



## Programming Lab #8c

# Q16 Fixed Point Quadratics

Prerequisite Reading: Chapters 1-10

Revised: July 18, 2018

*Note: This assignment is very similar to Lab 4 except that (1) it uses 32-bit integers as Q16 fixed-point reals to perform the arithmetic, and (2) the main program provides the following C functions that can be called by your assembly language functions as needed:*

```
Q16 Q16Product(Q16 multiplier, Q16 multiplicand) ;
Q16 Q16Quotient(Q16 dividend, Q16 divisor) ;
Q16 Q16SquareRoot(Q16 x) ;
```

Create a single ARM Cortex-M4 assembly source code file containing the following six functions whose function prototype declarations appear below. (Note that functions Root1 and Root2 should both contain calls to function Discriminant.) These functions are called by a main program (download from [here](#)) that will test your functions for three test cases.

```
Q16 Discriminant(Q16 a, Q16 b, Q16 c) ;
```

Computes the value of the discriminant,  $b^2 - 4ac$

```
Q16 Root1(Q16 a, Q16 b, Q16 c) ;
```

Computes the root given by  $\frac{-b + \sqrt{b^2 - 4ac}}{2a}$

```
Q16 Root2(Q16 a, Q16 b, Q16 c) ;
```

Computes the root given by  $\frac{-b - \sqrt{b^2 - 4ac}}{2a}$

```
Q16 Quadratic(Q16 x, Q16 a, Q16 b, Q16 c) ;
```

Computes the quadratic,  $ax^2 + bx + c$

If your code is correct, the display should look similar to the image shown. Incorrect values will be displayed as **white text on a red background**.

