ISLR 6.6.3

a) → iv steadily decrease. Regularization parameter decreases as $s \uparrow$

b) → ii decrease initially, then eventually start increasing. Once Reg parameter results in minimum, it will eventually cause test error to increase

c) → iii steadily increase because the model becomes more and more sensitive to noise as it becomes less regularized

d) → iv steadily decrease because less regularized means less bias

e) → v Remains constant, cannot be captured by the model.

6.6.5

a) $$\min_{\beta}\left[\sum_{i=1}^{2}\left(y_i - \sum_{j=1}^{p}\beta_j x_{ij}\right)^2 + \lambda\sum_{j=1}^{p}\beta_j^2\right] = \min_{\beta}\left[\sum_{i=1}^{2}\left(y_i - \beta_1 x_{i1} - \beta_2 x_{i2}\right)^2 + \lambda\left(\beta_1^2 + \beta_2^2\right)\right]$$

b) Ridge coefficients are equal because $x_{i1} = x_{i2}$ and thus they can be interchanged

c) $$\min_{\beta}\sum_{i=1}^{2}\left(y_i - \beta_1 x_{i1} - \beta_2 x_{i2}\right)^2 + \lambda\left(|\beta_1| + |\beta_2|\right)$$

d) Because the predictors are perfectly correlated there are many values of β_1 and β_2 that will produce the same result. There are infinite ways to have β_1 and β_2 to add up to the given number necessary for optimization

ISLR 8.4.5

Decisions:

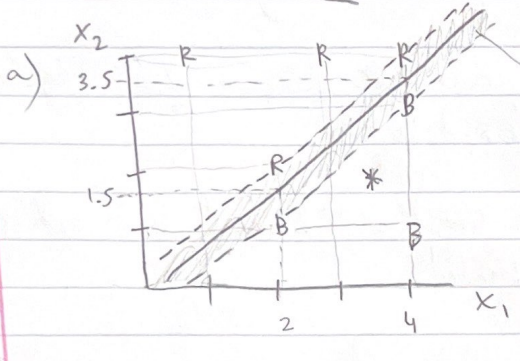
.1	.15	.2	.2	.55	.6	.6	.65	.7	.75
G	G	G	G	R	R	R	R	R	R

majority Decision: Red

Average prob Decision: .45 → Green

ISLR 9.7.3

a)



b) $\beta_0 + \beta_1 X_1 + \beta_2 X_2 = 0$

maximum marginal classifier

(2,2) & (4,4) will be around
(2,1) & (4,3) the boundary

↳ (2,1.5) & (4,3.5) outlines the line b/c it is inbetween

$\frac{3.5-1.5}{4-2} = \frac{2}{2} = 1$ is the slope for x_1

$X_2 = mx_1 + b$

$1.5 = 1(2) + b \rightarrow b = -.5$

$X_2 = X_1 - .5 \rightarrow \boxed{X_2 - X_1 + .5 = 0}$

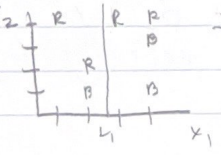
c) classify to red if $X_2 - X_1 + .5 > 0$ classify to blue other wise

D) shaded region on plot

E) support vectors are (2,2) (2,4) (2,1) (4,3)

F) The 7th observation is 4,1 and no where near these support vectors, thus it wouldn't effect the max. marg. hyperplane

g)



equation of L_1: $X_1 = 2.5$

h) If * was Red there would be no way to seperate with a hyper plane