

**NAME**

cosh, coshf, coshl – hyperbolic cosine function

**SYNOPSIS**

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

```
double cosh(double x);
```

```
float coshf(float x);
```

```
long double coshl(long double x);
```

Link with `-lm`.

Feature Test Macro Requirements for glibc (see [feature\\_test\\_macros\(7\)](#)):

```
coshf(), coshl():
```

```
_ISOC99_SOURCE || _POSIX_C_SOURCE >= 200112L || /* Since glibc 2.19: */ _DE-  
FAULT_SOURCE || /* Glibc versions <= 2.19: */ _BSD_SOURCE || _SVID_SOURCE
```

**DESCRIPTION**

These functions return the hyperbolic cosine of  $x$ , which is defined mathematically as:

$$\cosh(x) = (\exp(x) + \exp(-x)) / 2$$

**RETURN VALUE**

On success, these functions return the hyperbolic cosine of  $x$ .

If  $x$  is a NaN, a NaN is returned.

If  $x$  is +0 or -0, 1 is returned.

If  $x$  is positive infinity or negative infinity, positive infinity is returned.

If the result overflows, a range error occurs, and the functions return `+HUGE_VAL`, `+HUGE_VALF`, or `+HUGE_VALL`, respectively.

**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:

Range error: result overflow

`errno` is set to `ERANGE`. An overflow floating-point exception (`FE_OVERFLOW`) is raised.

**ATTRIBUTES**

For an explanation of the terms used in this section, see [attributes\(7\)](#).

Interface	Attribute	Value
<code>cosh()</code> , <code>coshf()</code> , <code>coshl()</code>	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 version 2.3.4 and earlier, an overflow floating-point (`FE_OVERFLOW`) exception is not raised when an overflow occurs.

**SEE ALSO**

[acosh\(3\)](#), [asinh\(3\)](#), [atanh\(3\)](#), [ccos\(3\)](#), [sinh\(3\)](#), [tanh\(3\)](#)

**COLOPHON**

This page is part of release 4.16 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/>.