(15) 1. Do Problem 5.8 on p.188 of the text. Clearly state the null and alternative hypotheses on the transformed regression coefficient $\gamma_1$.

(15) 2. Do Problem 5.8 on p.188 of the text using the t-test statistic approach that is explained in the handout on Chapter 5. Express the hypotheses in the form of $R\beta = r$. Define $R$ and $r$. Use the following estimated variance-covariance matrix:

$$V \equiv \text{est.Var}(\hat{\beta}) = \begin{bmatrix} a^{00} & a^{01} & a^{02} \\ a^{01} & a^{11} & a^{12} \\ a^{02} & a^{12} & a^{22} \end{bmatrix},$$

where

- $a^{00} =$ estimated variance of $\hat{\beta}_0$
- $a^{01} =$ estimated covariance between $\hat{\beta}_0$ and $\hat{\beta}_1$
- $a^{02} =$ estimated covariance between $\hat{\beta}_0$ and $\hat{\beta}_2$
- $a^{11} =$ estimated variance of $\hat{\beta}_1$
- $a^{12} =$ estimated covariance between $\hat{\beta}_1$ and $\hat{\beta}_2$
- $a^{22} =$ estimated variance of $\hat{\beta}_2$

(20) 3. Using the production function data of Assignment #8, numerically show that the approach #2 of the text and the t-test approach of the handout yield identically equal t-statistics.

(10) 4. Using the production function data of Assignment #8, test the hypotheses

$$H_0 : \begin{bmatrix} \beta_2 \\ \beta_3 \end{bmatrix} = \begin{bmatrix} 1.3 \\ .5 \end{bmatrix} \quad \text{versus} \quad H_1 : \begin{bmatrix} \beta_2 \\ \beta_3 \end{bmatrix} \neq \begin{bmatrix} 1.3 \\ .5 \end{bmatrix}$$

Set the significance level at 1% ($\alpha = .01$).

(30) 5. Form the likelihood function based on a random sample of size $n : x_1, x_2, \cdots, x_n$ where each $x_i$ is drawn randomly from the following distribution. Also obtain the maximum likelihood estimator.

(i) $f(x_i | \lambda) = \lambda \exp(-\lambda x_i), \quad x_i > 0, \quad \lambda > 0.$

(ii) $f(x_i | \theta) = \theta x_i^{\theta - 1}, \quad 0 < x_i < 1, \quad \theta > 0.$

(iii) $f(x_i | \theta) = \frac{1}{\theta}, \quad 0 < x_i < \theta.$