Lab 2 - Root Finder

November 20, 2020

Purpose

The aim of this experiment is to find the roots of a quadratic equation by using discriminants conditionally.

Procedure

In this lab, you are expected to write a code that finds roots of a quadratic equation in the form $\mathbf{ax^2+bx+c}$ with the help of **discriminant** which reveals what type of roots, e.g. real, imaginary..., the equation has. The discrimininant, Δ is defined,

$$\Delta = b^2 - 4ac$$

The roots x_1 and x_2 can be found accordingly

$$x_{1,2} = \frac{-b \pm \sqrt{\Delta}}{2a}.$$

Source code

- should receive three inputs a$\neq$ 0, b, and c **from the user** in a **float** data type [10 pts].
- calculates the discriminant according to received inputs and print the value [20 pts].
- finds the roots depending on the value of discriminant for each cases,

$$x_{1,2} = \begin{cases} \text{are real roots [20 pts]}, & \Delta > 0 \\ \text{are real and identical roots [20 pts]}, & \Delta = 0 \\ \text{are complex roots [30 pts]}, & \Delta < 0 \end{cases}$$

for the complex roots;

$x_1 = \frac{-b+i\sqrt{-\Delta}}{2a}$ and $x_2 = \frac{-b-i\sqrt{-\Delta}}{2a}$, therefore $x_{1_{re}} = x_{2_{re}} = -\frac{b}{2a}$ and $x_{1_{im}} = -x_{2_{im}} = \frac{\sqrt{-\Delta}}{2a}$.

Hint; *Include math.h library in addition to standard input-output library (#include < stdio.h > and #include < math.h >) to use* sqrt *function* (sqrt(Δ)=$\sqrt{\Delta}$)

```
Enter coefficients a, b and c:
0.5
1.2
-3.4

Discriminant is 8
There are two real roots
x1 = 1.671 and x2 = -4.071
Program ended with exit code: 0
```

```
Enter coefficients a, b and c:
1
-4
4

Discriminant is 0
There are two real, identical roots
x1 = x2 = 2.000
Program ended with exit code: 0
```

```
Enter coefficients a, b and c:
4
1
1

Discriminant is -15
There are no real roots
x1_re= -0.125 x1_im=0.484 and
x2_re= -0.125 x2_im=-0.484
Program ended with exit code: 0
```

```
Enter coefficients a, b and c:
1
4
1

Discriminant is 12
There are two real roots
x1 = -0.268 and x2 = -3.732
Program ended with exit code: 0
```