

NAME

atanh, atanhf, atanhf – inverse hyperbolic tangent function

LIBRARY

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

SYNOPSIS

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

```
double atanh(double x);
```

```
float atanhf(float x);
```

```
long double atanhf(long double x);
```

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

atanh():

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

atanhf(), atanhf():

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

DESCRIPTION

These functions calculate the inverse hyperbolic tangent of x ; that is the value whose hyperbolic tangent is x .

RETURN VALUE

On success, these functions return the inverse hyperbolic tangent of x .

If x is a NaN, a NaN is returned.

If x is $+0$ (-0), $+0$ (-0) is returned.

If x is $+1$ or -1 , a pole error occurs, and the functions return **HUGE_VAL**, **HUGE_VALF**, or **HUGE_VALL**, respectively, with the mathematically correct sign.

If the absolute value of x is greater than 1, a domain error occurs, and a NaN is returned.

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 less than -1 or greater than $+1$

errno is set to **EDOM**. An invalid floating-point exception (**FE_INVALID**) is raised.

Pole error: x is $+1$ or -1

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

ATTRIBUTES

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

Interface	Attribute	Value
atanh() , atanhf() , atanf()	Thread safety	MT-Safe

STANDARDS

C11, POSIX.1-2008.

HISTORY

C99, POSIX.1-2001.

The variant returning *double* also conforms to SVr4, 4.3BSD.

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

acosh(3), **asinh(3)**, **catanh(3)**, **cosh(3)**, **sinh(3)**, **tanh(3)**