

**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: */ _DEFAULT_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   |
|---|---------------|---------|
| <b>cosh()</b> , <b>coshf()</b> , <b>coshl()</b> | 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**

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