

**NAME**

pow, powf, powl – power functions

**SYNOPSIS**

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

```
double pow(double x, double y);
```

```
float powf(float x, float y);
```

```
long double powl(long double x, long double y);
```

Link with `-lm`.

Feature Test Macro Requirements for glibc (see `feature_test_macros(7)`):

```
powf(), powl():
```

```
_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 value of  $x$  raised to the power of  $y$ .

**RETURN VALUE**

On success, these functions return the value of  $x$  to the power of  $y$ .

If  $x$  is a finite value less than 0, and  $y$  is a finite noninteger, a domain error occurs, and a NaN is returned.

If the result overflows, a range error occurs, and the functions return **HUGE\_VAL**, **HUGE\_VALF**, or **HUGE\_VALL**, respectively, with the mathematically correct sign.

If result underflows, and is not representable, a range error occurs, and 0.0 is returned.

Except as specified below, if  $x$  or  $y$  is a NaN, the result is a NaN.

If  $x$  is +1, the result is 1.0 (even if  $y$  is a NaN).

If  $y$  is 0, the result is 1.0 (even if  $x$  is a NaN).

If  $x$  is +0 (−0), and  $y$  is an odd integer greater than 0, the result is +0 (−0).

If  $x$  is 0, and  $y$  greater than 0 and not an odd integer, the result is +0.

If  $x$  is −1, and  $y$  is positive infinity or negative infinity, the result is 1.0.

If the absolute value of  $x$  is less than 1, and  $y$  is negative infinity, the result is positive infinity.

If the absolute value of  $x$  is greater than 1, and  $y$  is negative infinity, the result is +0.

If the absolute value of  $x$  is less than 1, and  $y$  is positive infinity, the result is +0.

If the absolute value of  $x$  is greater than 1, and  $y$  is positive infinity, the result is positive infinity.

If  $x$  is negative infinity, and  $y$  is an odd integer less than 0, the result is −0.

If  $x$  is negative infinity, and  $y$  less than 0 and not an odd integer, the result is +0.

If  $x$  is negative infinity, and  $y$  is an odd integer greater than 0, the result is negative infinity.

If  $x$  is negative infinity, and  $y$  greater than 0 and not an odd integer, the result is positive infinity.

If  $x$  is positive infinity, and  $y$  less than 0, the result is +0.

If  $x$  is positive infinity, and  $y$  greater than 0, the result is positive infinity.

If  $x$  is +0 or −0, and  $y$  is an odd integer less than 0, a pole error occurs and **HUGE\_VAL**, **HUGE\_VALF**, or **HUGE\_VALL**, is returned, with the same sign as  $x$ .

If  $x$  is +0 or −0, and  $y$  is less than 0 and not an odd integer, a pole error occurs and **+HUGE\_VAL**, **+HUGE\_VALF**, or **+HUGE\_VALL**, 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:  $x$  is negative, and  $y$  is a finite noninteger

*errno* is set to **EDOM**. An invalid floating-point exception (**FE\_INVALID**) is raised.

Pole error:  $x$  is zero, and  $y$  is negative

*errno* is set to **ERANGE** (but see BUGS). A divide-by-zero floating-point exception (**FE\_DIVBYZERO**) is raised.

Range error: the result overflows

*errno* is set to **ERANGE**. An overflow floating-point exception (**FE\_OVERFLOW**) is raised.

Range error: the result underflows

*errno* is set to **ERANGE**. An underflow floating-point exception (**FE\_UNDERFLOW**) is raised.

## ATTRIBUTES

For an explanation of the terms used in this section, see **attributes(7)**.

| Interface                                    | Attribute     | Value   |
|--|---------------|---------|
| <b>pow()</b> , <b>powf()</b> , <b>powl()</b> | Thread safety | MT-Safe |

## CONFORMING TO

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

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

## BUGS

On 64-bits, **pow()** may be more than 10,000 times slower for some (rare) inputs than for other nearby inputs. This affects only **pow()**, and not **powf()** nor **powl()**.

In glibc 2.9 and earlier, when a pole error occurs, *errno* is set to **EDOM** instead of the POSIX-mandated **ERANGE**. Since version 2.10, glibc does the right thing.

If  $x$  is negative, then large negative or positive  $y$  values yield a NaN as the function result, with *errno* set to **EDOM**, and an invalid (**FE\_INVALID**) floating-point exception. For example, with **pow()**, one sees this behavior when the absolute value of  $y$  is greater than about 9.223373e18.

In version 2.3.2 and earlier, when an overflow or underflow error occurs, glibc's **pow()** generates a bogus invalid floating-point exception (**FE\_INVALID**) in addition to the overflow or underflow exception.

## SEE ALSO

**cbirt(3)**, **cpow(3)**, **sqrt(3)**

## COLOPHON

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