Peter Smith

ECE 1395

PS2 Report

1)
```
Cost of theta (i):  29.65625
Cost of theta (ii):  14.875
```

2)
```
Theta for gradient descent is:  [[0.70259635]
 [0.6645031 ]]
Cost is:  [33.64858972105618, 32.61533112902761, 31.614738860723477, 30.645779114983274, 29.707450808832476, 28.798784542002053, 27.918841594219188, 27.066712954232372, 26.24151837956626, 25.442405486033902, 24.66854886606452, 23.919149234934828, 23.19343260402087, 22.490649480215158, 21.810074090681027]
```

3)
```
Theta for normal equation is:  [4. 2.]
```
The theta from the normal equation is very different than the theta I got from problem 2. This is due to the small amount of iterations that I run the test for. If I made a larger alpha and a lot more iterations I believe I would converge onto the right theta from the linear regression.

4) **C)**
```
X size is  (179, 2)
y vector is  (179, 1)
```

E)
```
Theta 0 =  [-5.98134877]
Theta 1 =  [17.93733454]
```

F)
```
Prediction Error = [9.28922886]
```

G)
```
Theta 0 normal equation =  -5.981348857245692
Theta 1 normal equation =  17.93733462499445
Prediction Error normal equation = 9.289228889332332
```
The theta and prediction error that I obtained from the normal equation and linear regression are the same.

H) The learning rate of 0.001 is a very consistent steady decline. The Learning rate's of 0.003 and 0.03 descend rapidly and converge. The learning rate of three rapidly gets to big for python and never converges.

5) A)
```
Mean of square feet =  2000.6808510638298
Mean of bedrooms =  3.1702127659574466
Standard Deviation of square feet =  786.2026187430467
Standard Deviation of bedrooms =  0.7528428090618781
Shape of X =  (47, 3)
shape of y =  (47, 1)
```

B)
```
Theta0 =  [340412.65957447]
Theta1 =  [109447.79646964]
Theta2 =  [-6578.35485416]
```

C)
```
Predicted cost of house is  [222469.39925718]
```