

In this post I show you how to write a C program that finds the roots(both real and complex) of a quadratic equation.



Theory:

A quadratic equation looks like this:

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

We will therefore, ask the user to enter the coefficients(a, b, c).

The discriminant is given as,

$$d = b^2 - 4ac$$

If $d = 0$ then the equation has real and equal roots, if $d > 0$ then the equation has real and unequal roots, and if $d < 0$ then the equation has complex roots.

So, in our program, we will first perform a check to find out if the roots are going to be real or complex by using the above conditions.

Then accordingly we will, use the following formulas to find the root:

Real Roots($d \geq 0$):

$$root1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$root2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Complex Roots($d < 0$):

$$root1 = \frac{-b}{2a} + i\left(\frac{\sqrt{b^2 - 4ac}}{2a}\right)$$

$$root2 = \frac{-b}{2a} - i\left(\frac{\sqrt{b^2 - 4ac}}{2a}\right)$$

That's all the information you need to be able to write the program.

Program:

```

/*****
****ROOTS OF A QUADRATIC EQUATION
2017 (c) Manas Sharma - http://bragitoff.com
*****/
#include<stdio.h>
#include<math.h>
main()
{
double a,b,c,root1,root2,d,imag;
printf("Enter the coefficients(a,b,c) of the quadratic equation\nax^2+bx+c=0\n");
scanf("%lf%lf%lf",&a,&b,&c);
//printf("%f,%f,%f",a,b,c);
d=b*b-4*a*c;
if(d>=0){
/****REAL ROOTS CALCULATION****/
root1=(-b+sqrt(d))/(2*a);
root2=(-b-sqrt(d))/(2*a);
printf("The polynomial has real roots:\nx1=%f\nx2=%f\n",root1,root2);
}
else{
/****COMPLEX ROOTS CALCULATION****/
root1=-b/(2*a);
imag=sqrt(fabs(d))/(2*a);
printf("The polynomial has complex roots:\nx1=%f+%fi\nx2=%f-
%fi\n",root1,imag,root1,imag);
}
}
}

```

OUTPUT:

```

Enter the coefficients(a,b,c) of the quadratic equation
ax^2+bx+c=0
5      2      -5
The polynomial has real roots:
x1=0.819804
x2=-1.219804

```



Manas Sharma

PhD researcher at Friedrich-Schiller University Jena, Germany. I'm a physicist specializing in theoretical, computational and experimental condensed matter physics. I like to develop Physics related apps and softwares from time to time. Can code in most of the popular languages. Like to share my knowledge in Physics and applications using this Blog and a YouTube channel.

Share this:

[Click to share on Facebook \(Opens in new window\)](#)

[Click to share on Twitter \(Opens in new window\)](#)

[Click to share on Google+ \(Opens in new window\)](#)

[Click to share on WhatsApp \(Opens in new window\)](#)

[Click to share on Pinterest \(Opens in new window\)](#)

[Click to share on Reddit \(Opens in new window\)](#)

[Click to share on LinkedIn \(Opens in new window\)](#)

[Click to share on Skype \(Opens in new window\)](#)

[Click to email this to a friend \(Opens in new window\)](#)

[Click to print \(Opens in new window\)](#)

[Click to share on Tumblr \(Opens in new window\)](#)

[Click to share on Pocket \(Opens in new window\)](#)

[Click to share on Telegram \(Opens in new window\)](#)

Like this:

Loading...

Consider donating if you found the information useful
I appreciate your blog: \$3

