MAE384 Fall 2012 Homework #3

1. The set of the following 8 data points is given:

x	y
4	4062
5	4404
6	4686
7	4969
8	5659
9	6840
10	8128
11	9716

(a) Perform linear least-squares regression (Sec 5.2.2) to obtain a line, $y = a\,x + b$, to represent the data.
(b) Perform quadratic least-squares regression (pp. 201-202; Eq. (5.22)-(5.28)) to obtain a quadratic formula, $y = p\,x^2 + q\,x + r$, to represent the data.
Plot the results of (a) and (b) along with the original data points in a single figure. Which method produces a better fit to the data? What will be the projected value of y at $x = 14$ based on the linear and quadratic fit, respectively? **[4 points]**

2. The set of the following 4 data points is given:

x	y
1	2
1.6	4
3	3
5	3.5

(a) Following the procedure in Sec. 5.6.2, determine the quadratic splines that fit the data. Plot the quadratic splines and the original data points in a single figure, in the fashion of the figure in Example 5-7 in the textbook. Show your procedure or matlab code.

(b) Directly fit the data by a single 3rd-order polynomial that runs through all of the data points. You may use either the method of direct matrix solution (the introduction of Sec 5.5, pp. 205-206; see Eq. (5.35)-(5.36)) or the Lagrange interpolation method (Sec 5.5.1). Plot the polynomial and the original data points in a single figure. Show your procedure or matlab code.

It would be even better if you can merge the results of Part (a) and (b) into a single plot.
[5 points; Part (a) accounts for 70% of the score]