ECE 1410 Quadratic Roots Program Requirements (C review)

Introduction

Some mathematical computations are extremely complex and time-consuming for a computer to perform. Often, we resort to a look-up table instead, where outputs are pre-calculated and stored in a file. Mathematical functions that fall into this category include trigonometric functions (sine, cosine, tangent, etc.), roots, and logarithms.

Task

You are to create a program that computes the roots of the equation $ax^2 + bx + c = 0$ using the Quadratic Formula:

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

The program shall read lines containing 3 integers representing a, b, and c from an input text file and writes the set and its corresponding floating-point roots to either an output text file or the screen.

Requirements

1. The program will be done using Cygwin and gcc.

2. The input file will contain three integers per line, representing values for a, b, and c respectively. Each line of the output file or screen shall contain the set of three integers followed by the two floating-point roots, with all values separated by tabs. All floating-point values shall be printed with 4 digits after the decimal point. If an input set generates complex roots, the output should state "complex" rather than computing the roots.

3. All integers in the input file will be between -99 and 99. There is no limit to the size of the input file.

4. The output file / screen must print the number sets in the same order as they appear in the input file.

5. The program will expect either 1 or 2 command-line arguments to specify the names of the input and output files. Example command-line input:

```
$ .\qr.exe input.txt output.txt
$ .\qr.exe input.txt
```

   The output file argument is optional. If it does not appear, output shall be sent to the screen.

6. Malformed command-line syntax and/or failure to open input or output files shall result in an error message and immediate program termination.

7. A makefile will be used and submitted.

8. Remember function headers and pseudocode!

Example Files

If the input file appeared like this:

```
1     20    3
2     -11   5
1     -5    6
3     6     3
4     5     6
1     4     4
```

The associated output file (or screen) should look like this:

```
1     20    3     -0.1511    -19.8489
2     -11   5     5.0000     0.5000
1     -5    6     3.0000     2.0000
3     6     3     -1.0000    -1.0000
4     5     6     complex
1     4     4     -2.0000    -2.0000
```

Think about different input scenarios and craft appropriate files to test those scenarios.