

**NAME**

lgamma, lgammaf, lgammal, lgamma\_r, lgammaf\_r, lgammal\_r, signgam – log gamma function

**LIBRARY**

Math library (*libm*, *-lm*)

**SYNOPSIS**

```
#include <math.h>

double lgamma(double x);
float lgammaf(float x);
long double lgammal(long double x);

double lgamma_r(double x, int *signp);
float lgammaf_r(float x, int *signp);
long double lgammal_r(long double x, int *signp);

extern int signgam;
```

Feature Test Macro Requirements for glibc (see **feature\_test\_macros(7)**):

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

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

lgamma_r(), lgammaf_r(), lgammal_r():
    /* Since glibc 2.19: */ _DEFAULT_SOURCE
    || /* glibc <= 2.19: */ _BSD_SOURCE || _SVID_SOURCE

signgam:
    _XOPEN_SOURCE
    || /* Since glibc 2.19: */ _DEFAULT_SOURCE
    || /* glibc <= 2.19: */ _BSD_SOURCE || _SVID_SOURCE
```

**DESCRIPTION**

For the definition of the Gamma function, see **tgamma(3)**.

The **lgamma()**, **lgammaf()**, and **lgammal()** functions return the natural logarithm of the absolute value of the Gamma function. The sign of the Gamma function is returned in the external integer *signgam* declared in *<math.h>*. It is 1 when the Gamma function is positive or zero, -1 when it is negative.

Since using a constant location *signgam* is not thread-safe, the functions **lgamma\_r()**, **lgammaf\_r()**, and **lgammal\_r()** have been introduced; they return the sign via the argument *signp*.

**RETURN VALUE**

On success, these functions return the natural logarithm of Gamma(x).

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

If *x* is 1 or 2, +0 is returned.

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

If *x* is a nonpositive integer, a pole error occurs, and the functions return **+HUGE\_VAL**, **+HUGE\_VALF**, or **+HUGE\_VALL**, respectively.

If the result overflows, a range error occurs, and the functions return **HUGE\_VAL**, **HUGE\_VALF**, or **HUGE\_VALL**, respectively, with the correct mathematical sign.

## 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:

Pole error:  $x$  is a nonpositive integer

*errno* is set to **ERANGE** (but see BUGS). A divide-by-zero floating-point exception (**FE\_DIVBYZERO**) is raised.

Range error: result overflow

*errno* is set to **ERANGE**. An overflow floating-point exception (**FE\_OVERFLOW**) is raised.

## STANDARDS

The **lgamma()** functions are specified in C99, POSIX.1-2001, and POSIX.1-2008. *signgam* is specified in POSIX.1-2001 and POSIX.1-2008, but not in C99. The **lgamma\_r()** functions are nonstandard, but present on several other systems.

## BUGS

In glibc 2.9 and earlier, when a pole error occurs, *errno* is set to **EDOM**; instead of the POSIX-mandated **ERANGE**. Since glibc 2.10, glibc does the right thing.

## SEE ALSO

**tgamma(3)**