

Homework 2

PP 312: Advanced Statistics for Data Analysis I

Instructors: Black, Chen, Chhikara, Matz, and Wyse

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Instructions: Answer all the questions. Show your work for any calculations that you do. For your work in R, please upload the .rmd file and a knitted PDF. For your work in Stata, please submit a .do file and a PDF of a log file. Your computer code should include clear and concise comments. **This assignment is due Friday, October 15 at 11:59pm.**

1. Suppose you have the following pdf:

$$f(x) = \begin{cases} c(2+x) & -2 \leq x \leq -1 \\ c & -1 < x < 1 \\ c(2-x) & 1 \leq x \leq 2 \end{cases} \quad (1)$$

- A. Find the constant c so that $f(x)$ is a pdf.
B. Find the mean and variance of x .

2. Suppose you have

$$f(x) = c(1-x^2) \quad -1 < x < 1 \quad (2)$$

- A. Find the constant c so that $f(x)$ is a pdf.
B. Find the mean and variance of x .

3. Suppose you have the following pdf:

$$f(x) = \begin{cases} c & 0 \leq x < 1 \\ c(2-x) & 1 \leq x \leq 2 \end{cases} \quad (3)$$

This is the right half of the pdf in problem one.

- A. Find the constant c so that $f(x)$ is a pdf.
B. Find the mean and variance of x .

4. Suppose you have a three-face die where one side is has a two, the second side has a four, and the final side has a four. Suppose each side appears with probability $\frac{1}{3}$. Find the mean and variance for x , the outcome of a single throw of the die.

5. Now consider multiple rolls of the die. Let the random variable y be the sum of the values from a given number of rolls.

- A. Find the pmf of y for two rolls of the die.

B. Find the pmf of y for three rolls of the die.

6. Suppose you have

$$f(x) = cx^3 \quad 0 \leq x \leq 4 \quad (4)$$

A. Find the constant c so that $f(x)$ is a pdf.

B. Find the mean and variance of x .

7. **Corrected on 10-12-21.** In both Stata and R, draw sample of 100 observations from a probability mass function where the probability that $x = 1$ is $\frac{1}{15}$, $x = 2$ is $\frac{2}{15}$, $x = 3$ is $\frac{3}{15}$, $x = 4$ is $\frac{4}{15}$, and $x = 5$ is $\frac{5}{15}$.

A. Calculate the sample mean and sample variance from both the sample drawn in R and Stata.

B. Calculate the mean and variance from the distribution. What are the errors from the R and Stata samples?