Math 158 – Spring 2018 Jo Hardin warm-up # 2

Name: _____

Given the model with an interaction term:

$$E[Y] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 \cdot X_2$$

$$Y = \text{baby's weight in ounces}$$

$$X_1 = \text{lbs mother gained}$$

$$X_2 = \text{smoking status}$$

- 1. Describe what σ measures in the above model.
- 2. How is SSE calculated for these data?
- 3. How is MSE related to σ^2 ?

Solution:

1. σ (or σ^2) represents the variability of the observed values around the mean value from which the response was drawn. That is, considering the linear hyperplane of explanatory variables (in this case, 2 different simple linear regression lines), the observed response values will vary according to σ around the hyperplane at the given explanatory values. (Note that the above description is identical to saying that σ^2 represents the variance of the model error terms.)

2.

SSE =
$$\sum_{i} (Y_i - \hat{Y}_i)^2$$

MSE = $\frac{SSE}{n-p} = \frac{\sum_{i} (Y_i - \hat{Y}_i)^2}{n-4}$

3. MSE is the estimated value of variance of the model error terms. That is, MSE is the statistic that estimates the parameter, σ^2 .