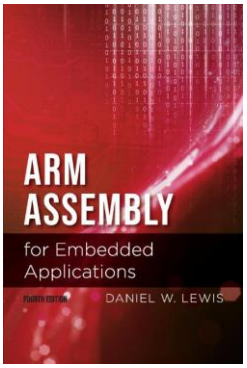

Programming Lab #8a

Fixed vs. Floating Point

Prerequisite Reading: Chapters 1-10
Revised: January 5, 2019

Background: Taylor series are often used as approximations for exponential functions, logarithmic functions, and trig functions. Each such approximation is simply a polynomial in which the coefficients $(a_0, a_1, a_2, \cdots)$ have been determined according to the function desired.

$$a_0x^0 + a_1x^1 + a_2x^2 + \cdots + a_{n-1}x^{n-1}$$

When implemented in a computer program, the values of x, the coefficients and the polynomial must be implemented as reals (not integers). However, the computation can use constants, variables and arithmetic based on either a floating-point or fixed-point representation of reals.

Assignment: You are to create a single assembly language file containing two functions - one called `FloatPoly` that evaluates a polynomial using single-precision 32-bit floating-point reals and a second called `FixedPoly` that evaluates a polynomial using 32-bit Q16 fixed-point reals:

```
float FloatPoly(float x, float a[], int32_t n) ;
Q16   FixedPoly(Q16   x, Q16   a[], int32_t n) ;
```

Test your functions using the C main program downloaded from here. The program will call each function with an array a containing n coefficients that have been chosen to approximate the *sine* function at an angle x expressed in radians. The values returned by the two functions are used to display two sine waves for comparison. If your code is correct, the display should look like the image to the right although it will be animated and your cycle counts may differ.

Error messages (if any) will appear as white text on a red background.