**Homework Set # 4 – Math 371 – Fall 2009**
**No Quiz! Will be included in exam on 9/22**

1. Suppose you have the data set $\{(1,10),(2,15),(4,8),(5,2),(7,12)\}$. Use this data for the following parts:

   (a) Find the full interpolation polynomial of degree 4 determined by these five points.

   (b) Find the piecewise linear interpolation polynomial for these five points.

   (c) Find the shape-preserving piecewise cubic polynomial that fits these five points, with $d_1 = d_5 = 0$ end conditions.

   (d) Find the cubic spline piecewise polynomial, with "not a knot" spline end conditions for these five points.

2. Now consider a set of 5 generic coordinates $\{(x_i, y_i) | i = 1, \ldots, 5\}$, with $h_k = x_{k+1} - x_k = h$ where $h$ is a positive constant. Set up the system of 5 equations for the 5 unknown slopes $d_1, \ldots, d_5$ as a matrix problem $A\vec{d} = \vec{y}$ for

   (a) the "Natural Cubic Spline" - i.e. where $P_1''(x_1) = P_{n-1}''(x_n) = 0$

   (b) the "Clamped Cubic Spline" with $d_0 = d_5 = 0$.
   (Note: you just need to find $A$ and $\vec{y}$, but do not need to solve the system)