AMSC/CMSC 460: HW #7
Due: Thursday 3/30/17 (in class)

Please submit the solution to at least one problem in LaTeX.

1. Find a quartic polynomial (written in Newton's form) that takes these values: $p(0) = 2$, $p(1) = -4$, $p(2) = 44$, $p'(0) = -9$, and $p'(1) = 4$.

2. What condition will have to be placed on the nodes x_0 and x_1 if the interpolation problem

$$p(x_i) = c_{i0}, \qquad p''(x_i) = c_{i2}, \qquad i = 0, 1$$

   is to be solvable by a cubic polynomial (for arbitrary c_{ij})?

3. Determine all the values of a, b, c, d, e for which the following function is a cubic spline

$$f(x) = \begin{cases} a(x-2)^2 + b(x-1)^3, & x \in (-\infty, 1], \\ c(x-2)^2, & x \in [1, 3], \\ d(x-2)^2 + e(x-3)^3, & x \in [3, \infty). \end{cases}$$

   Next, determine the values of the parameters so that the cubic spline interpolates this table

x	0	1	4
y	26	7	25

4. Find a natural cubic spline function whose knots are $-1, 0, 1$ and that takes these values

x	-1	0	1
y	13	7	9

5. Use Matlab's built-in *spline* routine to plot a spline function that interpolates the following 11 points:

$$x_i = i/10, \quad y_i = e^{x_i}, \quad i = 0, \ldots 10.$$

   If you have access to Matlab's spline toolbox, use the *csape* routine to plot the spline function that interpolates this exponential data with different boundary conditions (try not-a-knot, periodic, etc.). See `https://www.mathworks.com/help/curvefit/csape.html`