

NAME

atanh, atanhf, atanh1 – inverse hyperbolic tangent function

SYNOPSIS

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

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

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

```
long double atanh1(long double x);
```

Link with `-lm`.

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 versions <= 2.19: */ _BSD_SOURCE ||
_SVID_SOURCE
```

atanhf(), **atanh1()**:

```
_ISOC99_SOURCE || _POSIX_C_SOURCE >= 200112L /* Since glibc 2.19: */ _DE-
FAULT_SOURCE || /* Glibc versions <= 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() , atanh1()	Thread safety	MT-Safe

CONFORMING TO

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

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

BUGS

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

SEE ALSO

[acosh\(3\)](#), [asinh\(3\)](#), [catanh\(3\)](#), [cosh\(3\)](#), [sinh\(3\)](#), [tanh\(3\)](#)

COLOPHON

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