GATTRIBUTE VALUE
129 _
130 Interface Stability^GSee below.
131 _
132 MT-Level^GMT-Safe
133 .TE

135 .sp
136 .LP
137 The \fBscalb()\fR function is Standard. The \fBscalbf()\fR and \fBscalbl()\fR
138 functions are Stable.
139 .SH SEE ALSO
140 .sp
141 .LP
142 \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBilogb\fR(3M),
143 \fBldexp\fR(3M), \fBlogb\fR(3M), \fBmath.h\fR(3HEAD), \fBmatherr\fR(3M),
144 \fBscalbln\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4693 Sat May 10 12:10:19 2014
new/usr/src/man/man3m/scalbln.3m
patch11 - added LIBM man pages
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.TH scalbln 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
scalbln, scalblnf, scalblnl, scalbn, scalbnf, scalbnl \- compute exponent using
FLT_RADIX
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBscalbln\fR(\fBdouble\fR \fIx\fR, \fBlong\fR \fIn\fR);
.fi

.LP
.nf
\fBfloat\fR \fBscalblnf\fR(\fBfloat\fR \fIx\fR, \fBlong\fR \fIn\fR);
.fi

.LP
.nf
\fBlong double\fR \fBscalblnl\fR(\fBlong double\fR \fIx\fR, \fBlong\fR \fIn\fR);
.fi

.LP
.nf
\fBdouble\fR \fBscalbn\fR(\fBdouble\fR \fIx\fR, \fBint\fR \fIn\fR);
.fi

.LP
.nf
\fBfloat\fR \fBscalbnf\fR(\fBfloat\fR \fIx\fR, \fBint\fR \fIn\fR);
.fi

.LP
.nf
\fBlong double\fR \fBscalbnl\fR(\fBlong double\fR \fIx\fR, \fBint\fR \fIn\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute \fIx\fR * \fBFLT_RADIX\fR^n efficiently, not normally
by computing \fBFLT_RADIX\fR^n explicitly.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return \fIx\fR *
\fBFLT_RADIX\fR^\fIn\fR>.
.sp
.LP
If the result would cause overflow, a range error occurs and these functions
```



```
return \(+-\fBHUGE_VAL\fR, \(+-\fBHUGE_VALF\fR, and \(+-\fBHUGE_VALL\fR
(according to the sign of \fIx\fR) as appropriate for the return type of the
function.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or \(+-Inf, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is 0, \fIx\fR is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 15n
.rt
The result overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the overflow floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBmath.h\fR(3HEAD),
\fBscalb\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3336 Sat May 10 12:10:19 2014
new/usr/src/man/man3m/signbit.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH signbit 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
signbit \- test sign
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBint\fR \fBsignbit\fR(\fBreal-floating\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
The \fBsignbit()\fR macro determines whether the sign of its argument value is
negative. NaNs, zeros, and infinities have a sign bit.
.SH RETURN VALUES
.sp
.LP
The \fBsignbit()\fR macro returns a non-zero value if and only if the sign of
its argument value is negative.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfpclassify\fR(3M), \fBisfinite\fR(3M), \fBisinf\fR(3M), \fBisnan\fR(3M),
\fBisnormal\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5),
```



```
\fBstandards\fR(5)
```

```
**********************************************************
    3326 Sat May 10 12:10:19 2014
new/usr/src/man/man3m/significand.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH significand 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
significand, significandf, significandl \- significand function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBsignificand\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBsignificandf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBsignificandl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
If \fIx\fR equals \fIsig \fR* 2^\fIn\fR with \fI1\fR\(<= \fIsig\fR < \fI2\fR,
then these functions return \fIsig\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return \fIsig\fR.
.sp
.LP
If \fIx\fR is either 0, \(+-Inf or NaN, \fIx\fR is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
```



```
_
Interface Stability^GStable
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBlogb\fR(3M), \fBscalb\fR(3M), \fBattributes\fR(5)
```

```
**********************************************************
    4122 Sat May 10 12:10:19 2014
new/usr/src/man/man3m/sin.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH sin 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
sin, sinf, sinl \- sine function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBsin\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBsinf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBsinl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the sine of its argument \fIx\fR, measured in radians.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the sine of \fIx\fR.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, a domain error occurs and a NaN is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
```



```
.rt
The \fIx\fR argument is \(+-Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBasin\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    1996 Sat May 10 12:10:19 2014
new/usr/src/man/man3m/sincos.3m
patch11 - added LIBM man pages
**********************************************************
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.TH sincos 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
sincos, sincosf, sincosl \- combined sine and cosine function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBvoid\fR \fBsincos\fR(\fBdouble\fR \fIx\fR, \fBdouble *\fR\fIs\fR, \fBdouble *
.fi

.LP
.nf
\fBvoid\fR \fBsincosf\fR(\fBfloat\fR \fIx\fR, \fBfloat *\fR\fIs\fR, \fBfloat *\f
.fi

.LP
.nf
\fBvoid\fR \fBsincosl\fR(\fBlong double\fR \fIx\fR, \fBlong double *\fR\fIs\fR,
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the sine and cosine of the first argument \fIx\fR,
measured in radians.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the sine of \fIx\fR in
*\fIs\fR and cosine of \fIx\fR in *\fIc\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStable
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcos\fR(3M), \fBsin\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5)
```

```
**********************************************************
    4792 Sat May 10 12:10:20 2014
new/usr/src/man/man3m/sinh.3m
patch11 - added LIBM man pages
**********************************************************
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.TH sinh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
sinh, sinhf, sinhl \- hyperbolic sine function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBsinh\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBsinhf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBsinhl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the hyperbolic sine of \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the hyperbolic sine of
\fIx\fR.
.sp
.LP
If the result would cause an overflow, a range error occurs and
\(+-\fBHUGE_VAL\fR, \(+-\fBHUGE_VALF\fR, and \(+-\fBHUGE_VALL\fR (with the same
sign as \fIx\fR) is returned as appropriate for the type of the function.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or \(+-Inf, \fIx\fR is returned.
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned by
\fBacos()\fR as specified by SVID3 and XPG3.
.SH ERRORS
.sp
.LP
These functions will fail if:
```



```
.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 15n
.rt
The result would cause an overflow.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the overflow floating-point exception is raised.
.sp
The \fBasinh()\fR function sets \fBerrno\fR to \fBERANGE\fR if the result would
cause an overflow.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBasinh()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBasinhf()\fR
and \fBasinhl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBasinh\fR(3M), \fBcosh\fR(3M), \fBfeclearexcept\fR(3M),
\fBfetestexcept\fR(3M), \fBisnan\fR(3M), \fBmath.h\fR(3HEAD),
\fBmatherr\fR(3M), \fBtanh\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4049 Sat May 10 12:10:20 2014
new/usr/src/man/man3m/sqrt.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH sqrt 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
sqrt, sqrtf, sqrtl \- square root function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBsqrt\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBsqrtf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBsqrtl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the square root of their argument \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the square root of \fIx\fR.
.sp
.LP
For finite values of \fIx\fR < \(mi0, a domain error occurs and either a NaN
(if supported) or an implementation-defined value is returned.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or +Inf, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is \(miInf, a domain error occurs and a NaN is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
```



```
.ad
.RS 16n
.rt
The finite value of \fIx\fR is < \(mi0 or \fIx\fR is \(miInf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.sp
The \fBsqrt()\fR function sets \fBerrno\fR to \fBEDOM\fR if the value of
\fIx\fR is negative.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.sp
.LP
An application can also set \fBerrno\fR to 0 before calling \fBsqrt()\fR. On
return, if \fBerrno\fR is non-zero, an error has occurred. The \fBsqrtf()\fR
and \fBsqrtl()\fR functions do not set \fBerrno\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBisnan\fR(3M),
\fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4271 Sat May 10 12:10:20 2014
new/usr/src/man/man3m/tan.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH tan 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
tan, tanf, tanl \- tangent function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBtan\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBtanf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBtanl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the tangent of their argument \fIx\fR, measured in
radians.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the tangent of \fIx\fR.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, a domain error occurs and a NaN is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
```



```
.RS 16n
.rt
The value of \fIx\fR is \(+-Inf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, the invalid floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
There are no known floating-point representations such that for a normal
argument, \fBtan\fR(\fIx\fR) is either overflow or underflow.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBatan\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3423 Sat May 10 12:10:20 2014
new/usr/src/man/man3m/tanh.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH tanh 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
tanh, tanhf, tanhl \- hyperbolic tangent function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBtanh\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBtanhf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBtanhl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the hyperbolic tangent of their argument \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the hyperbolic tangent of
\fIx\fR.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0, \fIx\fR is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, \(+-1 is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp
```



```
.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBatanh\fR(3M), \fBisnan\fR(3M), \fBmath.h\fR(3HEAD), \fBtan\fR(3M),
\fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    5060 Sat May 10 12:10:20 2014
new/usr/src/man/man3m/tgamma.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH tgamma 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
tgamma, tgammaf, tgammal \- compute gamma function
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBtgamma\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBtgammaf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBtgammal\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the \fBgamma()\fR function of \fIx\fR.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return \fBgamma\fR(\fIx\fR).
.sp
.LP
If \fIx\fR is a negative integer, a domain error occurs and a NaN is returned.
.sp
.LP
If the correct value would cause overflow, a range error occurs and
\fBtgamma()\fR, \fBtgammaf()\fR, and \fBtgammal()\fR return the value of the
macro \(+-\fBHUGE_VAL\fR, \(+-\fBHUGE_VALF\fR, or \(+-\fBHUGE_VALL\fR,
respectively.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-Inf, \fIx\fR is returned.
.sp
.LP
If x is \(+-0, a pole error occurs and \fBtgamma()\fR, \fBtgammaf()\fR, and
\fBtgammal()\fR return \(+-\fBHUGE_VAL\fR, \(+-\fBHUGE_VALF\fR, and
\(+-\fBHUGE_VALL\fR, respectively.
.sp
```



```
.LP
If \fIx\fR is +Inf, a domain error occurs and a NaN is returned.
.SH ERRORS
.sp
.LP
These functions will fail if:
.sp
.ne 2
.mk
.na
\fBDomain Error\fR
.ad
.RS 16n
.rt
The value of \fIx\fR is a negative integer or \fIx\fR is \(miInf.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the invalid floating-point exception is raised.
.RE

.sp
.ne 2
.mk
.na
\fBPole Error\fR
.ad
.RS 16n
.rt
The value of \fIx\fR is zero.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the divide-by-zero floating-point exception is raised.
.RE

.sp
.ne 2
.mk
.na
\fBRange Error\fR
.ad
.RS 16n
.rt
The value overflows.
.sp
If the integer expression (\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is
non-zero, then the overflow floating-point exception is raised.
.RE

.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
```

```
128 cw(2.75i) |cw(2.75i)
129 lw(2.75i) |lw(2.75i)
130 .
131 ATTRIBUTE TYPE^GATTRIBUTE VALUE
132 _
133 Interface Stability^GStandard
134 _
135 MT-Level^GMT-Safe
136 .TE

138 .SH SEE ALSO
139 .sp
140 .LP
141 \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBlgamma\fR(3M),
142 \fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    3333 Sat May 10 12:10:20 2014
new/usr/src/man/man3m/trunc.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH trunc 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
trunc, truncf, truncl \- round to truncated integer value
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBtrunc\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBtruncf\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBtruncl\fR(\fBlong double\fR \fIx\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions round their argument to the integer value, in floating format,
nearest to but no larger in magnitude than the argument.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the truncated integer value.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is \(+-0 or \(+-Inf, \fIx\fR is returned.
.SH ERRORS
.sp
.LP
No errors are defined.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
```



```
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GStandard
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBmath.h\fR(3HEAD), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
    4823 Sat May 10 12:10:20 2014
new/usr/src/man/man3m/y0.3m
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH y0 3M "12 Jul 2006" "SunOS 5.11" "Mathematical Library Functions"
.SH NAME
y0, y0f, y0l, y1, y1f, y1l, yn, ynf, ynl \- Bessel functions of the second kind
.SH SYNOPSIS
.LP
.nf
c99 [ \fIflag\fR... ] \fIfile\fR... \fB-lm\fR [ \fIlibrary\fR... ]
#include <math.h>

\fBdouble\fR \fBy0\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBy0f\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBy0l\fR(\fBlong double\fR \fIx\fR);
.fi

.LP
.nf
\fBdouble\fR \fBy1\fR(\fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBy1f\fR(\fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBy1l\fR(\fBlong double\fR \fIx\fR);
.fi

.LP
.nf
\fBdouble\fR \fByn\fR(\fBint\fR \fIn\fR, \fBdouble\fR \fIx\fR);
.fi

.LP
.nf
\fBfloat\fR \fBynf\fR(\fBint\fR \fIn\fR, \fBfloat\fR \fIx\fR);
.fi

.LP
.nf
\fBlong double\fR \fBynl\fR(\fBint\fR \fIn\fR, \fBlong double\fR \fIx\fR);
```



```
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute Bessel functions of \fIx\fR of the second kind of
orders 0, 1 and \fIn\fR, respectively.
.SH RETURN VALUES
.sp
.LP
Upon successful completion, these functions return the relevant Bessel value of
\fIx\fR of the second kind.
.sp
.LP
If \fIx\fR is NaN, a NaN is returned.
.sp
.LP
If \fIx\fR is negative, \(mi\fBHUGE_VAL\fR or NaN is returned.
.sp
.LP
If \fIx\fR is 0.0, \(mi\fBHUGE_VAL\fR is returned.
.sp
.LP
If the correct result would cause overflow, \(mi\fBHUGE_VAL\fR is returned.
.sp
.LP
For exceptional cases, \fBmatherr\fR(3M) tabulates the values to be returned as
specified by SVID3 and XPG3.
.SH ERRORS
.sp
.LP
No errors are returned.
.SH USAGE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. An application should either examine the return value or check the
floating point exception flags to detect exceptions.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GSee below.
_
MT-Level^GMT-Safe
.TE

.sp
.LP
The \fBy0()\fR, \fBy1()\fR, and \fByn()\fR functions are Standard. The
\fBy0f()\fR, \fBy0l()\fR, \fBy1f()\fR, \fBy1l()\fR, \fBynf()\fR, and
\fBynl()\fR functions are Stable.
.SH SEE ALSO
```

```
128 .sp
129 .LP
130 \fBisnan\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBj0\fR(3M),
131 \fBmath.h\fR(3HEAD), \fBmatherr\fR(3M), \fBattributes\fR(5), \fBstandards\fR(5)
```

```
**********************************************************
     920 Sat May 10 12:10:20 2014
new/usr/src/man/man3mvec/Makefile
patch11 - added LIBM man pages
**********************************************************
```

```
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   9 # at http://www.illumos.org/license/CDDL.
  10 #

  12 # Copyright (c) 2012, Igor Kozhukhov <ikozhukhov@gmail.com>

  14 include ../../Makefile.master

  16 MANSECT =       3mvec

  18 MANFILES =      vatan2_.3mvec \
  19                 vatan_.3mvec \
  20                 vcos_.3mvec \
  21                 vcospi_.3mvec \
  22                 vexp_.3mvec \
  23                 vhypot_.3mvec \
  24                 vlog_.3mvec \
  25                 vpow_.3mvec \
  26                 vrhypot_.3mvec \
  27                 vrsqrt_.3mvec \
  28                 vsin_.3mvec \
  29                 vsincos_.3mvec \
  30                 vsincospi_.3mvec \
  31                 vsinpi_.3mvec \
  32                 vsqrt_.3mvec \
  33                 vz_abs_.3mvec \
  34                 vz_exp_.3mvec \
  35                 vz_log_.3mvec \
  36                 vz_pow_.3mvec

  38 .KEEP_STATE:

  40 include ../Makefile.man

  42 install: $(ROOTMANFILES)
```

```
**********************************************************
    4631 Sat May 10 12:10:21 2014
new/usr/src/man/man3mvec/vatan2_.3mvec
patch11 - added LIBM man pages
**********************************************************
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.TH vatan2_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vatan2_, vatan2f_ \- vector atan2 functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvatan2_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIy\fR, \f
     \fBdouble * restrict\fR \fIx\fR, \fBint *\fR\fIstridex\fR, \fBdouble * rest
     \fBint *\fR\fIstridez\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvatan2f_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIy\fR, \f
     \fBfloat * restrict\fR \fIx\fR, \fBint *\fR\fIstridex\fR, \fBfloat * restri
     \fBint *\fR\fIstridez\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBatan2\fR(\fIy\fR, \fIx\fR) for an
entire vector of values at once. The first parameter specifies the number of
values to compute. Subsequent parameters specify the argument and result
vectors. Each vector is described by a pointer to the first element and a
stride, which is the increment between successive elements.
.sp
.LP
Specifically, \fBvatan2_\fR(\fIn,\fR \fIy\fR, \fIsy\fR, \fIx\fR, \fIsx\fR,
\fIz\fR, \fIsz\fR) computes \fIz\fR[\fIi\fR * *\fIsz\fR] =
\fBatan2\fR(\fIy\fR[\fIi\fR * *\fIsy\fR], \fIx\fR[\fIi\fR * *\fIsx\fR]) for
each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvatan2f_()\fR  function performs
the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBatan2\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
```



```
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
These functions handle special cases and exceptions in the same way as the
\fBatan2()\fR functions when \fBc99\fR \fBMATHERREXCEPT\fR conventions are in
effect. See \fBatan2\fR(3M) for the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBatan2\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4436 Sat May 10 12:10:21 2014
new/usr/src/man/man3mvec/vatan_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vatan_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vatan_, vatanf_ \- vector arctangent functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvatan_\fR(\fBint *\fR\fIn\fR,\fBdouble * restrict\fR \fIx\fR, \fBi
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvatanf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \fB
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBatan\fR(\fIx\fR) for an entire vector
of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements.
.sp
.LP
Specifically, \fBvatan_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = \fBatan\fR(\fIx\fR[\fIi\fR *
*\fIsx\fR]) for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvatanf_()\fR
function performs the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBatan\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
```



```
.sp
.LP
These functions handle special cases and exceptions in the same way as the
\fBatan()\fR functions when \fBc99\fR \fBMATHERREXCEPT\fR conventions are in
effect. See \fBatan\fR(3M) for the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBatan\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4420 Sat May 10 12:10:21 2014
new/usr/src/man/man3mvec/vcos_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vcos_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vcos_, vcosf_ \- vector cosine functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvcos_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \fBi
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvcosf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \fBi
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBcos\fR(\fIx\fR) for an entire vector
of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements.
.sp
.LP
Specifically, \fBvcos_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = \fBcos\fR(\fIx\fR[\fIi\fR * *\fIsx\fR])
for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvcosf_()\fR function
performs the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBcos\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
```



```
.sp
.LP
These functions handle special cases and exceptions in the same way as the
\fBcos()\fR functions when \fBc99\fR \fBMATHERREXCEPT\fR conventions are in
effect. See \fBcos\fR(3M) for the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcos\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4402 Sat May 10 12:10:21 2014
new/usr/src/man/man3mvec/vcospi_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vcospi_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vcospi_, vcospif_ \- vector cospi functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvcospi_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \f
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvcosfpi_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \f
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBcospi\fR(\fIx\fR), defined by
\fBcospi\fR(\fIx\fR) =  \fBcos\fR(\c
.if n pi\c
.if t \(*p
\c
 * \fIx\fR), for an entire vector of values at once. The first parameter
specifies the number of values to compute. Subsequent parameters specify the
argument and result vectors. Each vector is described by a pointer to the first
element and a stride, which is the increment between successive elements.
.sp
.LP
Specifically, \fBvcospi_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = \fBcospi\fR(\fIx\fR[\fIi\fR *
*\fIsx\fR]) for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvcospif_()\fR
function performs the same computation for single precision data.
.sp
.LP
Non-exceptional results are accurate to within a unit in the last place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
```



```
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
These functions handle special cases and exceptions in the spirit of IEEE 754.
In particular,
.RS +4
.TP
.ie t \(bu
.el o
\fBcospi\fR(NaN) is NaN,
.RE
.RS +4
.TP
.ie t \(bu
.el o
\fBcospi\fR(\(+-Inf) is NaN, and  an  invalid operation exception is raised.
.RE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBattributes\fR(5)
```

```
**********************************************************
    4578 Sat May 10 12:10:21 2014
new/usr/src/man/man3mvec/vexp_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vexp_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vexp_, vexpf_ \- vector exponential functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvexp_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \fBi
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvexpf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \fBi
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBexp\fR(\fIx\fR) for an entire vector
of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements.
.sp
.LP
Specifically, \fBvexp_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = \fBexp\fR(\fIx\fR[\fIi\fR * *\fIsx\fR])
for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvexpf_()\fR function
performs the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBexp\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
```



```
.sp
.LP
On SPARC, the \fBvexpf_()\fR function delivers +0 rather than a subnormal
result for arguments in the range -103.2789 <= \fIx\fR <= -87.3365. Otherwise,
these functions handle special cases and exceptions in the same way as the
\fBexp()\fR functions when \fBc99\fR \fBMATHERREXCEPT\fR conventions are in
effect. See \fBexp\fR(3M) for the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBexp\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4635 Sat May 10 12:10:21 2014
new/usr/src/man/man3mvec/vhypot_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vhypot_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vhypot_, vhypotf_ \- vector hypotenuse functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvhypot_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \f
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR, \fBdouble * rest
     \fBint *\fR\fIstridez\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvhypotf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \f
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR, \fBfloat * restri
     \fBint *\fR\fIstridez\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBhypot\fR(\fIx\fR, \fIy\fR) for an
entire vector of values at once. The first parameter specifies the number of
values to compute. Subsequent parameters specify the argument and result
vectors. Each vector is described by a pointer to the first element and a
stride, which is the increment between successive elements.
.sp
.LP
Specifically, \fBvhypot_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR,
\fIz\fR, \fIsz\fR) computes \fIz\fR[\fIi\fR * *\fIsz\fR] =
\fBhypot\fR(\fIx\fR[\fIi\fR * *\fIsx\fR], \fIy\fR[\fIi\fR * *\fIsy\fR]) for
each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvhypotf_()\fR function performs
the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBhypot\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
```



```
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
These functions handle special cases and exceptions in the same way as the
\fBhypot()\fR functions when \fBc99\fR \fBMATHERREXCEPT\fR conventions are in
effect. See \fBhypot\fR(3M) for the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBhypot\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4423 Sat May 10 12:10:21 2014
new/usr/src/man/man3mvec/vlog_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
.\" Copyright (c) 2007, Sun Microsystems, Inc. All Rights Reserved.
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.\" You can obtain a copy of the license at usr/src/OPENSOLARIS.LICENSE or http:
.\" When distributing Covered Code, include this CDDL HEADER in each file and in
.TH vlog_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vlog_, vlogf_ \- vector logarithm functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvlog_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \fBi
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvlogf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \fBi
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBlog\fR(\fIx\fR) for an entire vector
of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements.
.sp
.LP
Specifically, \fBvlog_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = \fBlog\fR(\fIx\fR[\fIi\fR * *\fIsx\fR])
for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvlogf_()\fR function
performs the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBlog\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
```



```
.sp
.LP
These functions handle special cases and exceptions in the same way as the
\fBlog()\fR functions when \fBc99\fR \fBMATHERREXCEPT\fR conventions are in
effect. See \fBlog\fR(3M) for the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBlog\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4782 Sat May 10 12:10:21 2014
new/usr/src/man/man3mvec/vpow_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vpow_ 3MVEC "16 Jan 2009" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vpow_, vpowf_ \- vector power functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvpow_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \fBi
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR, \fBdouble * rest
     \fBint *\fR\fIstridez\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvpowf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \fBi
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR, \fBfloat * restri
     \fBint *\fR\fIstridez\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBpow\fR(\fIx\fR, \fIy\fR) for an entire
vector of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements.
.sp
.LP
Specifically, \fBvpow_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR,
\fIz\fR, \fIsz\fR) computes \fIz\fR[\fIi\fR * *\fIsz\fR] =
\fBpow\fR(\fIx\fR[\fIi\fR * *\fIsx\fR], \fIy\fR[\fIi\fR * *\fIsy\fR]) for each
\fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvpowf_()\fR function performs the
same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBpow\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
```



```
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
The results of these functions for special cases and exceptions match that of
the \fBpow()\fR functions when the latter are used in a program compiled with
the \fBcc\fR compiler driver (that is, not SUSv3-conforming) and the expression
(\fBmath_errhandling\fR & \fBMATH_ERREXCEPT\fR) is non-zero. These functions do
not set \fBerrno\fR. See \fBpow\fR(3M) for the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBpow\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    5047 Sat May 10 12:10:22 2014
new/usr/src/man/man3mvec/vrhypot_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vrhypot_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vrhypot_, vrhypotf_ \- vector reciprocal hypotenuse functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvrhypot_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR, \fBdouble * rest
     \fBint *\fR\fIstridez\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvrhypotf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR, \fBfloat * restri
     \fBint *\fR\fIstridez\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBrhypot\fR(\fIx\fR, \fIy\fR), defined
by \fBrhypot\fR(\fIx\fR, \fIy\fR) = 1 / \fBhypot\fR(\fIx\fR, \fIy\fR), for an
entire vector of values at once. The first parameter specifies the number of
values to compute. Subsequent parameters specify the argument and result
vectors. Each vector is described by a pointer to the first element and a
stride, which is the increment between successive elements.
.sp
.LP
Specifically, \fBvrhypot_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR,
\fIz\fR, \fIsz\fR) computes \fIz\fR[\fIi\fR * *\fIsz\fR] =
\fBrhypot\fR(\fIx\fR[\fIi\fR * *\fIsx\fR], \fIy\fR[\fIi\fR * *\fIsy\fR]) for
each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvrhypotf_()\fR  function
performs the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of evaluating 1.0 / \fBhypot\fR(\fIx\fR, \fIy\fR) given the same
arguments. Non-exceptional results, however, are accurate to within a unit in
the last place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
```



```
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
These functions handle special cases and exceptions in the spirit of IEEE 754.
In particular,
.RS +4
.TP
.ie t \(bu
.el o
if x or \fIy\fR is \(+-Inf, \fBrhypot\fR(\fIx\fR, \fIy\fR) is +0, even if the
other of \fIx\fR or \fIy\fR is NaN,
.RE
.RS +4
.TP
.ie t \(bu
.el o
if x or \fIy\fR is NaN and neither is infinite, \fBrhypot\fR(\fIx\fR, \fIy\fR)
is NaN
.RE
.RS +4
.TP
.ie t \(bu
.el o
if \fIx\fR and \fIy\fR are both zero, \fBrhypot\fR(\fIx\fR, \fIy\fR) is +0, and
a division-by-zero exception is raised.
.RE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBhypot\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4750 Sat May 10 12:10:22 2014
new/usr/src/man/man3mvec/vrsqrt_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vrsqrt_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vrsqrt_, vrsqrtf_ \- vector reciprocal square root functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvrsqrt_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \f
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvrsqrtf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \f
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBrsqrt\fR(\fIx\fR), defined by
\fBrsqrt\fR(\fIx\fR) = 1 / \fBsqrt\fR(\fIx\fR), for an entire vector of values
at once. The first parameter specifies the number of values to compute.
Subsequent parameters specify the argument and result vectors. Each vector is
described by a pointer to the first element and a stride, which is the
increment between successive elements.
.sp
.LP
Specifically, \fBvrsqrt_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = \fBrsqrt\fR(\fIx\fR[\fIi\fR *
*\fIsx\fR]) for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvrsqrtf_()\fR
function performs the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of evaluating 1.0 / \fBsqrt\fR(\fIx\fR) given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
```



```
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
These functions handle special cases and exceptions in the spirit of IEEE 754.
In particular,
.RS +4
.TP
.ie t \(bu
.el o
if \fIx\fR < 0, \fBrsqrt\fR(\fIx\fR) is NaN, and an invalid operation exception
is raised,
.RE
.RS +4
.TP
.ie t \(bu
.el o
\fBrsqrt\fR(NaN) is NaN,
.RE
.RS +4
.TP
.ie t \(bu
.el o
\fBrsqrt\fR(+Inf) is +0,
.RE
.RS +4
.TP
.ie t \(bu
.el o
\fBrsqrt\fR(\(+-0) is \(+-Inf, and a division-by-zero exception is raised.
.RE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBsqrt\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4418 Sat May 10 12:10:22 2014
new/usr/src/man/man3mvec/vsin_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.\" When distributing Covered Code, include this CDDL HEADER in each file and in
.TH vsin_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vsin_, vsinf_ \- vector sine functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvsin_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \fBi
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvsinf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \fBi
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBsin\fR(\fIx\fR) for an entire vector
of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements.
.sp
.LP
Specifically, \fBvsin_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = \fBsin\fR(\fIx\fR[\fIi\fR * *\fIsx\fR])
for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvsinf_()\fR function
performs the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBsin\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
```



```
.sp
.LP
These functions handle special cases and exceptions in the same way as the
\fBsin()\fR functions when \fBc99\fR \fBMATHERREXCEPT\fR conventions are in
effect. See \fBsin\fR(3M) for the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBsin\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4763 Sat May 10 12:10:22 2014
new/usr/src/man/man3mvec/vsincos_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vsincos_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vsincos_, vsincosf_ \- vector sincos functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvsincos_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \
     \fBdouble * restrict\fR \fIs\fR, \fBint *\fR\fIstrides\fR, \fBdouble * rest
     \fBint *\fR\fIstridec\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvsincosf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \
     \fBfloat * restrict\fR \fIs\fR, \fBint *\fR\fIstrides\fR, \fBfloat * restri
     \fBint *\fR\fIstridec\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate both \fBsin\fR(\fIx\fR) and \fBcos\fR(\fIx\fR) for an
entire vector of values at once. The first parameter specifies the number of
values to compute. Subsequent parameters specify the argument and result
vectors. Each vector is described by a pointer to the first element and a
stride, which is the increment between successive elements.
.sp
.LP
Specifically, \fBvsincos_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIs\fR, \fIss\fR,
\fIc\fR, \fIsc\fR) simultaneously computes \fIs\fR[\fIi\fR * *\fIss\fR] =
\fBsin\fR(\fIx\fR[\fIi\fR * *\fIsx\fR]) and \fIc\fR[\fIi\fR * *\fIsc\fR] =
\fBcos\fR(\fIx\fR[\fIi\fR * *\fIsx\fR]) for each \fIi\fR = 0, 1, ..., *\fIn\fR
- 1. The  \fBvsincosf_()\fR function performs the same computation for single
precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBsincos\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
```



```
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
These functions handle special cases and exceptions in the same way as the
\fBsin()\fR and \fBcos()\fR functions when \fBc99\fR \fBMATHERREXCEPT\fR
conventions are in effect. See \fBsin\fR(3M) and \fBcos\fR(3M) for the results
for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcos\fR(3M), \fBsin\fR(3M), \fBsincos\fR(3M), \fBfeclearexcept\fR(3M),
\fBfetestexcept\fR(3M), \fBattributes\fR(5)
```

```
**********************************************************
    4857 Sat May 10 12:10:22 2014
new/usr/src/man/man3mvec/vsincospi_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vsincospi_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vsincospi_, vsincospif_ \- vector sincospi functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvsincospi_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR,
     \fBdouble * restrict\fR \fIs\fR, \fBint *\fR\fIstrides\fR, \fBdouble * rest
     \fBint *\fR\fIstridec\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvsincospif_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR,
     \fBfloat * restrict\fR \fIs\fR, \fBint *\fR\fIstrides\fR, \fBfloat * restri
     \fBint *\fR\fIstridec\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate both \fBsinpi\fR(\fIx\fR) and \fBcospi\fR(\fIx\fR),
defined by \fBsinpi\fR(\fIx\fR) = \fBsin\fR(\c
.if n pi\c
.if t \(*p
\c
 * \fIx\fR) and \fBcospi\fR(\fIx\fR) = \fBcos\fR(\c
.if n pi\c
.if t \(*p
\c
 * \fIx\fR), for an entire vector of values at once. The first parameter
specifies the number of values to compute. Subsequent parameters specify the
argument and result vectors. Each vector is described by a pointer to the first
element and a stride, which is the increment between successive elements.
.sp
.LP
Specifically, \fBvsincospi_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIs\fR, \fIss\fR,
\fIc\fR, \fIsc\fR) simultaneously computes \fIs\fR[\fIi\fR * *\fIss\fR] =
\fBsinpi\fR(\fIx\fR[\fIi\fR * *\fIsx\fR]) and \fIc\fR[\fIi\fR * *\fIsc\fR] =
\fBcospi\fR(\fIx\fR[\fIi\fR * *\fIsx\fR]) for each \fIi\fR = 0, 1, ...,
*\fIn\fR - 1. The  \fBvsincosf_()\fR function performs the same computation for
single precision data.
.sp
.LP
Non-exceptional results are accurate to within a unit in the last place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
```



```
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
These functions handle special cases and exceptions in the spirit of IEEE 754.
In particular,
.RS +4
.TP
.ie t \(bu
.el o
\fBsinpi\fR(NaN), \fBcospi\fR(NaN) are NaN,
.RE
.RS +4
.TP
.ie t \(bu
.el o
\fBsinpi\fR(\(+-0) is \(+-0,
.RE
.RS +4
.TP
.ie t \(bu
.el o
\fBsinpi\fR(\(+-Inf), \fBcospi\fR(\(+-Inf) are NaN, and an invalid operation
exception is raised.
.RE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBattributes\fR(5)
```

```
**********************************************************
    4461 Sat May 10 12:10:22 2014
new/usr/src/man/man3mvec/vsinpi_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vsinpi_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vsinpi_, vsinpif_ \- vector sinpi functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvsinpi_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \f
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvsinpif_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \f
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBsinpi\fR(\fIx\fR), defined by
\fBsinpi\fR(\fIx\fR) =  \fBsin\fR(\c
.if n pi\c
.if t \(*p
\c
 * \fIx\fR), for an entire vector of values at once. The first parameter
specifies the number of values to compute. Subsequent parameters specify the
argument and result vectors. Each vector is described by a pointer to the first
element and a stride, which is the increment between successive elements.
.sp
.LP
Specifically, \fBvsinpi_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = \fBsinpi\fR(\fIx\fR[\fIi\fR *
*\fIsx\fR]) for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvsinpif_()\fR
function performs the same computation for single precision data.
.sp
.LP
Non-exceptional results are accurate to within a unit in the last place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
```



```
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
These functions handle special cases and exceptions in the spirit of IEEE 754.
In particular,
.RS +4
.TP
.ie t \(bu
.el o
\fBsinpi\fR(NaN) is NaN,
.RE
.RS +4
.TP
.ie t \(bu
.el o
\fBsinpi\fR(\(+-0) is \(+-0,
.RE
.RS +4
.TP
.ie t \(bu
.el o
\fBsinpi\fR(\(+-Inf) is NaN, and an invalid operation exception is raised.
.RE
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M), \fBattributes\fR(5)
```

```
**********************************************************
    4406 Sat May 10 12:10:22 2014
new/usr/src/man/man3mvec/vsqrt_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vsqrt_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vsqrt_, vsqrtf_ \- vector square root functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvsqrt_\fR(\fBint *\fR\fIn\fR, \fBdouble * restrict\fR \fIx\fR, \fB
     \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvsqrtf_\fR(\fBint *\fR\fIn\fR, \fBfloat * restrict\fR \fIx\fR, \fB
     \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstridey\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the function \fBsqrt\fR(\fIx\fR) for an entire vector
of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements.
.sp
.LP
Specifically, \fBvsqrt_\fR(\fIn\fR, \fIx\fR, \fIsx\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = \fBsqrt\fR(\fIx\fR[\fIi\fR *
*\fIsx\fR]) for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The  \fBvsqrtf_()\fR
function performs the same computation for single precision data.
.sp
.LP
Unlike their scalar counterparts, these functions do not always deliver
correctly rounded results. However, the error in each non-exceptional result is
less than one unit in the last place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
```



```
.LP
These functions handle special  cases  and exceptions in the same way as the
\fBsqrt()\fR functions  when  \fBc99\fR  \fBMATHERREXCEPT\fR conventions are in
effect. See \fBsqrt\fR(3M) for  the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBsqrt\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4386 Sat May 10 12:10:22 2014
new/usr/src/man/man3mvec/vz_abs_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.\" When distributing Covered Code, include this CDDL HEADER in each file and in
.TH vz_abs_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vz_abs_, vc_abs_ \- vector complex absolute value functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvz_abs_\fR(\fBint *\fR\fIn\fR, \fBdouble complex * restrict\fR \fI
     \fBint *\fR\fIstridez\fR, \fBdouble * restrict\fR \fIy\fR, \fBint *\fR\fIst
.fi

.LP
.nf
\fBvoid\fR \fBvc_abs_\fR(\fBint *\fR\fIn\fR, \fBfloat complex * restrict\fR \fIz
     \fBint *\fR\fIstridez\fR, \fBfloat * restrict\fR \fIy\fR, \fBint *\fR\fIstr
.fi

.SH DESCRIPTION
.sp
.LP
These functions compute the magnitude (or modulus) | \fIz\fR | for an entire
vector of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements.
.sp
.LP
Specifically, \fBvz_abs_\fR(\fIn,\fR \fIz\fR, \fIsz\fR, \fIy\fR, \fIsy\fR)
computes \fIy\fR[\fIi\fR * *\fIsy\fR] = | \fIz\fR[\fIi\fR * *\fIsz\fR] | for
each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The  \fBvc_abs_()\fR function performs
the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBcabs\fR(3M) functions given the same arguments.
Non-exceptional results, however, are accurate to within a unit in the last
place.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
```



```
.sp
.LP
These functions handle special cases and exceptions in the spirit of IEEE 754.
See \fBcabs\fR(3M) for the results for special cases.
.sp
.LP
An application wanting to check for exceptions should call
\fBfeclearexcept\fR(\fBFE_ALL_EXCEPT\fR) before calling these functions. On
return, if \fBfetestexcept\fR(\fBFE_INVALID\fR | \fBFE_DIVBYZERO\fR |
\fBFE_OVERFLOW\fR | \fBFE_UNDERFLOW\fR) is non-zero, an exception has been
raised. The application can then examine the result or argument vectors for
exceptional values. Some vector functions can raise the inexact exception even
if all elements of the argument array are such that the numerical results are
exact.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcabs\fR(3M), \fBfeclearexcept\fR(3M), \fBfetestexcept\fR(3M),
\fBattributes\fR(5)
```

```
**********************************************************
    4243 Sat May 10 12:10:22 2014
new/usr/src/man/man3mvec/vz_exp_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vz_exp_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vz_exp_, vc_exp_ \- vector complex exponential functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvz_exp_\fR(\fBint *\fR\fIn\fR, \fBdouble complex * restrict\fR \fI
     \fBint *\fR\fIstridez\fR, \fBdouble  complex * restrict\fR \fIw\fR \fBint *
     \fBdouble *\fR \fItmp\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvc_exp_\fR(\fBint *\fR\fIn\fR, \fBfloat complex * restrict\fR \fIz
     \fBint *\fR\fIstridez\fR, \fBfloat complex * restrict\fR \fIw\fR, \fBint *\
     \fBfloat *\fR \fItmp\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the complex function \fBexp\fR(\fIz\fR) for an entire
vector of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements. The last argument is a pointer to
scratch storage; this storage must be large enough to hold *\fIn\fR consecutive
values of the real type corresponding to the complex type of the argument and
result.
.sp
.LP
Specifically, \fBvz_exp_\fR(\fIn\fR, \fIz\fR, \fIsz\fR, \fIw\fR, \fIsw\fR,
\fItmp\fR) computes \fIw\fR[\fIi\fR * *\fIsw\fR] = \fBexp\fR(\fIz\fR[\fIi\fR *
*\fIsz\fR]) for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvc_exp_()\fR
function performs the same  computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBcexp\fR(3M) functions given the same arguments.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
```



```
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
Unlike the c99 \fBcexp\fR(3M) functions, the vector complex exponential
functions make no attempt to handle special cases and exceptions; they simply
use textbook formulas to compute a complex exponential in terms of real
elementary functions. As a result, these functions can raise different
exceptions and/or deliver different results from \fBcexp()\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcexp\fR(3M), \fBattributes\fR(5)
```

```
**********************************************************
    3969 Sat May 10 12:10:23 2014
new/usr/src/man/man3mvec/vz_log_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vz_log_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vz_log_, vc_log_ \- vector complex logarithm functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvz_log_\fR(\fBint *\fR\fIn\fR, \fBdouble complex * restrict\fR \fI
     \fBint *\fR\fIstridez\fR, \fBdouble _complex * restrict\fR \fIw\fR, \fBint
.fi

.LP
.nf
\fBvoid\fR \fBvc_log_\fR(\fBint *\fR\fIn\fR, \fBfloat complex * restrict\fR \fIz
     \fBint *\fR\fIstridez\fR, \fBfloat complex * restrict\fR \fIw\fR, \fBint *\
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the complex function \fBlog\fR(\fIz\fR) for an entire
vector of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements.
.sp
.LP
Specifically, \fBvz_log_\fR(\fIn\fR, \fIz\fR, \fIsz\fR, \fIw\fR, \fIsw\fR)
computes \fIw\fR[\fIi\fR * *\fIsw\fR] = \fBlog\fR(\fIz\fR[\fIi\fR * *\fIsz\fR])
for each \fIi\fR = 0, 1, ..., *\fIn\fR - 1. The \fBvc_log_()\fR function
performs the same computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBclog\fR(3M) functions given the same arguments.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
```



```
Unlike the c99 \fBclog\fR(3M) functions, the vector complex exponential
functions make no attempt to handle special cases and exceptions; they simply
use textbook formulas to compute a complex exponential in terms of real
elementary functions. As a result, these functions can raise different
exceptions and/or deliver different results from \fBclog()\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBclog\fR(3M), \fBattributes\fR(5)
```

```
**********************************************************
    4421 Sat May 10 12:10:23 2014
new/usr/src/man/man3mvec/vz_pow_.3mvec
patch11 - added LIBM man pages
**********************************************************
'\" te
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.TH vz_pow_ 3MVEC "14 Dec 2007" "SunOS 5.11" "Vector Math Library Functions"
.SH NAME
vz_pow_, vc_pow_ \- vector complex power functions
.SH SYNOPSIS
.LP
.nf
cc [ \fIflag\fR\&.\|.\|. ] \fIfile\fR\&.\|.\|. \fB-lmvec\fR [ \fIlibrary\fR\&.\|

\fBvoid\fR \fBvz_pow_\fR(\fBint *\fR\fIn\fR, \fBdouble complex * restrict\fR \fI
     \fBint *\fR\fIstridez\fR, \fBdouble complex * restrict\fR \fIw\fR, \fBint *
     \fBdouble complex * restrict\fR \fIu\fR, \fBint *\fR\fIstrideu\fR,
     \fBdouble *\fR \fItmp\fR);
.fi

.LP
.nf
\fBvoid\fR \fBvc_pow_\fR(\fBint *\fR\fIn\fR, \fBfloat complex * restrict\fR \fIz
     \fBint *\fR\fIstridez\fR, \fBfloat complex * restrict\fR \fIw\fR, \fBint *\
     \fBfloat complex * restrict\fR \fIu\fR, \fBint *\fR\fIstrideu\fR,
     \fBfloat *\fR \fItmp\fR);
.fi

.SH DESCRIPTION
.sp
.LP
These functions evaluate the complex function \fIz\fR^\fIw\fR for an entire
vector of values at once. The first parameter specifies the number of values to
compute. Subsequent parameters specify the argument and result vectors. Each
vector is described by a pointer to the first element and a stride, which is
the increment between successive elements. The last argument is a pointer to
scratch storage; this storage must be large enough to hold 3 * *\fIn\fR
consecutive values of the real type corresponding to the complex type of the
argument and result.
.sp
.LP
Specifically, \fBvz_pow_\fR(\fIn\fR, \fIz\fR, \fIsz\fR, \fIw\fR, \fIsw\fR,
\fIu\fR, \fIsu\fR, \fItmp\fR) computes \fIu\fR[\fIi\fR * *\fIsu\fR] =
(\fIz\fR[\fIi\fR * *\fIsz\fR])^(\fIw\fR[\fIi\fR * *\fIsw\fR]) for each \fIi\fR
= 0, 1, ..., *\fIn\fR - 1. The \fBvc_pow_()\fR function performs the same
computation for single precision data.
.sp
.LP
These functions are not guaranteed to deliver results that are identical to the
results of the \fBcpow\fR(3M) functions given the same arguments.
.SH USAGE
.sp
.LP
The element count *\fIn\fR must be greater than zero. The strides for the
argument and result arrays can be arbitrary integers, but the arrays themselves
must not be the same or overlap. A zero stride effectively collapses an entire
vector into a single element. A negative stride causes a vector to be accessed
in descending memory order, but note that the corresponding pointer must still
point to the first element of the vector to be used; if the stride is negative,
this will be the highest-addressed element in memory. This convention differs
from the Level 1 BLAS, in which array parameters always refer to the
lowest-addressed element in memory even when negative increments are used.
```



```
.sp
.LP
These functions assume that the default round-to-nearest rounding direction
mode is in effect. On x86, these functions also assume that the default
round-to-64-bit rounding precision mode is in effect. The result of calling a
vector function with a non-default rounding mode in effect is undefined.
.sp
.LP
Unlike the c99 \fBcpow\fR(3M) functions, the vector complex exponential
functions make no attempt to handle special cases and exceptions; they simply
use textbook formulas to compute a complex exponential in terms of real
elementary functions. As a result, these functions can raise different
exceptions and/or deliver different results from \fBcpow()\fR.
.SH ATTRIBUTES
.sp
.LP
See \fBattributes\fR(5) for descriptions of the following attributes:
.sp

.sp
.TS
tab(^G) box;
cw(2.75i) |cw(2.75i)
lw(2.75i) |lw(2.75i)
.
ATTRIBUTE TYPE^GATTRIBUTE VALUE
_
Interface Stability^GCommitted
_
MT-Level^GMT-Safe
.TE

.SH SEE ALSO
.sp
.LP
\fBcpow\fR(3M), \fBattributes\fR(5)
```

```
**********************************************************
    1146 Sat May 10 12:10:23 2014
new/usr/src/pkg/manifests/SUNWlibm.mf
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  10 #

  12 #
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  14 #

  16 set name=pkg.fmri value=pkg:/SUNWlibm@0.5.11,5.11-0.132
  17 set name=pkg.description \
  18     value="Math & Microtasking Library Headers & Lint Files"
  19 # license license=SUNWlibm.copyright
  20 # license license=SUNWlibmr.copyright
  21 set name=pkg.renamed value=true
  22 # set name=pkg.renamed value=true
  23 set name=pkg.summary value="Math & Microtasking Library Headers & Lint Files"
  24 set name=info.classification \
  25     value=org.opensolaris.category.2008:System/Libraries
  26 # set name=org.opensolaris.consolidation value=sunpro
  27 set name=variant.arch value=$(ARCH)
  28 set name=variant.opensolaris.zone value=global value=nonglobal
  29 depend fmri=pkg:/system/library/math/header-math@$(PKGVERS) type=require
```

```
**********************************************************
    1098 Sat May 10 12:10:23 2014
new/usr/src/pkg/manifests/SUNWlibms.mf
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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   9 # http://www.illumos.org/license/CDDL.
  10 #

  12 #
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  14 #

  16 set name=pkg.fmri value=pkg:/SUNWlibms@0.5.11,5.11-0.132
  17 set name=pkg.description value="Math & Microtasking Libraries"
  18 # license license=SUNWlibms.copyright
  19 # license license=SUNWlibmsr.copyright
  20 set name=pkg.renamed value=true
  21 # set name=pkg.renamed value=true
  22 set name=pkg.summary value="Math & Microtasking Libraries"
  23 set name=description value="Math & Microtasking Libraries"
  24 set name=info.classification \
  25     value=org.opensolaris.category.2008:System/Libraries
  26 set name=variant.arch value=$(ARCH)
  27 set name=variant.opensolaris.zone value=global value=nonglobal
  28 depend fmri=pkg:/system/library/math@$(PKGVERS) type=require
```

```
**********************************************************
     925 Sat May 10 12:10:23 2014
new/usr/src/pkg/manifests/system-library-math-header-math.mf
update libm manifests
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
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  10 #

  12 #
  13 # Copyright (c) 2012, Igor Kozhukhov <ikozhukhov@gmail.com>.  All rights reserve
  14 #

  16 # all data have been moved to system/library/math
  17 # package obsolete now
  18 #
  19 set name=pkg.fmri value=pkg:/system/library/math/header-math@$(PKGVERS)
  20 set name=pkg.description value="Math Library Headers & Lint Files"
  21 set name=pkg.obsolete value=true
  22 set name=pkg.summary value="Math Library Headers & Lint Files"
  23 set name=info.classification \
  24     value=org.opensolaris.category.2008:System/Libraries
  25 set name=variant.arch value=$(ARCH)
```

```
**********************************************************
    4752 Sat May 10 12:10:23 2014
new/usr/src/pkg/manifests/system-library-math.man3m.inc
patch11 - added LIBM man pages
**********************************************************
```

```
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file path=usr/share/man/man3m/acos.3m
file path=usr/share/man/man3m/acosh.3m
file path=usr/share/man/man3m/asin.3m
file path=usr/share/man/man3m/asinh.3m
file path=usr/share/man/man3m/atan.3m
file path=usr/share/man/man3m/atan2.3m
file path=usr/share/man/man3m/atanh.3m
file path=usr/share/man/man3m/cabs.3m
file path=usr/share/man/man3m/cacos.3m
file path=usr/share/man/man3m/cacosh.3m
file path=usr/share/man/man3m/carg.3m
file path=usr/share/man/man3m/casin.3m
file path=usr/share/man/man3m/casinh.3m
file path=usr/share/man/man3m/catan.3m
file path=usr/share/man/man3m/catanh.3m
file path=usr/share/man/man3m/cbrt.3m
file path=usr/share/man/man3m/ccos.3m
file path=usr/share/man/man3m/ccosh.3m
file path=usr/share/man/man3m/ceil.3m
file path=usr/share/man/man3m/cexp.3m
file path=usr/share/man/man3m/cimag.3m
file path=usr/share/man/man3m/clog.3m
file path=usr/share/man/man3m/conj.3m
file path=usr/share/man/man3m/copysign.3m
file path=usr/share/man/man3m/cos.3m
file path=usr/share/man/man3m/cosh.3m
file path=usr/share/man/man3m/cpow.3m
file path=usr/share/man/man3m/cproj.3m
file path=usr/share/man/man3m/creal.3m
file path=usr/share/man/man3m/csin.3m
file path=usr/share/man/man3m/csinh.3m
file path=usr/share/man/man3m/csqrt.3m
file path=usr/share/man/man3m/ctan.3m
file path=usr/share/man/man3m/ctanh.3m
file path=usr/share/man/man3m/erf.3m
file path=usr/share/man/man3m/erfc.3m
file path=usr/share/man/man3m/exp.3m
file path=usr/share/man/man3m/exp2.3m
file path=usr/share/man/man3m/expm1.3m
file path=usr/share/man/man3m/fabs.3m
file path=usr/share/man/man3m/fdim.3m
file path=usr/share/man/man3m/feclearexcept.3m
file path=usr/share/man/man3m/fegetenv.3m
file path=usr/share/man/man3m/fegetexceptflag.3m
file path=usr/share/man/man3m/fegetround.3m
file path=usr/share/man/man3m/feholdexcept.3m
file path=usr/share/man/man3m/feraiseexcept.3m
file path=usr/share/man/man3m/fesetprec.3m
```



```
file path=usr/share/man/man3m/fetestexcept.3m
file path=usr/share/man/man3m/feupdateenv.3m
file path=usr/share/man/man3m/fex_merge_flags.3m
file path=usr/share/man/man3m/fex_set_handling.3m
file path=usr/share/man/man3m/fex_set_log.3m
file path=usr/share/man/man3m/floor.3m
file path=usr/share/man/man3m/fma.3m
file path=usr/share/man/man3m/fmax.3m
file path=usr/share/man/man3m/fmin.3m
file path=usr/share/man/man3m/fmod.3m
file path=usr/share/man/man3m/fpclassify.3m
file path=usr/share/man/man3m/frexp.3m
file path=usr/share/man/man3m/hypot.3m
file path=usr/share/man/man3m/ilogb.3m
file path=usr/share/man/man3m/isfinite.3m
file path=usr/share/man/man3m/isgreater.3m
file path=usr/share/man/man3m/isgreaterequal.3m
file path=usr/share/man/man3m/isinf.3m
file path=usr/share/man/man3m/isless.3m
file path=usr/share/man/man3m/islessequal.3m
file path=usr/share/man/man3m/islessgreater.3m
file path=usr/share/man/man3m/isnan.3m
file path=usr/share/man/man3m/isnormal.3m
file path=usr/share/man/man3m/isunordered.3m
file path=usr/share/man/man3m/j0.3m
file path=usr/share/man/man3m/ldexp.3m
file path=usr/share/man/man3m/lgamma.3m
file path=usr/share/man/man3m/llrint.3m
file path=usr/share/man/man3m/llround.3m
file path=usr/share/man/man3m/log.3m
file path=usr/share/man/man3m/log10.3m
file path=usr/share/man/man3m/log1p.3m
file path=usr/share/man/man3m/log2.3m
file path=usr/share/man/man3m/logb.3m
file path=usr/share/man/man3m/lrint.3m
file path=usr/share/man/man3m/lround.3m
file path=usr/share/man/man3m/matherr.3m
file path=usr/share/man/man3m/modf.3m
file path=usr/share/man/man3m/nan.3m
file path=usr/share/man/man3m/nearbyint.3m
file path=usr/share/man/man3m/nextafter.3m
file path=usr/share/man/man3m/pow.3m
file path=usr/share/man/man3m/remainder.3m
file path=usr/share/man/man3m/remquo.3m
file path=usr/share/man/man3m/rint.3m
file path=usr/share/man/man3m/round.3m
file path=usr/share/man/man3m/scalb.3m
file path=usr/share/man/man3m/scalbln.3m
file path=usr/share/man/man3m/signbit.3m
file path=usr/share/man/man3m/significand.3m
file path=usr/share/man/man3m/sin.3m
file path=usr/share/man/man3m/sincos.3m
file path=usr/share/man/man3m/sinh.3m
file path=usr/share/man/man3m/sqrt.3m
file path=usr/share/man/man3m/tan.3m
file path=usr/share/man/man3m/tanh.3m
file path=usr/share/man/man3m/tgamma.3m
file path=usr/share/man/man3m/trunc.3m
file path=usr/share/man/man3m/y0.3m
```

```
**********************************************************
    1350 Sat May 10 12:10:23 2014
new/usr/src/pkg/manifests/system-library-math.man3mvec.inc
patch11 - added LIBM man pages
**********************************************************
```

```
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file path=usr/share/man/man3mvec/vatan2_.3mvec
file path=usr/share/man/man3mvec/vatan_.3mvec
file path=usr/share/man/man3mvec/vcos_.3mvec
file path=usr/share/man/man3mvec/vcospi_.3mvec
file path=usr/share/man/man3mvec/vexp_.3mvec
file path=usr/share/man/man3mvec/vhypot_.3mvec
file path=usr/share/man/man3mvec/vlog_.3mvec
file path=usr/share/man/man3mvec/vpow_.3mvec
file path=usr/share/man/man3mvec/vrhypot_.3mvec
file path=usr/share/man/man3mvec/vrsqrt_.3mvec
file path=usr/share/man/man3mvec/vsin_.3mvec
file path=usr/share/man/man3mvec/vsincos_.3mvec
file path=usr/share/man/man3mvec/vsincospi_.3mvec
file path=usr/share/man/man3mvec/vsinpi_.3mvec
file path=usr/share/man/man3mvec/vsqrt_.3mvec
file path=usr/share/man/man3mvec/vz_abs_.3mvec
file path=usr/share/man/man3mvec/vz_exp_.3mvec
file path=usr/share/man/man3mvec/vz_log_.3mvec
file path=usr/share/man/man3mvec/vz_pow_.3mvec
```

```
**********************************************************
    3835 Sat May 10 12:10:24 2014
new/usr/src/pkg/manifests/system-library-math.mf
fix system-library-math.mf
update libm manifests
patch11 - added LIBM man pages
patch01 - 693 import Sun Devpro Math Library
**********************************************************
```

```
#
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#

<include system-library-math.man3m.inc>
<include system-library-math.man3mvec.inc>
set name=pkg.fmri value=pkg:/system/library/math@$(PKGVERS)
set name=pkg.description value="Math Libraries"
set name=pkg.summary value="Math Libraries"
set name=description value="Math Libraries"
set name=info.classification \
    value=org.opensolaris.category.2008:System/Libraries
set name=variant.arch value=$(ARCH)
set name=variant.opensolaris.zone value=global value=nonglobal
dir path=lib
dir path=lib/$(ARCH64)
$(sparc_ONLY)dir path=lib/cpu
$(sparc_ONLY)dir path=lib/cpu/sparcv8plus+vis
$(sparc_ONLY)dir path=lib/cpu/sparcv9+vis
$(sparc_ONLY)dir path=lib/cpu/sparcv9+vis/$(ARCH64)
$(sparc_ONLY)dir path=lib/cpu/sparcv9+vis2
$(sparc_ONLY)dir path=lib/cpu/sparcv9+vis2/$(ARCH64)
$(i386_ONLY)dir path=lib/libmvec
dir path=usr group=sys
dir path=usr/include
dir path=usr/include/iso
dir path=usr/include/sys
dir path=usr/lib
dir path=usr/lib/$(ARCH64)
dir path=usr/share/man/man3m
dir path=usr/share/man/man3mvec
file path=lib/$(ARCH64)/libm.so.1
file path=lib/$(ARCH64)/libm.so.2
file path=lib/$(ARCH64)/libmvec.so.1
file path=lib/$(ARCH64)/llib-lm.ln
$(sparc_ONLY)file path=lib/cpu/sparcv8plus+vis/libmvec_isa.so.1
$(sparc_ONLY)file path=lib/cpu/sparcv9+vis/$(ARCH64)/libmvec_isa.so.1
$(sparc_ONLY)file path=lib/cpu/sparcv9+vis2/$(ARCH64)/libmvec_isa.so.1
$(sparc_ONLY)file path=lib/cpu/sparcv9+vis2/libmvec_isa.so.1
file path=lib/libm.so.1
file path=lib/libm.so.2
file path=lib/libmvec.so.1
$(i386_ONLY)file path=lib/libmvec/libmvec_hwcap1.so.1
file path=lib/llib-lm
file path=lib/llib-lm.ln
file path=usr/include/complex.h
file path=usr/include/fenv.h
```



```
file path=usr/include/floatingpoint.h
file path=usr/include/iso/math_c99.h
file path=usr/include/iso/math_iso.h
file path=usr/include/math.h
file path=usr/include/sys/ieeefp.h
file path=usr/include/tgmath.h
legacy pkg=SUNWlibms desc="Math Libraries (Usr)" \
    hotline="Please contact your local service provider" \
    name="Math Libraries (Usr)" vendor="Sun Microsystems, Inc." \
    version=5.11,REV=2009.08.04
legacy pkg=SUNWlibmsr desc="Math Libraries (Root)" \
    hotline="Please contact your local service provider" \
    name="Math Libraries (Root)" vendor="Sun Microsystems, Inc." \
    version=5.11,REV=2009.08.04
link path=lib/$(ARCH64)/libm.so target=libm.so.2
link path=lib/$(ARCH64)/libmvec.so target=libmvec.so.1
link path=lib/libm.so target=libm.so.2
link path=lib/libmvec.so target=libmvec.so.1
link path=usr/lib/$(ARCH64)/libm.so target=../../../lib/$(ARCH64)/libm.so.2
link path=usr/lib/$(ARCH64)/libm.so.1 target=../../../lib/$(ARCH64)/libm.so.1
link path=usr/lib/$(ARCH64)/libm.so.2 target=../../../lib/$(ARCH64)/libm.so.2
link path=usr/lib/$(ARCH64)/libmvec.so \
    target=../../../lib/$(ARCH64)/libmvec.so.1
link path=usr/lib/$(ARCH64)/libmvec.so.1 \
    target=../../../lib/$(ARCH64)/libmvec.so.1
link path=usr/lib/$(ARCH64)/llib-lm.ln \
    target=../../../lib/$(ARCH64)/llib-lm.ln
link path=usr/lib/libm.so target=../../lib/libm.so.2
link path=usr/lib/libm.so.1 target=../../lib/libm.so.1
link path=usr/lib/libm.so.2 target=../../lib/libm.so.2
link path=usr/lib/libmvec.so target=../../lib/libmvec.so.1
link path=usr/lib/libmvec.so.1 target=../../lib/libmvec.so.1
link path=usr/lib/llib-lm target=../../lib/llib-lm
link path=usr/lib/llib-lm.ln target=../../lib/llib-lm.ln
```

```
**********************************************************
   17025 Sat May 10 12:10:24 2014
new/usr/src/tools/aw/aw.c
libm fixes from richlowe - richlowe.net/webrevs/il_keith
patch01 - 693 import Sun Devpro Math Library
**********************************************************
______unchanged_portion_omitted_

 480 int
 481 main(int argc, char *argv[])
 482 {
 483         struct aelist *cpp = NULL;
 484         struct aelist *m4 = NULL;
 485         struct aelist *as = newael();
 486         char **asargv;
 487         char *outfile = NULL;
 488         char *srcfile = NULL;
 489         const char *dir, *cmd;
 490         static char as_pgm[MAXPATHLEN];
 491         static char as64_pgm[MAXPATHLEN];
 492         static char m4_pgm[MAXPATHLEN];
 493         static char m4_cmdefs[MAXPATHLEN];
 494         static char cpp_pgm[MAXPATHLEN];
 495         int as64 = 0;
 496         int code;

 498         if ((progname = strrchr(argv[0], '/')) == NULL)
 499                 progname = argv[0];
 500         else
 501                 progname++;

 503         /*
 504          * Helpful when debugging, or when changing tool versions..
 505          */
 506         if ((cmd = getenv("AW_AS")) != NULL)
 507                 strlcpy(as_pgm, cmd, sizeof (as_pgm));
 508         else {
 509                 if ((dir = getenv("AW_AS_DIR")) == NULL)
 510                         dir = DEFAULT_AS_DIR;   /* /usr/sfw/bin */
 511                 (void) snprintf(as_pgm, sizeof (as_pgm), "%s/gas", dir);
 512         }

 514         if ((cmd = getenv("AW_AS64")) != NULL)
 515                 strlcpy(as64_pgm, cmd, sizeof (as64_pgm));
 516         else {
 517                 if ((dir = getenv("AW_AS64_DIR")) == NULL)
 518                         dir = DEFAULT_AS64_DIR; /* /usr/sfw/bin */
 519                 (void) snprintf(as64_pgm, sizeof (as_pgm), "%s/gas", dir);
 520         }

 522         if ((cmd = getenv("AW_M4")) != NULL)
 523                 strlcpy(m4_pgm, cmd, sizeof (m4_pgm));
 524         else {
 525                 if ((dir = getenv("AW_M4_DIR")) == NULL)
 526                         dir = DEFAULT_M4_DIR;   /* /usr/ccs/bin */
 527                 (void) snprintf(m4_pgm, sizeof (m4_pgm), "%s/m4", dir);
 528         }

 530         if ((cmd = getenv("AW_M4LIB")) != NULL)
 531                 strlcpy(m4_cmdefs, cmd, sizeof (m4_cmdefs));
 532         else {
 533                 if ((dir = getenv("AW_M4LIB_DIR")) == NULL)
 534                         dir = DEFAULT_M4LIB_DIR;        /* /usr/ccs/lib */
 535                 (void) snprintf(m4_cmdefs, sizeof (m4_cmdefs),
 536                     "%s/cm4defs", dir);
 537         }
```



```
 539         if ((cmd = getenv("AW_CPP")) != NULL)
 540                 strlcpy(cpp_pgm, cmd, sizeof (cpp_pgm));
 541         else {
 542                 if ((dir = getenv("AW_CPP_DIR")) == NULL)
 543                         dir = DEFAULT_CPP_DIR;  /* /usr/ccs/lib */
 544                 (void) snprintf(cpp_pgm, sizeof (cpp_pgm), "%s/cpp", dir);
 545         }

 547         newae(as, as_pgm);
 548         newae(as, "--warn");
 549         newae(as, "--fatal-warnings");
 550         newae(as, "--traditional-format");

 552         /*
 553          * Walk the argument list, translating as we go ..
 554          */
 555         while (--argc > 0) {
 556                 char *arg;
 557                 int arglen;

 559                 arg = *++argv;
 560                 arglen = strlen(arg);

 562                 if (*arg != '-') {
 563                         char *filename;

 565                         /*
 566                          * filenames ending in '.s' are taken to be
 567                          * assembler files, and provide the default
 568                          * basename of the output file.
 569                          *
 570                          * other files are passed through to the
 571                          * preprocessor, if present, or to gas if not.
 572                          */
 573                         filename = arg;
 574                         if ((arglen > 2) &&
 575                             ((strcmp(arg + arglen - 2, ".s") == 0) ||
 576                             (strcmp(arg + arglen - 2, ".S") == 0))) {
 574                         if (arglen > 2 &&
 575                             strcmp(arg + arglen - 2, ".s") == 0) {
 577                                 /*
 578                                  * Though 'as' allows multiple assembler
 579                                  * files to be processed in one invocation
 580                                  * of the assembler, ON only processes one
 581                                  * file at a time, which makes things a lot
 582                                  * simpler!
 583                                  */
 584                                 if (srcfile == NULL)
 585                                         srcfile = arg;
 586                                 else
 587                                         return (usage(
 588                                             "one assembler file at a time"));

 590                                 /*
 591                                  * If we haven't seen a -o option yet,
 592                                  * default the output to the basename
 593                                  * of the input, substituting a .o on the end
 594                                  */
 595                                 if (outfile == NULL) {
 596                                         char *argcopy;

 598                                         argcopy = strdup(arg);
 599                                         argcopy[arglen - 1] = 'o';

 601                                         if ((outfile = strrchr(
```

```
602                                         argcopy, '/')) == NULL)
603                                     outfile = argcopy;
604                                 else
605                                     outfile++;
606                         }
607                 }
608                 if (cpp)
609                         newae(cpp, filename);
610                 else if (m4)
611                         newae(m4, filename);
612                 else
613                         newae(as, filename);
614                 continue;
615         } else
616                 arglen--;

618         switch (arg[1]) {
619         case 'K':
620                 /*
621                  * -K pic
622                  * -K PIC
623                  */
624                 if (arglen == 1) {
625                         if ((arg = *++argv) == NULL || *arg == '\0')
626                                 return (usage("malformed -K"));
627                         argc--;
628                 } else {
629                         arg += 2;
630                 }
631                 if (strcmp(arg, "PIC") != 0 && strcmp(arg, "pic") != 0)
632                         return (usage("malformed -K"));
633                 break;          /* just ignore -Kpic for gcc */
634         case 'Q':
635                 if (strcmp(arg, "-Qn") == 0)
636                         break;
637                 /*FALLTHROUGH*/
638         case 'b':
639         case 's':
640         case 'T':
641                 /*
642                  * -b   Extra symbol table for source browser ..
643                  *      not relevant to gas, thus should error.
644                  * -s   Put stabs in .stabs section not stabs.excl
645                  *      not clear if there's an equivalent
646                  * -T   4.x migration option
647                  */
648         default:
649                 return (error(arg));
650         case 'x':
651                 /*
652                  * Accept -xarch special case to invoke alternate
653                  * assemblers or assembler flags for different
654                  * architectures.
655                  */
656                 if (strcmp(arg, "-xarch=amd64") == 0 ||
657                     strcmp(arg, "-xarch=generic64") == 0) {
658                         as64++;
659                         fixae_arg(as->ael_head, as64_pgm);
660                         break;
661                 }
662                 /*
663                  * XX64: Is this useful to gas?
664                  */
665                 if (strcmp(arg, "-xmodel=kernel") == 0)
666                         break;
```



```
668                         /*
669                          * -xF  Generates performance analysis data
670                          *      no equivalent
671                          */
672                         return (error(arg));
673                 case 'V':
674                         newae(as, arg);
675                         break;
676                 case '#':
677                         verbose++;
678                         break;
679                 case 'L':
680                         newae(as, "--keep-locals");
681                         break;
682                 case 'n':
683                         newae(as, "--no-warn");
684                         break;
685                 case 'o':
686                         if (arglen != 1)
687                                 return (usage("bad -o flag"));
688                         if ((arg = *++argv) == NULL || *arg == '\0')
689                                 return (usage("bad -o flag"));
690                         outfile = arg;
691                         argc--;
692                         arglen = strlen(arg + 1);
693                         break;
694                 case 'm':
695                         if (cpp)
696                                 return (usage("-m conflicts with -P"));
697                         if (m4 == NULL) {
698                                 m4 = newael();
699                                 newae(m4, m4_pgm);
700                                 newae(m4, m4_cmdefs);
701                         }
702                         break;
703                 case 'P':
704                         if (m4)
705                                 return (usage("-P conflicts with -m"));
706                         if (cpp == NULL) {
707                                 cpp = newael();
708                                 newae(cpp, cpp_pgm);
709                                 newae(cpp, "-D__GNUC_AS__");
710                         }
711                         break;
712                 case 'D':
713                 case 'U':
714                         if (cpp)
715                                 newae(cpp, arg);
716                         else if (m4)
717                                 newae(m4, arg);
718                         else
719                                 newae(as, arg);
720                         break;
721                 case 'I':
722                         if (cpp)
723                                 newae(cpp, arg);
724                         else
725                                 newae(as, arg);
726                         break;
727                 case '-':       /* a gas-specific option */
728                         newae(as, arg);
729                         break;
730                 }
731         }

733 #if defined(__i386)
```

```
734         if (as64)
735                 newae(as, "--64");
736         else
737                 newae(as, "--32");
738 #endif

740         if (srcfile == NULL)
741                 return (usage("no source file(s) specified"));
742         if (outfile == NULL)
743                 outfile = "a.out";
744         newae(as, "-o");
745         newae(as, outfile);

747         asargv = aeltoargv(as);
748         if (cpp) {
749 #if defined(__sparc)
750                 newae(cpp, "-Dsparc");
751                 newae(cpp, "-D__sparc");
752                 if (as64)
753                         newae(cpp, "-D__sparcv9");
754                 else
755                         newae(cpp, "-D__sparcv8");
756 #elif defined(__i386) || defined(__x86)
757                 if (as64) {
758                         newae(cpp, "-D__x86_64");
759                         newae(cpp, "-D__amd64");
760                 } else {
761                         newae(cpp, "-Di386");
762                         newae(cpp, "-D__i386");
763                 }
764 #else
765 #error  "need isa-dependent defines"
766 #endif
767                 code = pipeline(aeltoargv(cpp), asargv);
768         } else if (m4)
769                 code = pipeline(aeltoargv(m4), asargv);
770         else {
771                 /*
772                  * XXX  should arrange to fork/exec so that we
773                  *      can unlink the output file if errors are
774                  *      detected..
775                  */
776                 (void) execvp(asargv[0], asargv);
777                 perror("execvp");
778                 (void) fprintf(stderr, "%s: couldn't run %s\n",
779                     progname, asargv[0]);
780                 code = 7;
781         }
782         if (code != 0)
783                 (void) unlink(outfile);
784         return (code);
785 }
```

unchanged_portion_omitted_

****
45780 Sat May 10 12:10:24 2014
new/usr/src/tools/cw/cw.c
patch01 - 693 import Sun Devpro Math Library
****
_____***unchanged_portion_omitted_***

```
 385 /*
 386  * The translation table for the -xarch= flag used in the Studio compilers.
 387  */
 388 static const xarch_table_t xtbl[] = {
 389 #if defined(__x86)
 390         { "generic",    SS11 },
 391         { "generic64",  (SS11|M64), { "-m64", "-mtune=opteron" } },
 392         { "amd64",      (SS11|M64), { "-m64", "-mtune=opteron" } },
 393         { "386",        SS11,   { "-march=i386" } },
 394         { "pentium_pro", SS11,  { "-march=pentiumpro" } },
 395         { "sse",        SS11, { "-msse", "-mfpmath=sse" } },
 396         { "sse2",       SS11, { "-msse2", "-mfpmath=sse" } },
 397 #elif defined(__sparc)
 398         { "generic",    (SS11|M32), { "-m32", "-mcpu=v8" } },
 399         { "generic64",  (SS11|M64), { "-m64", "-mcpu=v9" } },
 400         { "v8",         (SS11|M32), { "-m32", "-mcpu=v8", "-mno-v8plus" } },
 401         { "v8plus",     (SS11|M32), { "-m32", "-mcpu=v9", "-mv8plus" } },
 402         { "v8plusa",    (SS11|M32), { "-m32", "-mcpu=ultrasparc", "-mv8plus",
 403                         "-mvis" } },
 404         { "v8plusb",    (SS11|M32), { "-m32", "-mcpu=ultrasparc3", "-mv8plus",
 405                         "-mvis" } },
 406         { "v9",         (SS11|M64), { "-m64", "-mcpu=v9" } },
 407         { "v9a",        (SS11|M64), { "-m64", "-mcpu=ultrasparc", "-mvis" } },
 408         { "v9b",        (SS11|M64), { "-m64", "-mcpu=ultrasparc3", "-mvis" } },
 409         { "sparc",      SS12, { "-mcpu=v9", "-mv8plus" } },
 410         { "sparcvis",   SS12, { "-mcpu=ultrasparc", "-mvis" } },
 411         { "sparcvis2",  SS12, { "-mcpu=ultrasparc3", "-mvis" } }
 412 #endif
 413 };
```

_____***unchanged_portion_omitted_***