

Question 4:

4b)

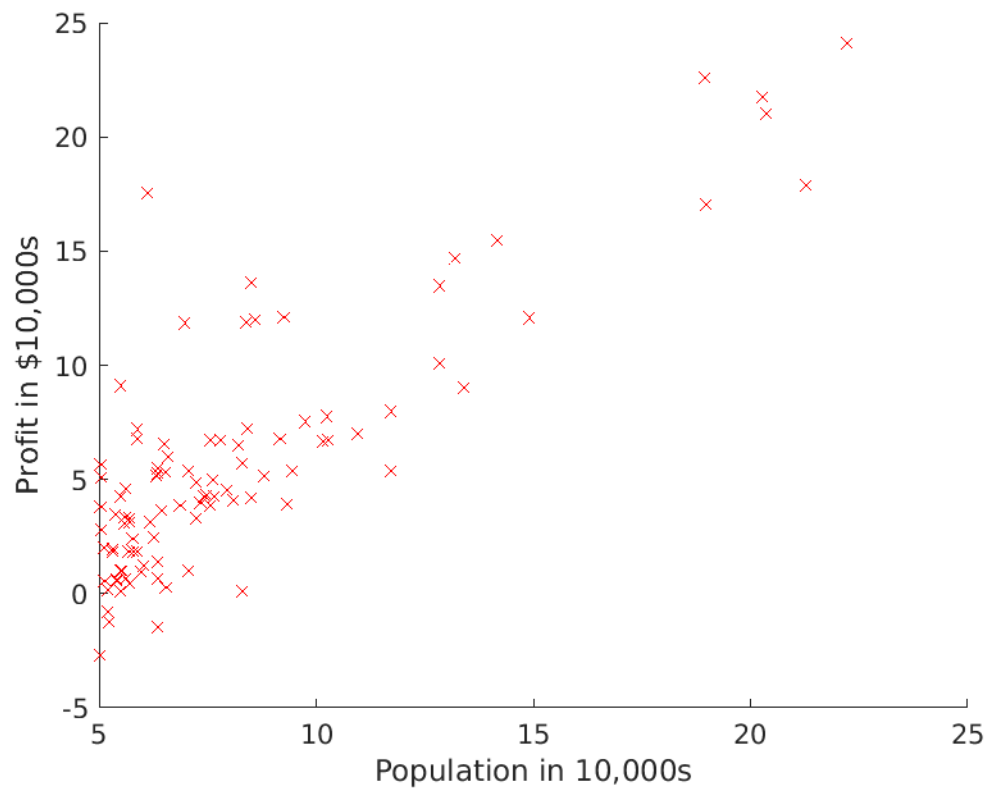


Figure 1: ps2-4-b.png

4c)

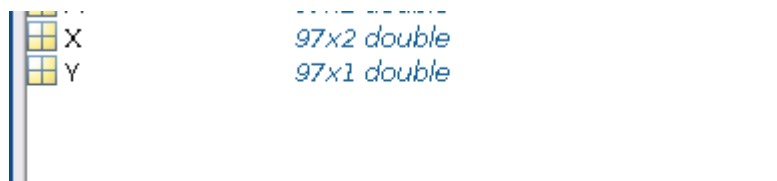


Figure 2: ps2-4-c.png

4d)

The cost associated with  $\theta = [0; 0]$  is 32.072734

Figure 3: ps2-4-d.png

4e)

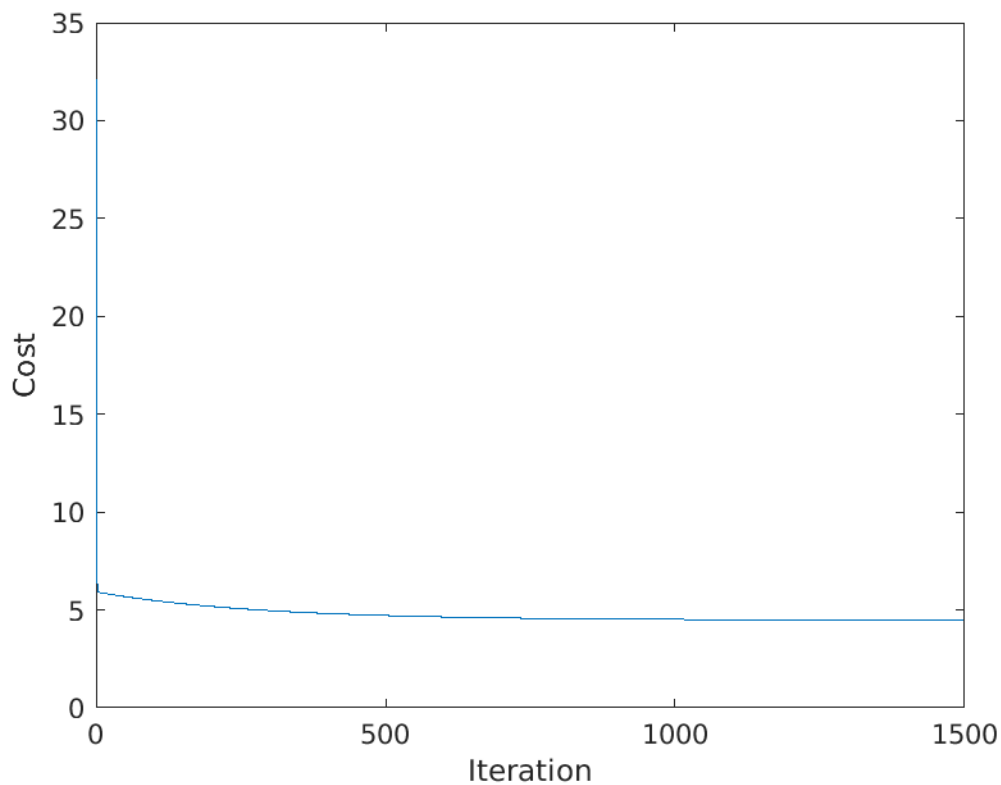


Figure 4: ps2-4-e.png

The computed model parameters are:  $\theta_1 = -3.630291$  and  $\theta_2 = 1.166362$

Figure 5: ps2-4-e2.png

4f)

using the obtained model parameters, the profit in a city of population 35000 is estimated (in \$10,000s) to be 37.192391  
using the obtained model parameters, the profit in a city of population 70000 is estimated (in \$10,000s) to be 78.015073

Figure 6: ps2-4-f.png

4g)

using the normalEqn function, the profit in a city of population 35000 is estimated (in \$10,000s) to be 37.860397  
using the normalEqn function, the profit in a city of population 70000 is estimated (in \$10,000s) to be 79.616574

Figure 7: ps2-4-g.png

The estimate made from using the obtained model parameters is fairly close to the estimate made using the normal equation. The difference can be explained by the fact that the normal equation only depends on the data itself and no other variables. On the other hand, gradient descent depends on the selected value for  $\alpha$  and the number of iterations.

4h)

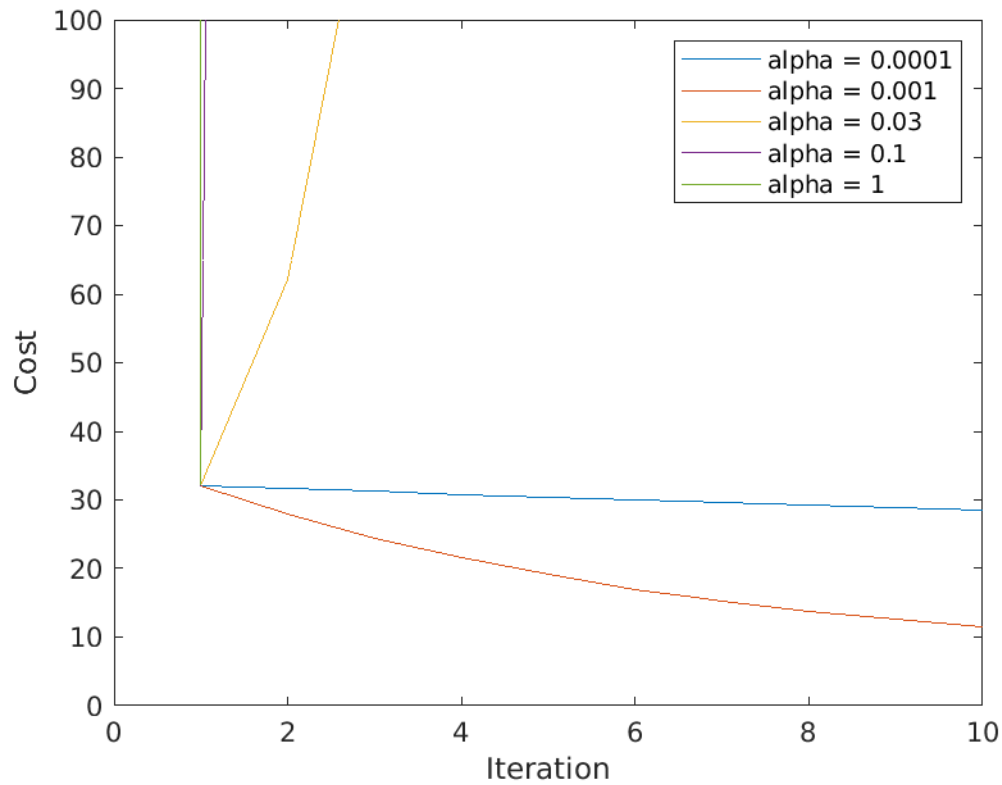


Figure 8: ps2-4-h.png

From the figure, We can see that the ideal learning rate is closest to 0.0001. We can also see that the selection of 0.03, 0.1 and 1 as values for the learning rate are not good choices as they cause the error to diverge.

5a)

The size of the feature matrix  $X$  is  $[47, 2]$  and the size of the label vector  $Y$  is  $[47, 1]$   
The mean and standard deviation of  $x_1$  are 2000.680851 and 794.702354  
The mean and standard deviation of  $x_2$  are 3.170213 and 0.760982

Figure 9: ps2-5-a.png

5b)

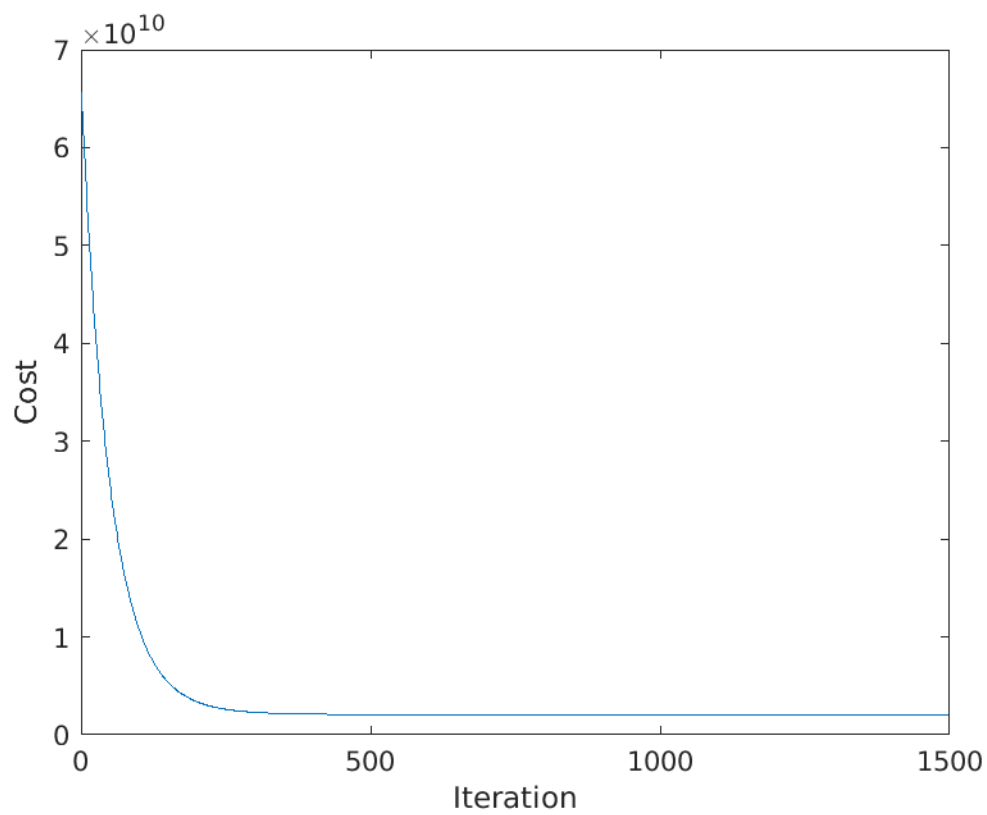


Figure 10: ps2-5-b.png

The computed model parameters are:  $\theta_1 = 340412.563014$ ,  $\theta_2 = 110540.566546$ ,  $\theta_3 = -6558.990548$

Figure 11: ps2-5-b2.png

5c)

Based on the model parameters obtained in question 5B, the predicted cost of a 1650 square foot house with 3 bedrooms is 293101.05665

Figure 12: ps2-5-c.png