Pre-class preparation

Please read the following textbook sections from Degroot and Schervish's *Probability and Statistics* (fourth edition) or watch the video, as indicated:

- None!

Objectives

By the end of the day's class, students should be able to do the following:

- State the necessary conditions for simple linear regression and prove that the least squares regression equation gives the MLE estimates for linear coefficients under these assumptions.
- Describe the joint sampling distribution for the linear coefficients in the simple linear regression model.

Reflection Questions

Please submit your answers to the following questions to the corresponding Canvas assignment by 8:45AM:

1. Suppose $\begin{bmatrix} Y_1 \\ Y_2 \end{bmatrix} \sim MVN_2\left(\begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix}, \begin{bmatrix} \sigma_1^2 & c\sigma_1\sigma_2 \\ c\sigma_1\sigma_2 & \sigma_2^2 \end{bmatrix}\right)$. Briefly explain under what conditions Y_1 and Y_2 are dependent versus independent. *Either reference notes from when we proved Theorem 8.3.1 or see the "Properties of Bivariate Normal Distributions" in the textbook starting on page 340.*
2. Suppose we have numbers $Y_1, \ldots, Y_n$. Consider the following quantity:

$$Y^* = \frac{\sum_{i=1}^n c_i(Y_i - \bar{Y})}{\sum_{i=1}^n c_i^2}$$

   Show that Y^* is a linear combination of the Y_i. That is, find the form of a_i such that $Y^* = \sum_{i=1}^n a_i Y_i$.
3. (Optional) Is there anything from the pre-class preparation that you have questions about? What topics would you like would you like some more clarification on?