

# Homework 10

Sections 5.4 - 5.7

STAT 5700 - Probability

## Instructions

- Homework problems come from the 7th edition of the text *Mathematical Statistics with Applications* by Wackerly, Mendenhall, and Scheaffer, as well as (potential) additional problems provided by the instructor.
- You are responsible for understanding the concepts covered in all problems listed in a homework assignment, but only even-numbered problems should be turned in.
- Be NEAT and show work to support your answers. Points will be deducted if your answer is not adequately supported or the work cannot be readily followed.
- You are encouraged to work together on homework assignments, but each person must write up and turn in their own work and solutions.
- You will turn in this assignment by scanning your work and uploading a single pdf to Blackboard.
- Note there is a corresponding R Lab (Lab 10) that will be due at the same time as this assignment (HW 10).

## Problems to do (responsible for content, but not collected/graded)

- Section 5.4: 45, 49, 53, 63
- Section 5.6: 77, 81, 87
- Section 5.7: 89, 93, 95

## Problems to submit

- Section 5.4: 48, 52, 60, 64
  - Section 5.6: 76, 80
  - Section 5.7: 92, 94
  - Additional Problems below:
1. Let  $X$  and  $Y$  be independent random variables with  $\mu_X = 1$ ,  $\sigma_X = 10$ ,  $\mu_Y = 2$ , and  $\sigma_Y = 4$ . Compute the mean and the standard deviation for:
    - a.  $X + Y$
    - b.  $X - Y$
    - c.  $X + 4Y$
    - d.  $2X - 5Y$
  2. Let  $X$  and  $Y$  be random variables such that  $V(X) = 5$ ,  $V(Y) = 4$ , and  $Cov(X, Y) = -2$ . Find

- a.  $Cov(X + Y, X - Y)$
  - b.  $Cov(X - Y, -2X + 5Y)$
  - c.  $Corr(X - Y, -2X + 5Y)$
3. The correlation between  $X$  and  $Y$  is given by  $\rho_{XY}$ . Assume that  $\rho_{XY} \neq 0$ . A linear transformation is performed on  $X$ , and this linearly transformed variable is called  $W$ , where  $W = bX$  and  $b$  is a positive constant. Show that  $\rho_{WY} = \rho_{XY}$ .