MATH 427- Homework 3-Spring 2023

1 Text Book problems from text book (page 597 to 615)

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1. Problem # 11.43 (By hand: you may use R outputs from regression model).
2. Problem #11.52(a,b)
3. Problem # 11.66 (Compute the coefficients estimated only)

2 Additional exercises-Using R

2.1 Exercise 1

This exercise relates to the **Auto** data set, which can be found in the in Canvas. (This is part 2 of Additional exercise Homework#2)

(a) Use the appropriate function in R to fit a quadratic model ($Y = \beta_0 + \beta_1 x + \beta_2 x^2 + \epsilon$) with *mpg* as the response variable, and where *horsepower* and $horsepower^2$ as the predictors.

(b) Write out the estimated model in equation form.

(c) Compute the covariance matrix for linear regression coefficients estimated.

(d) Do the data present sufficient evidence to indicate curvature in the response function? That is to test the hypotheses $H_0 : \beta_2 = 0$ vs $H_a : \beta_2 \neq 0$.
(Hint: you may use the p-value from your summary in part(a))

(e) Based on the R^2 or Adjusted R^2, compare the fits of the quadratic model in part(a) with the simple linear regression model (from Additional exercise of Hwk#2) where *mpg* is the response variable and *horsepower* is the only predictor variable.

2.2 Exercise 2

This question should be answered using the **Credit** data set in Canvas.

(a) Fit a multiple regression model to predict *Balance* using *Income*, *Limit*, *Education*, and *Rating*.

(b) Write out the estimated model in equation form.

(c) Provide the interpretation of each coefficient in the model.

(d) Obtain 95% confidence intervals for the coefficient(s)

(e) Test whether all the regression coefficients are zero (there is a linear relationship between the response and the predictors), i.e whether $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$.

(f) Based on the p-values in part(a), which predictor(s) seem(s) to not have an association with the response variable(*Balance*)

(g) On the basis of your response to the previous question, fit a smaller model that only uses the predictors for which there is evidence of association with the response variable.

(h) Test whether the coefficients of the predictor(s) in (f) are all zero. would you drop those predictors from the full model? Why?