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 to 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

```matlab
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.