Stat 354 Fall 2018
Assignment #2

This assignment is due at the beginning of class on Friday, October 19, 2018. Your solutions will be graded based on both correctness *and* exposition. In particular, neatness and grammar count. You must write out solutions using full sentences (including capital letters to start sentences and periods to end them) and no abbreviations. That is, symbols such as $\therefore$ and $\Rightarrow$ are forbidden; write out the full words *therefore* and *implies* in their place.

1. Consider the simple linear regression model $y_i = \beta_0 + \beta_1 x_i + \epsilon_i$, $i = 1, \ldots, n$, where $\epsilon_1, \ldots, \epsilon_n$ are independent and identically distributed with $\epsilon_i \sim \mathcal{N}(0, \sigma^2)$. Define

$$\overline{x} = \frac{1}{n}\sum x_i, \quad \overline{y} = \frac{1}{n}\sum y_i, \quad s_{yy} = \sum (y_i - \overline{y})^2, \quad s_{xx} = \sum (x_i - \overline{x})^2, \quad s_{xy} = \sum (x_i - \overline{x})(y_i - \overline{y})$$

so that the least squares estimators of β_1, β_0 as derived in class are

$$\hat{\beta}_1 = \frac{s_{xy}}{s_{xx}} \quad \text{and} \quad \hat{\beta}_0 = \overline{y} - \hat{\beta}_1 \overline{x},$$

respectively. Determine the distribution of the random vector

$$\boldsymbol{\beta} = \begin{bmatrix} \hat{\beta}_0 \\ \hat{\beta}_1 \end{bmatrix}.$$

Hint. The result of Problem 1 from Assignment #1 will likely prove helpful for solving this problem.

2. The following Exercises are on pages 83–86 of the textbook.

- Exercise 3.1
- Exercise 3.2
- Exercise 3.3
- Exercise 3.4 (a), (b)
- Exercise 3.6 (a), (b)
- Exercise 3.12
- Exercise 3.15 (a), (b)