



2. Based on a sample of 50 businesses of certain type, a SLR model was developed to explain profitability (in millions of \$) in terms of percent market share. The following results were obtained:

$$\hat{y} = 204 + .178x$$

$$R^2 = .176$$

$$MSE = .453$$

$$SE(\text{slope}) = .046$$

$$\bar{X} = 30.56$$

a) Is there evidence that the market share is a useful linear predictor of profitability? Test at  $\alpha = .05$  (10 p) [Use correct notation]

b) Interpret in practical terms the value of the slope. (5 p)

c) A 95% confidence interval for the mean profitability for a market share of 20% ( $x = 20$ ) is  $3.764 \pm 0.995$ . Carefully interpret this result.

d) A 95% prediction interval for  $x = 20$  is  $3.764 \pm 1.680$ . Interpret this interval.

3. Label each of the following statements as TRUE, or FALSE. Justify your answer (5 p each)

a) If the F-test is significant, then at least one of the individual partial t-tests will always be significant.

b) Every time a new regressor is added to a model, the coefficient of determination increases.

c) When an observation is deleted from a model, the coefficient of determination always decreases.

d) The length of a prediction interval depends on the value of the regressor(s) where the prediction is needed.

4. For a given set of data with two regressors and  $n = 35$ , the following linear models were fitted:

$$E(y) = f(x_1, x_2) \quad \text{SSE} = 315.78$$

$$E(y) = f(x_1, x_2, x_1x_2) \quad \text{SSE} = 289.49$$

$$E(y) = f(x_2) \quad \text{SSE} = 474.25$$

$$E(y) = f(x_1) \quad \text{SSE} = 417.80$$

It is also known that  $SS_{yy} = 579.30$ .

a) Is there evidence that interaction between  $x_1$  and  $x_2$  exists? Use alpha of .05. (10 pts)

b) If only one predictor is allowed in the model, which would you choose and why? (5 pts)