

**NAME**

`j0`, `j0f`, `j0l`, `j1`, `j1f`, `j1l`, `jn`, `jnf`, `jnl` – Bessel functions of the first kind

**SYNOPSIS**

```
#include <math.h>

double j0(double x);
double j1(double x);
double jn(int n, double x);

float j0f(float x);
float j1f(float x);
float jnf(int n, float x);

long double j0l(long double x);
long double j1l(long double x);
long double jnl(int n, long double x);
```

Link with `-lm`.

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

```
j0(), j1(), jn():
    _XOPEN_SOURCE
    || /* Since glibc 2.19: */ _DEFAULT_SOURCE
    || /* Glibc versions <= 2.19: */ _SVID_SOURCE || _BSD_SOURCE
j0f(), j0l(), j1f(), j1l(), jnf(), jnl():
    _XOPEN_SOURCE >= 600
    || (_ISOC99_SOURCE && _XOPEN_SOURCE)
    || /* Since glibc 2.19: */ _DEFAULT_SOURCE
    || /* Glibc versions <= 2.19: */ _SVID_SOURCE || _BSD_SOURCE
```

**DESCRIPTION**

The `j0()` and `j1()` functions return Bessel functions of  $x$  of the first kind of orders 0 and 1, respectively. The `jn()` function returns the Bessel function of  $x$  of the first kind of order  $n$ .

The `j0f()`, `j1f()`, and `jnf()`, functions are versions that take and return *float* values. The `j0l()`, `j1l()`, and `jnl()` functions are versions that take and return *long double* values.

**RETURN VALUE**

On success, these functions return the appropriate Bessel value of the first kind for  $x$ .

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

If  $x$  is too large in magnitude, or the result underflows, a range error occurs, and the return value is 0.

**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 underflow, or  $x$  is too large in magnitude  
`errno` is set to **ERANGE**.

These functions do not raise exceptions for `fetestexcept(3)`.

**ATTRIBUTES**

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

Interface	Attribute	Value
<b>j0()</b> , <b>j0f()</b> , <b>j0l()</b>	Thread safety	MT-Safe
<b>j1()</b> , <b>j1f()</b> , <b>j1l()</b>	Thread safety	MT-Safe
<b>jn()</b> , <b>jnf()</b> , <b>jnl()</b>	Thread safety	MT-Safe

**CONFORMING TO**

The functions returning *double* conform to SVr4, 4.3BSD, POSIX.1-2001, and POSIX.1-2008. The others are nonstandard functions that also exist on the BSDs.

**BUGS**

There are errors of up to  $2e-16$  in the values returned by **j0()**, **j1()** and **jn()** for values of  $x$  between  $-8$  and  $8$ .

**SEE ALSO**

**y0(3)**

**COLOPHON**

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