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19.1 Predefined Mathematical Constants

The header `math.h` defines several useful mathematical constants. All values are defined as preprocessor macros starting with `M_`. The values provided are:

`M_E`

The base of natural logarithms.

`M_LOG2E`

The logarithm to base 2 of `M_E`.

`M_LOG10E`

The logarithm to base 10 of `M_E`.

`M_LN2`

The natural logarithm of 2.

`M_LN10`

The natural logarithm of 10.

`M_PI`

Pi, the ratio of a circle's circumference to its diameter.

`M_PI_2`

Pi divided by two.

`M_PI_4`

Pi divided by four.

`M_1_PI`

The reciprocal of pi ($1/\pi$)

`M_2_PI`

Two times the reciprocal of pi.

`M_2_SQRTPI`

Two times the reciprocal of the square root of pi.

`M_SQRT2`

The square root of two.

`M_SQRT1_2`

The reciprocal of the square root of two (also the square root of 1/2).

These constants come from the Unix98 standard and were also available in 4.4BSD; therefore they are only defined if `_XOPEN_SOURCE=500`, or a more general feature select macro, is defined. The default set of features includes these constants. See [Feature Test Macros](#).

All values are of type `double`. As an extension, the GNU C Library also defines these constants with type `long double`. The `long double` macros have a lowercase 'l' appended to their names: `M_El`, `M_PIl`, and so forth. These are only available if `_GNU_SOURCE` is defined.

Likewise, the GNU C Library also defines these constants with the types `_FloatN` and `_FloatNx` for the machines that have support for such types enabled (see [Mathematics](#)) and if `_GNU_SOURCE` is defined. When available, the macros names are appended with '`fN`' or '`fNx`', such as '`f128`' for the type `_Float128`.

Note: Some programs use a constant named `PI` which has the same value as `M_PI`. This constant is not standard; it may have appeared in some old AT&T headers, and is mentioned in Stroustrup's book on C++. It infringes on the user's name space, so the GNU C Library does not define it. Fixing programs written to expect it is simple: replace `PI` with `M_PI` throughout, or put '`-DPI=M_PI`' on the compiler command line.

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