

# MTH 4230 Lab 5 **Answer Sheet**

Due Wed., Mar. 4

## **1 Part A**

### **1.1 Patient Satisfaction Data Set**

1. NA
2. NA
3. Give the following values:

$$\text{SSR}(X_2) = \text{-----}$$

$$\text{SSR}(X_1|X_2) = \text{-----}$$

$$\text{SSR}(X_3|X_1, X_2) = \text{-----}$$

4. State the hypotheses tested by the partial  $F$  test:

Please answer the following questions:

The observed value of the partial  $F$  test statistic is  $F = \text{-----}$

The p-value =  $\text{-----}$

Based on the partial  $F$  test, using  $\alpha = 0.025$ , would it be useful to add  $X_3$  to the model if it already includes  $X_1$  and  $X_2$  (Yes/No)?  $\text{-----}$

5. Show that  $F = t^2$ , where  $F$  is the partial  $F$  test statistic of Step 4 and  $t$  is the  $t$  test statistic for  $\beta_3$ . Also verify that the p-value for the  $t$  test is the same as that for the  $F$  test.

6. The partial  $R^2$  value is  $R^2_{X_3|X_1, X_2} = \text{-----}$

## 2 Part B

### 2.1 Nigeria Household Refuse Data Set

1. NA
2. NA (*don't* print the plot).
3. NA
4. NA
5. *Don't* print the plot, just answer the following question: Base on the scatterplot of Step 2 and the residual plot of this step, do you think a simple linear regression model is appropriate? Explain.
  
6. NA
7. NA
8. Based on the  $t$  tests for the  $\beta_k$ 's, which, if any, of the predictors  $X, X^2, X^3$  and  $X^4$  are statistically significant?

Based on the overall model  $F$  test, is at least one of the coefficients  $\beta_1, \beta_2, \beta_3$  or  $\beta_4$  different from 0?

9. Give the following values of the partial  $F$  tests:

$$F_{X^2|X} = \text{-----} \quad \text{and the p-value is } \text{-----}.$$

$$F_{X^3|X, X^2} = \text{-----} \quad \text{and the p-value is } \text{-----}.$$

$$F_{X^4|X, X^2, X^3} = \text{-----} \quad \text{and the p-value is } \text{-----}.$$

Based on the partial  $F$  tests, which of the polynomial terms  $X$ ,  $X^2$ ,  $X^3$  and  $X^4$  should be kept in the model?

10. NA

11. Write out the equation of the fitted third order polynomial below.

12. *Don't* print the scatterplot, just describe how well the polynomial fits the data.