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Rocky Enterprise Linux 9.2 Manual Pages on command 'tgamma.3'

\$ man tgamma.3

TGAMMA(3) Linux Programmer's Manual TGAMMA(3)

NAME

tgamma, tgammaf, tgammal - true gamma function

SYNOPSIS

```
#include <math.h>
```

```
double tgamma(double x);
```

```
float tgammaf(float x);
```

```
long double tgammal(long double x);
```

Link with -lm.

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

```
tgamma(), tgammaf(), tgammal():
```

```
_ISOC99_SOURCE || _POSIX_C_SOURCE >= 200112L
```

DESCRIPTION

These functions calculate the Gamma function of x.

The Gamma function is defined by

$$\Gamma(x) = \int_0^{\infty} t^{(x-1)} e^{-t} dt$$

It is defined for every real number except for nonpositive integers. For nonnegative in?

tegral m one has

$$\Gamma(m+1) = m!$$

and, more generally, for all x:

$$\Gamma(x+1) = x * \Gamma(x)$$

Furthermore, the following is valid for all values of x outside the poles:

$$\Gamma(x) * \Gamma(1 - x) = \pi / \sin(\pi * x)$$

RETURN VALUE

On success, these functions return $\Gamma(x)$.

If x is a NaN, a NaN is returned.

If x is positive infinity, positive infinity is returned.

If x is a negative integer, or is negative infinity, a domain error occurs, and a NaN is returned.

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.

If the result underflows, a range error occurs, and the functions return 0, with the correct mathematical sign.

If x is -0 or +0, a pole error occurs, and the functions return HUGE_VAL, HUGE_VALF, or HUGE_VALL, respectively, with the same sign as the 0.

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:

Domain error: x is a negative integer, or negative infinity

`errno` is set to `EDOM`. An invalid floating-point exception (`FE_INVALID`) is raised (but see `BUGS`).

Pole error: x is +0 or -0

`errno` is set to `ERANGE`. 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.

`glibc` also gives the following error which is not specified in C99 or POSIX.1-2001.

Range error: result underflow

An underflow floating-point exception (`FE_UNDERFLOW`) is raised, and `errno` is set to `ERANGE`.

VERSIONS

These functions first appeared in `glibc` in version 2.1.

ATTRIBUTES

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

??

?Interface ? Attribute ? Value ?

??

?tgamma(), tgammaf(), tgammaal() ? Thread safety ? MT-Safe ?

??

CONFORMING TO

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

NOTES

This function had to be called "true gamma function" since there is already a function `gamma(3)` that returns something else (see `gamma(3)` for details).

BUGS

Before version 2.18, the glibc implementation of these functions did not set `errno` to `EDOM` when `x` is negative infinity.

Before glibc 2.19, the glibc implementation of these functions did not set `errno` to `ERANGE` on an underflow range error. `x`

In glibc versions 2.3.3 and earlier, an argument of `+0` or `-0` incorrectly produced a domain error (`errno` set to `EDOM` and an `FE_INVALID` exception raised), rather than a pole error.

SEE ALSO

`gamma(3)`, `lgamma(3)`

COLOPHON

This page is part of release 5.10 of the Linux man-pages project. A description of the project, information about reporting bugs, and the latest version of this page, can be found at <https://www.kernel.org/doc/man-pages/>.

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