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Red Hat Enterprise Linux Release 9.2 Manual Pages on 'expm1.3p' command

\$ man expm1.3p

EXPM1(3P) POSIX Programmer's Manual EXPM1(3P)

PROLOG

This manual page is part of the POSIX Programmer's Manual. The Linux implementation of this interface may differ (consult the corresponding Linux manual page for details of Linux behavior), or the interface may not be implemented on Linux.

NAME

expm1, expm1f, expm1l ? compute exponential functions

SYNOPSIS

```
#include <math.h>

double expm1(double x);

float expm1f(float x);

long double expm1l(long double x);
```

DESCRIPTION

The functionality described on this reference page is aligned with the ISO C standard. Any conflict between the requirements described here and the ISO C standard is unintentional. This volume of POSIX.1?2017 defers to the ISO C standard.

These functions shall compute $e^x - 1.0$.

An application wishing to check for error situations should set `errno` to zero and call `feclearexcept(FE_ALL_EXCEPT)` before calling these functions. On return, if `errno` is non-zero or `fetestexcept(FE_INVALID | FE_DIVBYZERO | FE_OVERFLOW | FE_UNDERFLOW)` is non-zero, an error has

occurred.

RETURN VALUE

Upon successful completion, these functions return $x-1.0$.

If the correct value would cause overflow, a range error shall occur and `expm1()`, `expm1f()`, and `expm1l()` shall return the value of the macro `HUGE_VAL`, `HUGE_VALF`, and `HUGE_VALL`, respectively.

If x is NaN, a NaN shall be returned.

If x is ± 0 , ± 0 shall be returned.

If x is $-\infty$, -1 shall be returned.

If x is $+\infty$, x shall be returned.

If x is subnormal, a range error may occur and x should be returned.

If x is not returned, `expm1()`, `expm1f()`, and `expm1l()` shall return an implementation-defined value no greater in magnitude than `DBL_MIN`, `FLT_MIN`, and `LDBL_MIN`, respectively.

ERRORS

These functions shall fail if:

Range Error The result overflows.

If the integer expression `(math_errhandling & MATH_ERRNO)` is non-zero, then `errno` shall be set to `[ERANGE]`. If the integer expression `(math_errhandling & MATH_ERREXCEPT)` is non-zero, then the overflow floating-point exception shall be raised.

These functions may fail if:

Range Error The value of x is subnormal.

If the integer expression `(math_errhandling & MATH_ERRNO)` is non-zero, then `errno` shall be set to `[ERANGE]`. If the integer expression `(math_errhandling & MATH_ERREXCEPT)` is non-zero, then the underflow floating-point exception shall be raised.

The following sections are informative.

EXAMPLES

None.

APPLICATION USAGE

The value of `expm1(x)` may be more accurate than `exp(x)-1.0` for small values of `x`.

The `expm1()` and `log1p()` functions are useful for financial calculations of $((1+x)^n-1)/x$, namely:

```
expm1(n * log1p(x))/x
```

when `x` is very small (for example, when calculating small daily interest rates). These functions also simplify writing accurate inverse hyperbolic functions.

On error, the expressions `(math_errhandling & MATH_ERRNO)` and `(math_errhandling & MATH_ERREXCEPT)` are independent of each other, but at least one of them must be non-zero.

RATIONALE

None.

FUTURE DIRECTIONS

None.

SEE ALSO

`exp()`, `feclearexcept()`, `fetestexcept()`, `ilogb()`, `log1p()`

The Base Definitions volume of POSIX.1-2017, Section 4.20, Treatment of Error Conditions for Mathematical Functions, `<math.h>`

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