NAME

atanh, atanhf, atanhl − inverse hyperbolic tangent function

SYNOPSIS

```
#include <math.h>

double atanh(double x);
float atanhf(float x);
long double atanhl(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(), **atanhl**():

```
_ISOC99_SOURCE || _POSIX_C_SOURCE >= 200112L
  || /* Since glibc 2.19: */ _DEFAULT_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**(), **atanhl**()	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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