Math 310 – Numerical Analysis
Programming Assignment with HW 3
due Thursday, September 24

Write two programs:

* A program that uses Horner's method to evaluate a polynomial at a point x. Your function should take two arguments,

  a vector $\mathbf{a} = [a_n \ a_{n+1} \ \cdots \ a_0]$ of coefficients for a polynomial $p(x) = a_n x^n + \cdots + a_0$
  a value x for the argument,

  and compute the value of $p(x)$.

* A second program that uses Horner's method to evaluate the derivative of a polynomial at a point x, $p'(x)$.

With these programs in hand, consider the functions

$$f(x) = x^7 - 20x^6 + 2x^3 - 1$$
$$g(x) = x^{100} + x^{99} + \cdots + x + 1$$
$$h(x) = 2.1x^6 - \pi x^4 + \sqrt{2}x^3 - x - 20$$

Compute the values of each of these functions and their derivatives at the values of $x = -10, 0, 1, 5$.

Hand in a copy of your program, and the values of each of these computations. Place a copy of your program on your shared drive.

One thing you might consider doing is writing a script which performs all these computations. For example, if you wanted to write a script file to find the value of $p(x) = 2x^2 - 3$ and its derivative at $x = 3$, then the following file would do this:

```
% solns to programming HW 3
%
% My name and info

disp(' ')
% define the vector of coefficients for p(x)
a=[2 0 -3];
% store 3 to x
x=3;
% call the functions and display the results
% N.B.  the two apostrophes are needed so that one appears in the string
disp('The value of p(x) and p''(x) at x = 3  is ....')
[hornerEval(a,3) hornerDerivEval(a,3)]
```

Then you can just cut and paste the output to a file for printing.

Matlab commands that might help a bit include:

`ones(1,10)`: creates a row vector of ten ones

`x=[10:-1:1]`: This creates the vector `[10 9 8 7 6 5 4 3 2 1]` and can be helpful if you like to count down in a for loop.

`length(a)`: This computes the length of a vector a.

`polyval(a,x)`: To check your answer.