


# Programming Lab 5A

## Integer Quadratics

 Click to download Lab5A-Main.c

Topics: Instructions for integer arithmetic, calling a C function from assembly.

Prerequisite Reading: Chapters 1-5  
Revised: January 14, 2022

**Assignment:** This program plots the value of the quadratic equation  $ax^2 + bx + c$  for three sets of integer coefficients. The main program will compile and run without writing any assembly. However, your task is to create equivalent replacements in assembly language for the following four functions found in the C main program. The original C versions have been defined as “weak” so that the linker will automatically replace them in the executable image by those you create in assembly; you do not need to remove the C versions. This allows you to create and test your assembly language functions one at a time.

Note that functions *Root1* and *Root2* should both contain calls to functions *Discriminant* and *SquareRoot*. Functions *Discriminant*, *Root1*, *Root2* and *Quadratic* are called by a main program that will test your functions for three test cases. All of the parameters and return values are of type `int32_t`:

1.  $Discriminant(a, b, c) = b^2 - 4ac$
2.  $Root1(a, b, c) = \frac{-b + SquareRoot(Discriminant(a, b, c))}{2a}$
3.  $Root2(a, b, c) = \frac{-b - SquareRoot(Discriminant(a, b, c))}{2a}$
4.  $Quadratic(x, a, b, c) = ax^2 + bx + c$   
Most efficient implementation:  $c + x(b + ax)$

**Note:** Your *Root1* and *Root2* functions must call C function *SquareRoot* that is provided in the main program. It requires a single unsigned integer parameter and returns an unsigned integer result. Your assembly language code for *Root1* and *Root2* will likely need to push and pop registers; be sure that the total number of registers you push and pop is even so that the address held in the stack pointer remains a multiple of eight to satisfy the [data alignment requirements](#) of compiled C code. If your code is correct, the three test cases should look similar to the image above. Incorrect values will be displayed as **white text on a red background**.

