Optimum Design Homework #3 (Due May 7th)

(For problem 2, please write your own programming codes. For problem 3 and 4, you can use any commercial software or codes. For example, you can use one of the Matlab optimization functions or C codes in chapter 10 of the book: Numerical Recipes in C, or any online resources you find.)

Suppose you are given this data set: x=[0, 1, 2.2, 3, 4.1, 5.2, 5.9, 6.8, 8.1, 8.7, 9.2, 11, 12.4, 14.1, 15.2, 16.8, 18.7, 19.9];   y=[30, 27, 29, 30, 37.3, 36.4, 32.4, 28.5, 30, 34.1, 39, 36, 32, 28, 22, 20, 27, 40].

1. Find (analytically) the coefficients of the best-fit linear and quadratic regression equations. You can do it by hand or use some computer software to perform the calculation.

2. Find the coefficients the best-fit linear and quadratic regression equations numerically. First, use Fletcher-Reeves conjugate gradient method. Then use one of the methods involving Newton's method or one of the quasi-Newton methods (DFP or BFGS).

3. With polynomial regression, decide the order of the polynomial which reasonably fits the data without making the order too high.

4. Use your creativity to construct the regression model (e.g. combining polynomial, sin, cos, exponential, and/or log functions) which best fits the data. Also, describe your reasons for choosing certain functions in your model.