CSC 135
Assignment #5
Point value: 30

Program due: Sec 1 Mon [redacted], Oct 9
Sec 2 Tues, Oct 10

A polynomial of the form $ax^2 + bx + c$ is called a quadratic. If the coefficients a, b, and c are known, the quadratic formula can be used to find values (called roots) for x such that

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

You are to write a C++ program that finds roots of various quadratics. Your program will be interactive. It should prompt for the coefficients a, b, and c (all will be int). Then, either 1 or 2 roots should be calculated as follows:

Case 1: a = 0

In this case, there is only 1 real root, $x = \frac{-c}{b}$

Case 2: $b^2 \geq 4ac$

In case 2 there are 2 (possibly identical) real roots,

$$x1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \qquad x2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Case 3: $b^2 < 4ac$

There are 2 complex (imaginary) roots of the form x + yi and x – yi where

$$x = \frac{-b}{2a} \qquad y = \frac{\sqrt{4ac - b^2}}{2a} \qquad i = \sqrt{-1}$$

(just print 'i' for this value)

As output for your program, print a message listing a, b, and c with appropriate labels. Then print another message indicating whether there is 1 real root, 2 identical real roots, 2 different real roots, or 2 complex roots. Finally, print the solution(s) with appropriate labels. All float values should be printed with 4 digits to the right of the decimal.

Test your program by running it 5 times with the following data sets.

	a	b	c
1.	16	-82	45
2.	5	2	8
3.	0	32	2
4.	12	11	-15
5.	9	-12	4

MINIMUM PROGRAM DOCUMENTATION REQUIRED.

DESIGN DOCUMENT

Before writing this program, create a design document that illustrates the algorithm your program will use. This document should provide enough detail so that another programmer could translate your algorithm into a working program. (3 points)