NAME

complex − basics of complex mathematics

SYNOPSIS

#include <complex.h>

DESCRIPTION

Complex numbers are numbers of the form z = a+b*i, where a and b are real numbers and i = sqrt(−1), so that i*i = −1.

There are other ways to represent that number. The pair (a,b) of real numbers may be viewed as a point in the plane, given by X- and Y-coordinates. This same point may also be described by giving the pair of real numbers (r,phi), where r is the distance to the origin O, and phi the angle between the X-axis and the line Oz. Now z = r*exp(i*phi) = r*(cos(phi)+i*sin(phi)).

The basic operations are defined on z = a+b*i and w = c+d*i as:

addition: z+w = (a+c) + (b+d)*i

multiplication: z*w = (a*c − b*d) + (a*d + b*c)*i

division: z/w = ((a*c + b*d)/(c*c + d*d)) + ((b*c − a*d)/(c*c + d*d))*i

Nearly all math function have a complex counterpart but there are some complex-only functions.

EXAMPLES

Your C-compiler can work with complex numbers if it supports the C99 standard. Link with *−lm*. The imaginary unit is represented by I.

```
/* check that exp(i * pi) == −1 */
#include <math.h>        /* for atan */
#include <stdio.h>
#include <complex.h>

int
main(void)
{
    double pi = 4 * atan(1.0);
    double complex z = cexp(I * pi);
    printf("%f + %f * i\n", creal(z), cimag(z));
}
```

SEE ALSO

cabs(3), **cacos**(3), **cacosh**(3), **carg**(3), **casin**(3), **casinh**(3), **catan**(3), **catanh**(3), **ccos**(3), **ccosh**(3), **cerf**(3), **cexp**(3), **cexp2**(3), **cimag**(3), **clog**(3), **clog10**(3), **clog2**(3), **conj**(3), **cpow**(3), **cproj**(3), **creal**(3), **csin**(3), **csinh**(3), **csqrt**(3), **ctan**(3), **ctanh**(3)