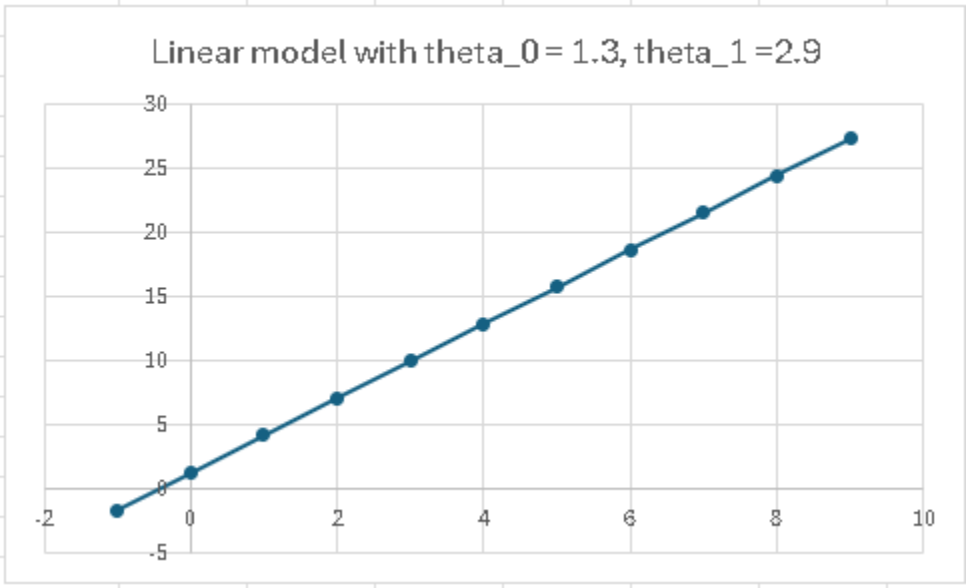
Self – Check #2

Linear Regression

1) My handwriting is rather sloppy so I graphed the line in Excel:

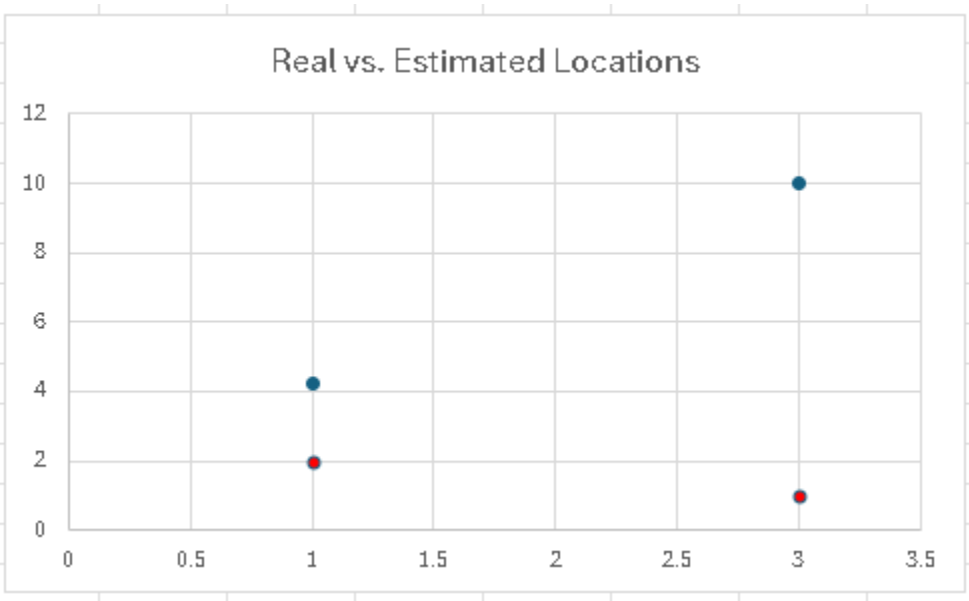


2) For our two given data points the estimate of y_hat is:

Y_hat = 4.2 = 1.3+2.9(1.0)

Y_hat = 10 = 1.3+2.9(3.0)

3) The graphing of the real (red) versus estimate (blue) of these points is:

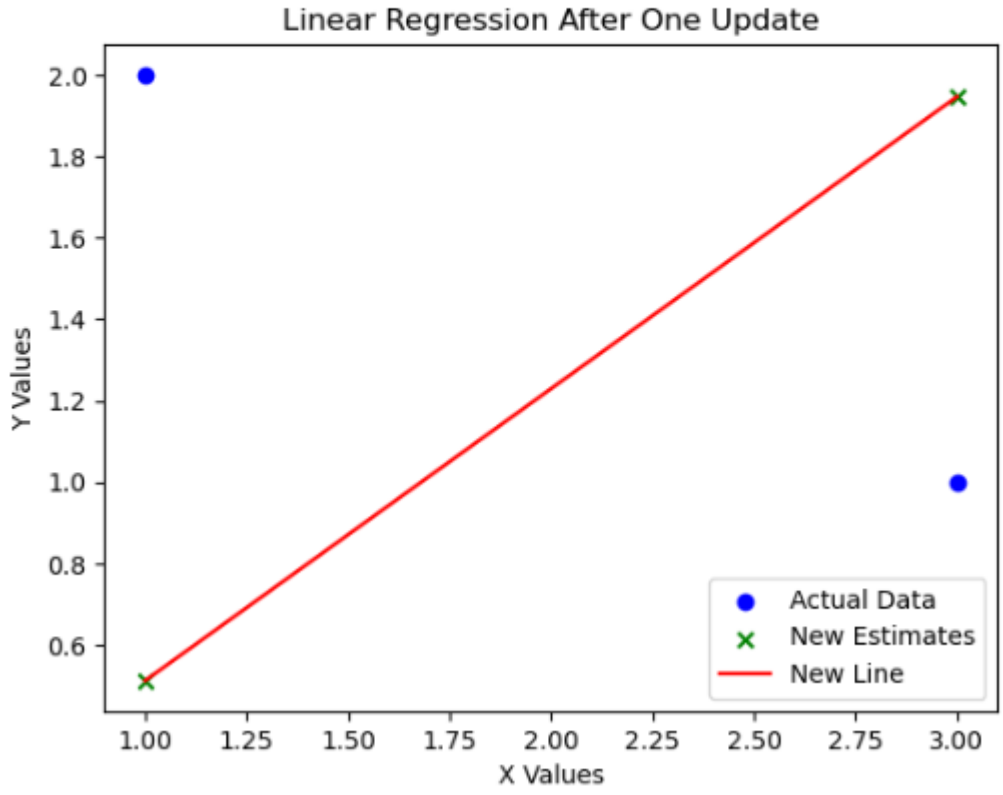


4) The error, mean squared error, is calculated as follows:

actual	pred	sq diff	MSE
2	4.2	4.84	42.92
1	10	81	

5), 6) and 7) I'm not sure if I converted the pseudocode correctly but I set it to run only one iteration and this is the graph of the new line and new estimates from the adjusted thetas which were :

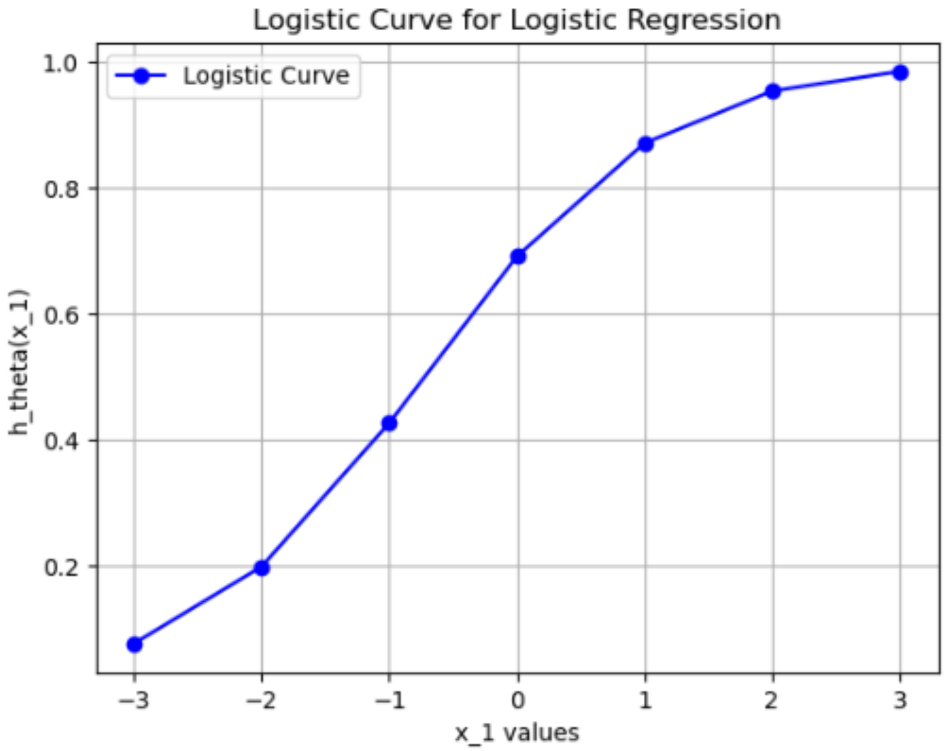
```
Initial thetas: [-0.5433550157851401, 0.17731371350741276]
Initial thetas: [-0.5433550157851401, 0.17731371350741276]
Derivative for theta[0] = -0.3377455177540629
Derivative for theta[1] = -0.5400282928066433
Updated thetas: [-0.2056094980310772, 0.7173420063140561]
Updated thetas after one step: [-0.2056094980310772, 0.7173420063140561]
```



Logistic Regression

$$h_\theta(x) = \frac{1}{1 + e^{-(\theta_0 + \theta_1 x_1)}}$$

1) Plotting the logistic curve. Using this:
   I plotted this curve over x = [-3, 3]:




```
Logistic function values: [0.07585818 0.19781611 0.42555748 0.68997448 0.86989153 0.95257413
 0.9836975 ]
```

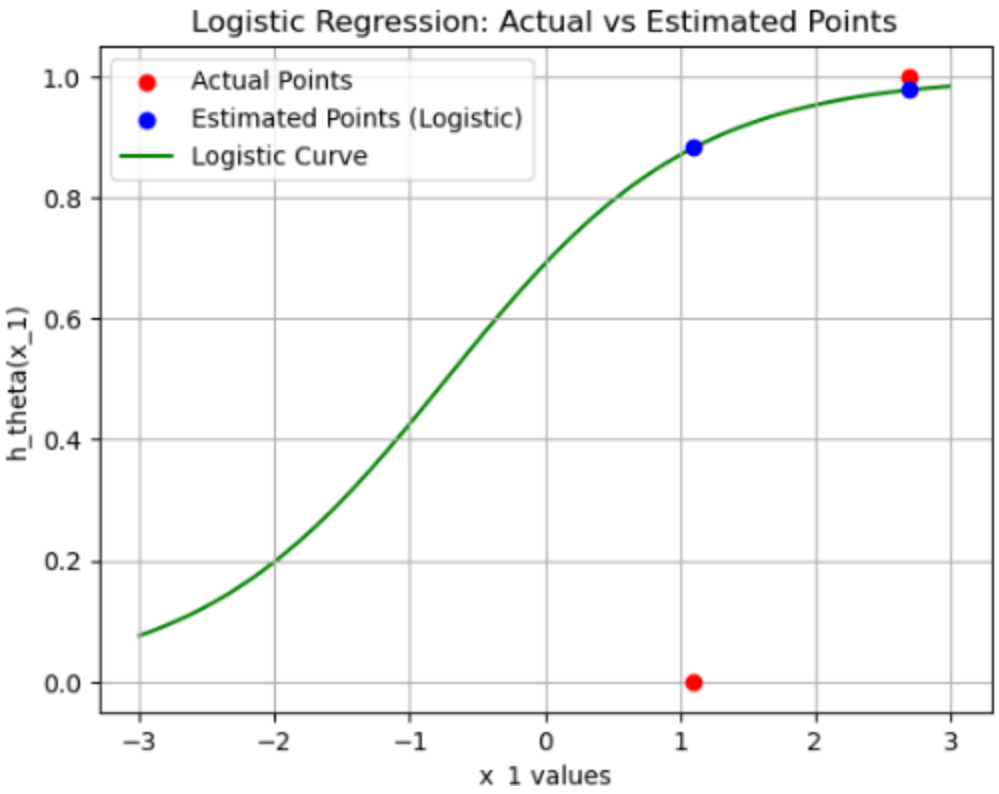
2) The log loss is calculated with:

$$\text{Log Loss} = -\frac{1}{n}\sum_{i=1}^{n}\left(y^{(i)}\log(h_\theta(x^{(i)})) + (1 - y^{(i)})\log(1 - h_\theta(x^{(i)}))\right)$$

For that I got:

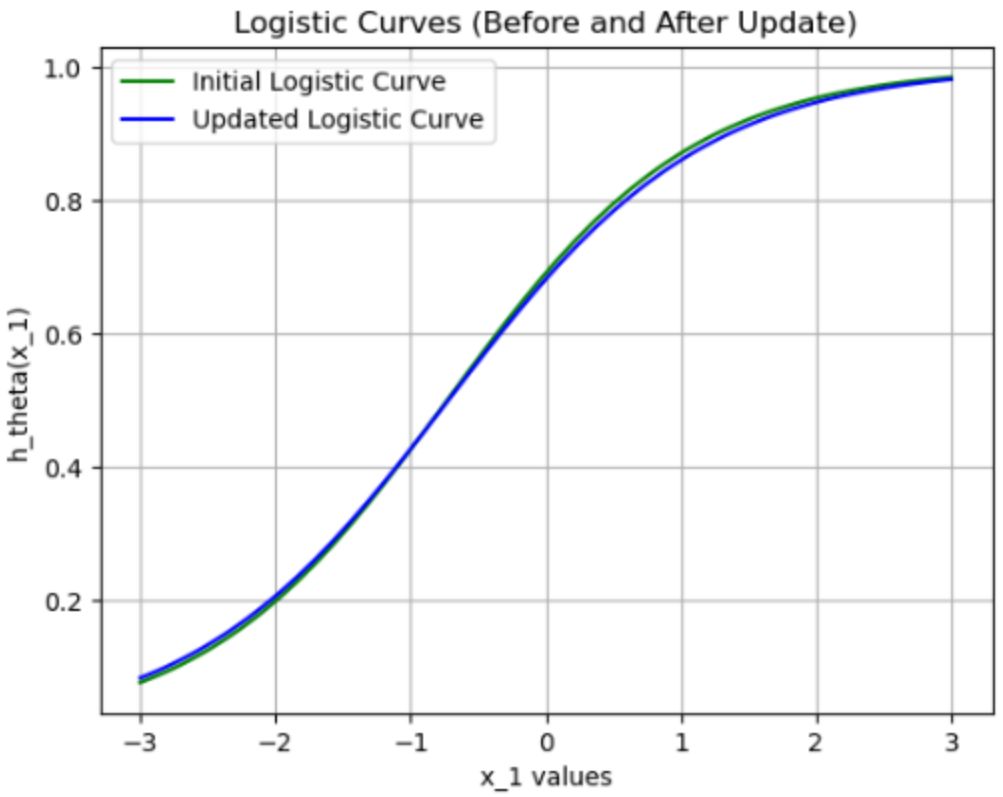
```
Predictions: [0.8818430221907305, 0.9774673605435528]
Log loss: 1.0792657983097635
```

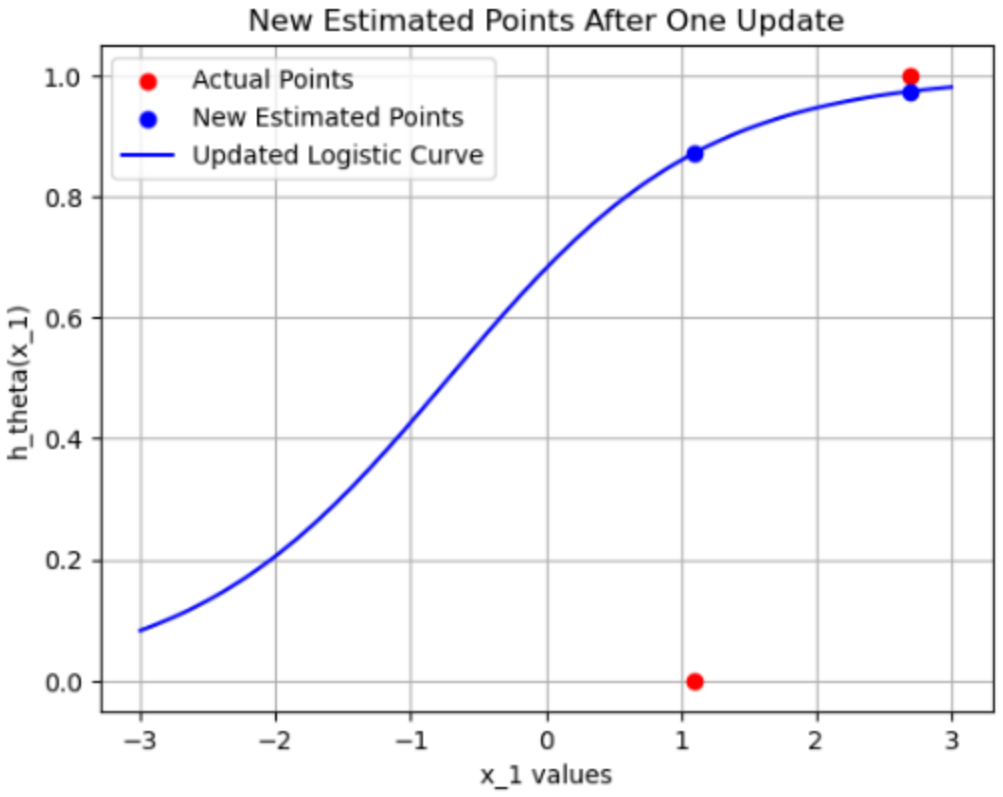
3) Here's my plot of the actual points vs. the estimated points on the logistic curve:



4), 5) and 6) Here's my initial thetas, the thetas after one adjustment, the new logistic curve, and the new y_hats plotted:

```
Initial thetas: [0.8, 1.1]
Updated thetas after one step: [0.7570344808632858, 1.0545405401061303]
```






```
New estimated points: [0.8718067705189205, 0.9735139490716267]
```