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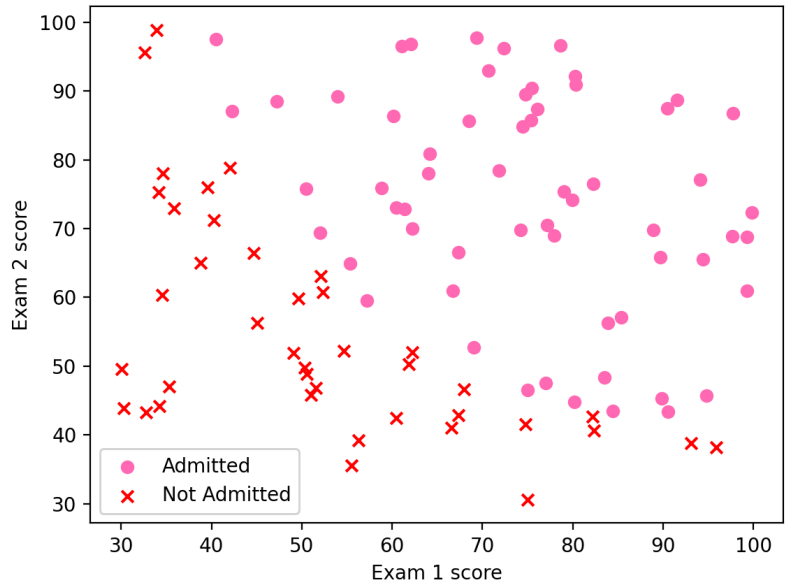
HW3

1 - Logistic Regression

a) Size of matrix X and vector y

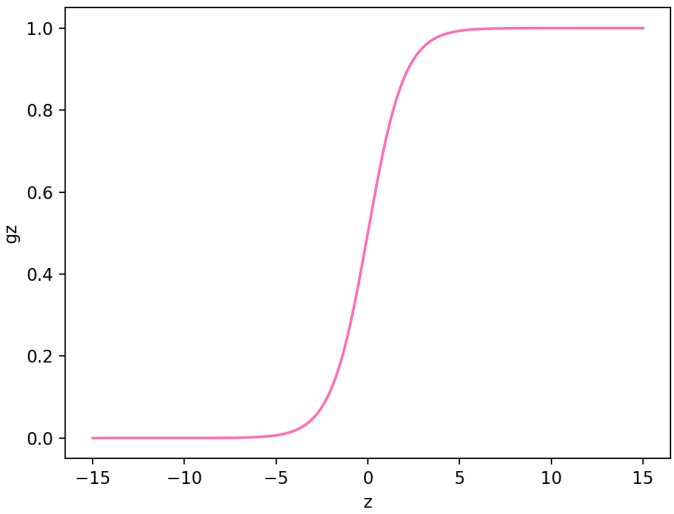
```
size of feature matrix X (100, 3)
size of label vector y (100, 1)
```

b)



ps3-1-b

d) By looking at the plot of z vs gz seems to steadily reach an output of 0.1 around -2.



ps3-1-c

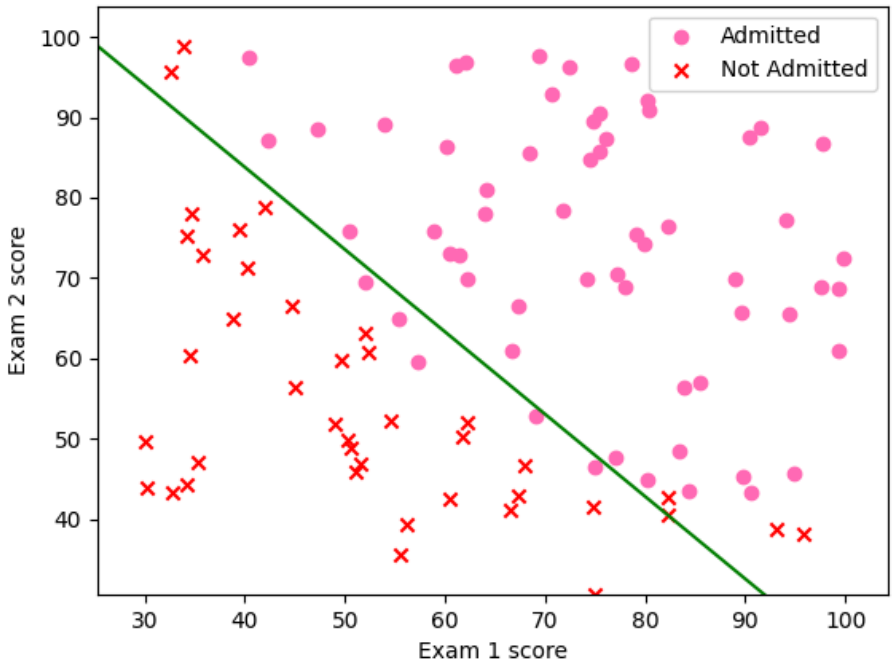
e) Cost of toy set when theta = [[1], [.5], [.2]]

```
cost =  1.1545489054524394
```

f) Optional theta and the cost at this convergence

```
optimal theta:  [-24.31354847   0.19962809   0.19484589]
conv cost:  0.2235917470551974
```

g) plotting decision boundary



ps3-1-g

h) accuracy for the logistic regression model, correct samples/total test samples. Ran multiple times to see how the accuracy changed but seemed to stay at either 90% or 100%.

```
y_test:  [[0.]          y_test:  [[1.]
 [0.]                    [1.]
 [0.]                    [0.]
 [0.]                    [1.]
 [1.]                    [0.]
 [0.]                    [1.]
 [0.]                    [1.]
 [1.]                    [0.]
 [0.]                    [1.]
 [0.]]                   [0.]]
y_pred:  [[0.]          y_pred:  [[1.]
 [0.]                    [1.]
 [0.]                    [0.]
 [0.]                    [1.]
 [1.]                    [0.]
 [0.]                    [1.]
 [0.]                    [1.]
 [1.]                    [0.]
 [1.]                    [1.]
 [0.]]                   [0.]]
90.0 %                  100.0 %
```

i) Admission probability and what should the decision be

```
admission probability:  63.01619536963394
admission probability:  58.23461213344575
```

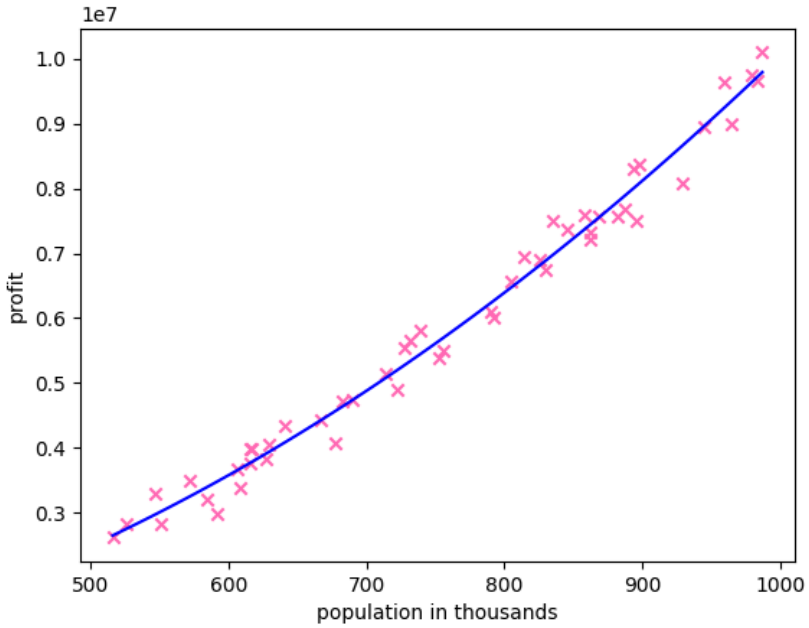
Based on the probability, run multiple times, being above 50% consistently this would be an admitted set of scores.

2 - Non-linear Fitting

a)

```
non-linear regression theta:  [[ 2.19256506e+05]
 [-7.75885823e+02]
 [ 1.06170506e+01]]
```

b)


1e7
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
profit
500
600
700
800
900
1000
population in thousands