

**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()**:

```
_BSD_SOURCE || _SVID_SOURCE || _XOPEN_SOURCE >= 500 ||
_XOPEN_SOURCE && _XOPEN_SOURCE_EXTENDED || _ISOC99_SOURCE ||
_POSIX_C_SOURCE >= 200112L;
or cc -std=c99
```

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

```
_BSD_SOURCE || _SVID_SOURCE || _XOPEN_SOURCE >= 600 || _ISOC99_SOURCE ||
_POSIX_C_SOURCE >= 200112L;
or cc -std=c99
```

**DESCRIPTION**

The **atanh()** function calculates 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.

**CONFORMING TO**

C99, POSIX.1-2001. The variant returning *double* also conforms to SVr4, 4.3BSD, C89.

**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**

This page is part of release 3.74 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 <http://www.kernel.org/doc/man-pages/>.