Program #1: Solving a Quadratic Equation

1. Write a program to solve a general quadratic equation of the form  
    ax2 + bx + c = 0 using the quadratic formula   
   that will be able to solve the equation for **all** possible values of a, b, c.  
   Note: complex roots should be expressed in *a + bi* form.  
     
   Your program should test the following values for a, b, and c by evaluating the quadratic at your “roots” for the equation. Test your roots to 5 significant digits.

|  |  |  |
| --- | --- | --- |
| **a** | **b** | **c** |
| 0 | 0 | 0 |
| 0 | 5 | 6 |
| 1 | 6 | 9 |
| 1 | 1 | 1 |
| 6 x 102 | 6 x 1010 | 10-10 |
| 1 | 1000.001 | 1 |
| 10-5 | 2 | 1 |

What “problems” do you notice with some of the equations? What is causing the problems?

(To answer these questions, compare the numbers in the first 5 examples to the last 3. How does floating point representations affect these examples?)

1. Change your program to include an “alternate” quadratic formula:

Compare your results to part A. Did the “alternate” formula solve some of the problems.

1. Change your program one more time to include a third solution:  
   Given a solution *r1* , the second root can be found using:  
     
    *r2 = c / (a\*r1)*

Does this help with any of the problems you encountered?

*Extra Credit: Verify that the 2 “alternate quadratic formula” methods are also valid solutions for the quadratic equation.*