Assignment 1 (Linear Regression)

1. Explain the following terms with suitable examples.
    a. Machine Learning
    b. Supervised Learning
    c. Regression
    d. Classification
2. What is Learning Rate? What is the effect of high and low value of learning rate on Gradient Descent?
3. Suppose you have a dataset of houses with their respective sizes (in square feet) and prices (in thousands of dollars). So, build a Linear regression model to predict house prices based on their sizes (use the normal equation method as well as gradient descent method).
   The hypothetical dataset is:

House Size (x)	Price (y)
1500	300
2000	400
1600	320
1200	250
1800	360

4. Consider the following data set. Based upon the data set build a Linear regression model to predict output (use the normal equation method as well as gradient descent method). Consider the hypothesis is $h_\theta(x) = \theta_1 x$.

Input(x)	Output(y)
1	1
2	2
3	2

5. Define the problem related with Underfitting and Overfitting and how we handle the problem of Underfitting and Overfitting.
6. Consider the following data set. Based upon the data set build a Linear regression model to predict output (use the normal equation method as well as gradient descent method.

Input(x)		Output(y)
x_1	x_2	
1	1	2
1	2	3

2	2	4
2	3	5
3	3	6

7. Consider the following data set. Based upon the dataset, build a Ridge regression (L1 Regularization) model to predict output (use the normal equation method as well as gradient descent method). Assume the value of $\lambda = 1$.

Input(x)		**Output(y)**
x_1	x_2	
1	1	2
1	2	3
2	2	4
2	3	5
3	3	6

8. Consider the following data set. Based upon the dataset build a Lasso regression (L2 Regularization) model to predict output. Assume the value of $\lambda = 1$.

Input(x)		**Output(y)**
x_1	x_2	
1	1	2
1	2	3
2	2	4
2	3	5
3	3	6

9. Consider the following data set. Based upon the dataset, build a Ridge regression (L1 Regularization) model to predict output (use the normal equation method as well as gradient descent method). Assume the value of $\lambda = 0.2$.

Input(x)		**Output(y)**
x_1	x_2	
1	2	3
2	3	5
3	4	7
4	5	9

10. Consider the following data set. Based upon the dataset built a Lasso regression (L2 Regularization) model to predict output. Assume the value of $\lambda = 0.2$.

Input(x)		**Output(y)**
x_1	x_2	
1	2	3
2	3	5
3	4	7
4	5	9