Udom Phay
Assignment 2

Haberman's Survival prediction

1. Using Maximum Likelihood Estimation with gradient ascent to get theta after multiple iterations. I used the theta from testing to predict whether or not the patient would survive after surgery.
    a. With Alpha = 0.005, and trained for 400 iterations
        i. Theta = [ 0.47771354  0.15124982 -0.16948554  0.13317509]
        ii. True Positive = 13
        iii. True Negative = 16
        iv. False Positive = 17
        v. False Negative = 0
        vi. Total = 46
        vii. precision = 0.43333333333333335
        viii. recall = 1.0
        ix. F1-Score = 0.6046511627906976
    b. With Alpha = .00255, and trained for 500 iterations
        i. Theta = [ 0.48838823  0.01265218 -0.04010522  0.07658857]
        ii. True Positive = 1
        iii. True Negative = 33
        iv. False Positive = 0
        v. False Negative = 12
        vi. Total = 46
        vii. precision = 1.0
        viii. recall = 0.07692307692307693
        ix. F1-Score = 0.14285714285714288
    c. With Alpha = .00952, and trained for 900 iterations
        i. Theta = [ 0.41881728  0.07572563 -0.1780453   0.26504306]
        ii. True Positive = 1
        iii. True Negative = 33
        iv. False Positive = 0
        v. False Negative = 12
        vi. Total = 46
        vii. precision = 1.0
        viii. recall = 0.07692307692307693
        ix. F1-Score = 0.14285714285714288
2. I normalized the features of my data, and ran the same test. Then with the data from the training, I used it to predict whether or not the patient would survive after the surgery. I learned that positive predictions are more likely to happen.  I get more true positive and

less true negative when compared to the non normalized data result. The results from the un-normalized predicted more negative results for the survivability of the patients. True positives are not low all the time compared to the un-normalized data. The predictions are more spread out instead of mostly negatives.

a. With Alpha = 0 .005, and trained for 400 iterations
    i. Theta = [-0.00534573  0.5261929   0.33840308  0.38752957]
    ii. True Positive = 12
    iii. True Negative = 3
    iv. False Positive = 30
    v. False Negative = 1
    vi. Total = 46
    vii. precision = 0.2857142857142857
    viii. recall = 0.9230769230769231
    ix. F1-Score = 0.43636363636363634
b. With Alpha = 0.00255, and trained for 500 iterations
    i. Theta = [0.1528495  0.5248469  0.39062115 0.42570131]
    ii. True Positive = 12
    iii. True Negative = 2
    iv. False Positive = 31
    v. False Negative = 1
    vi. Total = 46
    vii. precision = 0.27906976744186046
    viii. recall = 0.9230769230769231
    ix. F1-Score = 0.42857142857142855
c. With Alpha = .00952, and trained for 900 iterations
    i. Theta = [-0.70723408  0.40760222  0.10345186  0.22114745]
    ii. True Positive = 8
    iii. True Negative = 26
    iv. False Positive = 7
    v. False Negative = 5
    vi. Total = 46
    vii. precision = 0.5333333333333333
    viii. recall = 0.6153846153846154
    ix. F1-Score = 0.5714285714285715