Manipulation Functions

```
double carg(double complex z);
float cargf(float complex z);
long double cargl(long double complex z);

double cimag(double complex z);
float cimagf(float complex z);
long double cimagl(long double complex z);

double complex conj(double complex z);
float complex conjf(float complex z);
long double complex conjl(long double complex z);

double complex cproj(double complex z);
float complex cprojf(float complex z);
long double complex cprojl(long double complex z);

double creal(double complex z);
float crealf(float complex z);
long double creall(long double complex z);
```

carg The `carg` function returns the argument (phase angle) of `z`, with a branch cut along the negative real axis. The return value lies in the interval $[-\pi, +\pi]$.

cimag The `cimag` function returns the imaginary part of `z`.

conj The `conj` function returns the complex conjugate of `z`.

cproj The `cproj` function computes a projection of `z` onto the Riemann sphere. The return value is equal to `z` unless one of its parts is infinite, in which case `cproj` returns `INFINITY + I * copysign(0.0, cimag(z))`.

creal The `creal` function returns the real part of `z`.

PROGRAM Finding the Roots of a Quadratic Equation

The roots of the quadratic equation

$$ax^2 + bx + c = 0$$

are given by the ***quadratic formula:***

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

In general, the value of x will be a complex number, because the square root of $b^2 - 4ac$ is imaginary if $b^2 - 4ac$ (known as the ***discriminant***) is less than 0.

For example, suppose that $a = 5$, $b = 2$, and $c = 1$, which gives us the equation

$$5x^2 + 2x + 1 = 0$$

The value of the discriminant is $4 - 20 = -16$, so the roots of the equation will be