CS 210: Numerical and Scientific Computing

Assignment – 4

(a) Implement the Householder transformation for ***QR*** factorization of an ***m x n*** matrix ***A*** retuning the matrix ***R*** in the upper triangle of the storage for ***A*** and the Householder vector in the lower triangle of ***A***, with an extra vector to accommodate the overlap on the diagonal. Write a routine that takes this output array and auxiliary vector and forms the orthogonal matrix ***Q*** explicitly by multiplying the corresponding sequence of Householder transformations times an ***m x m*** matrix that is initialized to the identity matrix ***I***. Of course, the later will require a separate array. Test your computed ***Q*** is indeed orthogonal and that the product $Q \begin{bmatrix} R \\ 0 \end{bmatrix}$ recovers ***A***.

(b) For n = 0,1,….,5, fit a polynomial of degree n by least squares to the following data:

T	0.0	1.0	2.0	3.0	4.0	5.0
Y	1.0	2.7	5.8	6.6	7.5	9.9

Make a plot of the original data points along with each resulting polynomial curve (you may make separate graphs for each curve or a single graph containing all the curves). Which polynomial would you say captures the general trend of the data better? Obviously, this is a subjective question, and its answer depends on both the nature of the given data (e.g. uncertainty of the data values) and the purpose of the fit. Explain your assumption in answering.