ST 512 HW 5

All Problems: Due Thursday, March 3^{rd} in *lecture* at the beginning of class.

Note: SAS is not needed for this assignment.

12.10 (10 pts) 3 points for (a), 2 points for (b), and 5 points for (c)

12.15 (20 pts)

(a) (3 pts) This is asking you to locate the F statistic for the overall F test (1 pt). Also show how you can calculate it from the provided output (2 pts).

(b) (7 pts) The book is asking for your decision about the test but be sure to justify your decision (2 pts). Additionally, state the hypotheses in terms of the model (2 pts) and provide a conclusion in context (3 pts).

(c) (3 pts) Again, show how this could be computed based on the output (2 pts) in addition to providing the value (1 pt).

(d) (4 pts) State your hypotheses (2 pts) and provide a decision (2 pts)

(e) (3 pts)

12.17 (6 pts) To answer the question the book is asking, do the following:

(a) (3 pts) You do not need to state each set of hypotheses separately. Give a *brief* explanation of the type of tests being done and what types of conclusions can be drawn from these types of tests?

(b) (3 pts) What is the overall conclusion that can be drawn for the this particular model based on these t tests?

12.33 (6 pts)

(a) (4 pts) In addition to providing the estimate based on the output (2 pts), determine if the SE Fit they've provided is for the mean response or an individual response (2 pts).

(b) (2 pts)

NBP1 (18 pts) Non-Book Problem # 1: Consider a study that measured $n = 8$ observations and used an additive model with two predictors. That is, we fit the model

$$y_i = \beta_0 + \beta_1 x_{i,1} + \beta_2 x_{i,2} + \epsilon_i$$

The ANOVA table for the model is given by

Source	DF	SS	MS	F	P-value
Model	2	4.40039	2.20020	34.555	0.0012
Error	5	0.31836	0.06367		
Total	7	4.71875			

and the parameter estimates are

Variable	DF	Estimate	SE	t	p-value
Intercept	1	-0.8611	0.5001	-1.722	0.1457
X1	1	0.8001	0.0966	8.284	0.0004
X2	1	-0.0788	0.0371	-2.121	0.0874

The $(\mathbf{X}^T\mathbf{X})^{-1}$ matrix is given by

$$\left(\mathbf{X}^T\mathbf{X}\right)^{-1} = \begin{pmatrix} 3.9282 & -0.6684 & -0.0812 \\ -0.6684 & 0.1465 & -0.0098 \\ -0.0812 & -0.0098 & 0.0217 \end{pmatrix}$$

Use the above information to answer the following questions (<u>show your work for these problems</u>):

(a) (3 pts) Report $\hat{\mathbf{\Sigma}}$ the estimated Variance-Covariance matrix of the $\hat{\boldsymbol{\beta}}$ estimates.

(b) (6 pts) Construct a 95% CI for β_2 (3 pts). Interpret the interval (3 pts).

(c) (6 pts) Construct a 95% prediction interval for an observed response when $x_1 = 5$ and $x_2 = 3$ (4 pts). Interpret the interval (2 pts).

(d) (3 pts) Would the interval in part (c) be wider or narrower than a confidence interval for the mean response for all members of the population with $x_1 = 5$ and $x_2 = 3$? Why?