Math 5600 **Fall 2012**
Homework 5, due Friday 5 October.

1. (10 points) Based on the feedback you received from me and from the Talk page on your proposed edits, do one of:
   - Edit the actual Wikipedia topic page. On your user page describe what you did differently than you originally proposed and link to your contribution.
   - Decide your proposal was a bad idea. On your user page explain why, what you learned from this process, and what you will do better next time.

2. (40 points) Do this problem as a Good Problem, paying attention to the *Intros* handout.

   Construct the Lagrange basis polynomials for the points $x_0 = -\pi/2$, $x_1 = 0$, and $x_2 = \pi/2$. Use this to construct the interpolating polynomial of degree two $Q_2(x)$ for the function $f(x) = \cos(x)$. Write the error term in Lagrange form and use it obtain a bound for $|Q_2(\pi/4) - f(\pi/4)|$. Compare with your results using a Taylor approximation in Homework 2 problem 3.

3. (25 points)

   (a) Write a MATLAB function to evaluate a polynomial. Start from
   ```
   function y = evalpoly(a,x)
   % Evaluate a polynomial at a point using Horner's method.
   % Inputs: a -- the coefficients of the polynomial P(x).
   %         The degree of the polynomial is one less than the length of a.
   %         P(x)=a[1]*x^n+...+a[n]*x+a[n+1]
   %         x -- the point at which to evaluate
   % Output: P(x)
   ```

   (b) Write a MATLAB function `makeintpoly` to construct an interpolating polynomial using the Vandermonde method. It should output `a` in the format used by `evalpoly`. Include ample comments.

4. (15 points) Write a MATLAB function to evaluate the interpolating polynomial using Neville's algorithm. Include ample comments.

5. (10 points) Consider the data points stored in the vectors
   `x = [ 0 .1 .4 .5 .6 1.0 1.4 1.5 1.6 1.9 2.0]` and
   `y = [ 0 .06 .17 .19 .21 .26 .29 .29 .30 .31 .31]` .

   (a) Plot the data points, the interpolating polynomial as constructed in Problem 3 , and the interpolating polynomial as constructed in Problem 4.

   (b) Make a table of the errors in the two interpolating polynomials at the original data points.