## NAME

expm1, expm1f, expm1l − exponential minus 1

## LIBRARY

Math library (*libm*, *−lm*)

## SYNOPSIS

**#include <math.h>**

**double expm1(double** *x***);**
**float expm1f(float** *x***);**
**long double expm1l(long double** *x***);**

Feature Test Macro Requirements for glibc (see **feature_test_macros**(7)):

**expm1**():
```
    _ISOC99_SOURCE || _POSIX_C_SOURCE >= 200112L
        || _XOPEN_SOURCE >= 500
        || /* Since glibc 2.19: */ _DEFAULT_SOURCE
        || /* glibc <= 2.19: */ _BSD_SOURCE || _SVID_SOURCE
```

**expm1f**(), **expm1l**():
```
    _ISOC99_SOURCE || _POSIX_C_SOURCE >= 200112L
        || /* Since glibc 2.19: */ _DEFAULT_SOURCE
        || /* glibc <= 2.19: */ _BSD_SOURCE || _SVID_SOURCE
```

## DESCRIPTION

These functions return a value equivalent to

```
    exp(x) − 1
```

The result is computed in a way that is accurate even if the value of *x* is near zero—a case where *exp(x) − 1* would be inaccurate due to subtraction of two numbers that are nearly equal.

## RETURN VALUE

On success, these functions return *exp(x) − 1*.

If *x* is a NaN, a NaN is returned.

If *x* is +0 (−0), +0 (−0) is returned.

If *x* is positive infinity, positive infinity is returned.

If *x* is negative infinity, −1 is returned.

If the result overflows, a range error occurs, and the functions return −**HUGE_VAL**, −**HUGE_VALF**, or −**HUGE_VALL**, respectively.

## ERRORS

See **math_error**(7) for information on how to determine whether an error has occurred when calling these functions.

The following errors can occur:

Range error, overflow

> *errno* is set to **ERANGE** (but see BUGS). An overflow floating-point exception (**FE_OVERFLOW**) is raised.

## ATTRIBUTES

For an explanation of the terms used in this section, see **attributes**(7).

| **Interface** | **Attribute** | **Value** |
|---|---|---|
| **expm1**(), **expm1f**(), **expm1l**() | Thread safety | MT-Safe |

## STANDARDS

C99, POSIX.1-2001, POSIX.1-2008.

## BUGS

Before glibc 2.17, on certain architectures (e.g., x86, but not x86_64) **expm1**() raised a bogus underflow floating-point exception for some large negative *x* values (where the function result approaches −1).

Before approximately glibc 2.11, **expm1**() raised a bogus invalid floating-point exception in addition to the expected overflow exception, and returned a NaN instead of positive infinity, for some large positive *x* values.

Before glibc 2.11, the glibc implementation did not set *errno* to **ERANGE** when a range error occurred.

## SEE ALSO

**exp**(3), **log**(3), **log1p**(3)