

NAME

sinh, sinhf, sinh1 - hyperbolic sine function

SYNOPSIS

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

```
double sinh(double x);
```

```
float sinhf(float x);
```

```
long double sinh1(long double x);
```

Link with *-lm*.

Feature Test Macro Requirements for glibc (see [feature_test_macros\(7\)](#)):

```
sinhf(), sinh1():
```

```
_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 sine of *x*, which is defined mathematically as:

$$\sinh(x) = (\exp(x) - \exp(-x)) / 2$$

RETURN VALUE

On success, these functions return the hyperbolic sine of *x*.

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

If *x* is +0 (-0), +0 (-0) is returned.

If *x* is positive infinity (negative infinity), positive infinity (negative infinity) is returned.

If the result overflows, a range error occurs, and the functions return **HUGE_VAL**, **HUGE_VALF**, or **HUGE_VALL**, respectively, with the same sign as *x*.

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
sinh(), sinhf(), sinh1()	Thread safety	MT-Safe

CONFORMING TO

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

The variant returning *double* also conforms to SVr4, 4.3BSD, C89.

SEE ALSO

[acosh\(3\)](#), [asinh\(3\)](#), [atanh\(3\)](#), [cosh\(3\)](#), [csinh\(3\)](#), [tanh\(3\)](#)

COLOPHON

This page is part of release 4.10 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/>.