

**NAME**

`cacosh`, `cacoshf`, `cacoshl` - complex arc hyperbolic cosine

**SYNOPSIS**

```
#include <complex.h>
```

```
double complex cacosh(double complex z);
```

```
float complex cacoshf(float complex z);
```

```
long double complex cacoshl(long double complex z);
```

Link with `-lm`.

**DESCRIPTION**

The `cacosh()` function calculates the complex arc hyperbolic cosine of  $z$ . If  $y = \text{cacosh}(z)$ , then  $z = \text{ccosh}(y)$ . The imaginary part of  $y$  is chosen in the interval  $[-\pi, \pi]$ . The real part of  $y$  is chosen non-negative.

One has:

$$\text{cacosh}(z) = 2 * \text{clog}(\text{csqrt}((z + 1) / 2) + \text{csqrt}((z - 1) / 2))$$
**VERSIONS**

These functions first appeared in `glibc` in version 2.1.

**CONFORMING TO**

C99.

**EXAMPLE**

```
/* Link with "-lm" */
#include <complex.h>
#include <stdlib.h>
#include <unistd.h>
#include <stdio.h>

int
main(int argc, char *argv[])
{
    double complex z, c, f;

    if (argc != 3) {
        fprintf(stderr, "Usage: %s <real> <imag>\n", argv[0]);
        exit(EXIT_FAILURE);
    }

    z = atof(argv[1]) + atof(argv[2]) * I;

    c = cacosh(z);
    printf("cacosh() = %6.3f %6.3f*i\n", creal(c), cimag(c));

    f = 2 * clog(csqrt((z + 1)/2) + csqrt((z - 1)/2));
    printf("formula = %6.3f %6.3f*i\n", creal(f), cimag(f));

    exit(EXIT_SUCCESS);
}
```

**SEE ALSO**

[acosh\(3\)](#), [cabs\(3\)](#), [ccosh\(3\)](#), [cimag\(3\)](#), [complex\(7\)](#)

**COLOPHON**

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