

University of Massachusetts Dartmouth
Department of Electrical and Computer Engineering

ECE 160
Lab 4 – Quadratic

Name: quad.cpp
Due: see <http://www.ece160.org>

Write a program which finds the real roots of a quadratic equation of the form:

$$Ax^2 + Bx + C = 0 \text{ (A and B may not both be 0), when given A, B, and C.}$$

The quadratic formula may be used (when $A \neq 0$); the formula is:

$$x_1, x_2 = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

If $A \neq 0$, then, depending on the value of the discriminate ($B^2 - 4AC$), there are three possibilities as to what type of solution the given equation has:

- (1) The given values of A, B, and C have two real roots ($\text{disc} > 0$);
- (2) The given values of A, B, and C have one real root ($\text{disc} = 0$);
- (3) The given values of A, B, and C yield $\text{disc} < 0$; there are no real roots;

If $A = 0$, then a linear equation exists and the solution (root) is given by:

- (4) $x = -C/B$

Your program should be tested for each of these possibilities, and produce output similar to the sample run below. The "^" symbol is used in the printout to mean "to the power of". Note the "^" symbol is not the C operator for exponentiation within an expression. Input values should allow for decimals. All values should be printed with two decimal places. User input is underlined in the examples below (your program does not have to generate the underlining). Note that multiple runs are shown:

```
Quadratic Equation Solver
Enter A, B, C: 20 16 -21
Equation: 20.00X^2 + 16.00X + -21.00 = 0   Roots: -1.50 and 0.70
Press any key to continue...
```

```
Quadratic Equation Solver
Enter A, B, C: 1 6 9
Equation: 1.00X^2 + 6.00X + 9.00 = 0   Root: -3.00
Press any key to continue...
```

```
Quadratic Equation Solver
Enter A, B, C: 1 6 25
Equation: 1.00X^2 + 6.00X + 25.00 = 0   No real roots
Press any key to continue...
```

```
Quadratic Equation Solver
Enter A, B, C: 6 -7.75 -34.375
Equation: 6.00X^2 + -7.75X + -34.38 = 0   Roots: 3.13 and -1.83
Press any key to continue...
```

```
Quadratic Equation Solver
Enter A, B, C: 0 7 -3.5
Equation: 0.00X^2 + 7.00X + -3.50 = 0   Root: 0.50
Press any key to continue...
```

Notes:

- You must have the statement `#include <math.h>` in your program in order to use the `sqrt()` function.
- Squaring a number may be done by `B*B` or using the `pow()` function.
- Using a `%f` specification prints a float value to six decimal places by default. To print a float values to 2 decimal places, use a `%.2f` specification.
- Remember to include the required certification statement as specified in the grading rubric, and in the sample project.