We measured the value of a function $f(x)$ at the following values, i.e. x=1,3,5,6 and 7. Using the table given below, answer the following questions:

x	1	3	5	6	7
y	- 0.70	0.45	10.0	21.0	32.0

1. a) Plot your points. You may use Matlab or do it manually.

b) Fit a second order Lagrange polynomial to the data series using x=1,3 and 5 as your points.

c) For this function, determine the % deviation (error) from the known *f(x)* values at x=1 and 6.

d) Determine $f(3.6)$ and $f(9.0)$.

2. Using functions 1 and x, determine the parameters c_0 and c_1 of the "best line" $f(x)=c_0+c_1x$ fitting to the data points. Determine the root mean square error for all the data points you are given. Plot the estimated function on your graph.

3. This time we will fit a quadratic function to the data using least squares regression. Using functions 1, x and x^2, determine the equations with which you would obtain the parameters, c_0, c_1 and c_2 of the function $f(x)=c_0+c_1x+c_2x^2$. Find c_0, c_1 and c_2. Determine the root mean square error for all the data points you are given. Estimate $f(3.6)$ and $f(9.0)$. Plot the estimated function on your graph. How did the linear and quadratic estimations work? Which one gave the smallest RMS error?

4. Now use the function $f(x)=c_0+c_1e^x$. Determine the parameters c_0 and c_1. Determine the root mean square error for all the data points you are given. Estimate $f(3.6)$ and $f(9.0)$. What is the RMS error?

5. Box office revenue from a soccer game is dependent on lots of factors, including, but not limited to, game time, game type, importance and current success of the team. Predicting game revenue is very important for deciding the budget of the team for next year, hence regression analysis will be used often. For setting up your model of game revenue, we can consider four different variables, game time (x_1), game type (x_2), importance (x_3) and current success of the team (x_4), as given below, .

Variable	Value	Represents
Game Time (x_1)	1 2 3	Weekday Weekend Holiday/ Bayram
Game Type (x_2)	1 2 3	League Cup European Cup
Importance (x_3)	0-1	1-Critically Imp. 0-Not Important
Team Success(x_4)	0-1	1-won last 4 games 0-lost last 4 games

For 6 different games, these variables and the revenue for the game was measured/recorded to set up our regression model.

Game #	Revenue (in million $)	Game Time (x1)	Game Type (x2)	Importance (x3)	Team Success(x4)
1	1.04	2	1	0.5	0.7
2	1.50	1	3	0.6	0.4
3	1.05	2	1	0.9	0.6
4	0.40	1	2	0.3	0.5
5	1.15	3	1	0.7	0.7
6	0.8	2	1	0.3	0.3

a) One can think the revenue only depends on game time, as given in the following model. For the data given above, determine the equations for estimating the values of the parameters, and then determine c_0 and c_1 .What is the root mean square (RMS) error for your model?

$$Revenue\ (mil\ \$) = c_0 + c_1 x_1$$

b) One would think that current success of the team would be very effective in spectator turnouts. What happens if I add this to our model as the variable x_4 . Determine the equations for estimating c_0, c_1 and c_4 for the model given below. Determine their values.

$$Revenue\ (mil\ \$) = c_0 + c_1 x_1 + c_4 x_4$$

c) One would think that importance of the game would be very effective in spectator turnouts. What happens if I add this to our model as the variable x_3 . Determine the equations for estimating c_0, c_1 and c_3 for the model given below. Determine their values.

$$Revenue\ (mil\ \$) = c_0 + c_1 x_1 + c_3 x_3$$

d) How was your RMS affected by adding a new variable to the model? Do you think your model is better now? Which factor do you think affects the revenue more?