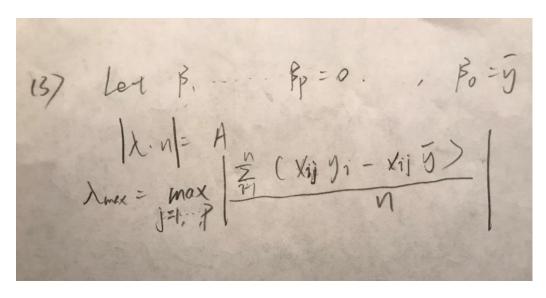
STAT 542 HW2

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Question 1

(a)(b)(c)



(d)

I use the beta of different lambda from the training data to predict Y in the test data.

Then I got the prediction errors of different lambda. To be the best lambda, the error should be the minimum. Thus, I got the best lambda=0.05372383.

Question 2

(a)

Number of nonzero parameters: 61(including intercept)

Best lambda: 0.04173215

(b)

Estimated degree of freedom: 60.31393, which is close to the number of non-zero parameter in part a.

(c)

Number of nonzero parameters: 201(including intercept)

Best lambda: 29.291

theoretical value of the degrees of freedom: 170.1506, from the following formula:

$$\mathrm{df}(\lambda) = \mathrm{Trace}\big(\mathbf{X}(\mathbf{X}^\mathsf{T}\mathbf{X} + \lambda\mathbf{I})^{-1}\mathbf{X}^\mathsf{T}\big) = \sum_{j=1}^p \frac{d_j^2}{d_j^2 + \lambda}$$

Estimated degree of freedom: 173.9836, which matches the theoretical value