

MATH 241 Homework 11

Due: Sunday 5/16 11:59pm to Moodle

• Chapter 7 Problem 4

If X and Y have joint density function

$$f_{X,Y}(x,y) = \begin{cases} 1/y, & \text{if } 0 < y < 1, 0 < x < y \\ 0, & \text{otherwise} \end{cases}$$

find

(a) $E[XY]$

(b) $E[X]$

(c) $E[Y]$

• Chapter 7 Problem 7

Suppose that A and B each randomly and independently choose 3 of 10 objects. Find the expected number of objects(a) chosen by both A and B ;(b) not chosen by either A or B ;(c) chosen by exactly one of A and B .

• Chapter 7 Problem 30

If X and Y are independent, and identically distributed with mean μ and variance σ^2 , find

$$E[(X - Y)^2]$$

• Chapter 7 Problem 33

If $E[X] = 1$ and $Var(X) = 5$, find

(a) $E[(2 + X)^2]$;

(b) $Var(4 + 3X)$.

• Chapter 7 Problem 36

Let X be the number of 1's and Y the number of 2's that occur in n rolls of a fair die. Compute $Cov(X, Y)$.

• Chapter 7 Problem 38

The random variables X and Y have a joint density function given by

$$f(x,y) = \begin{cases} 2e^{-2x}/x, & 0 \leq x < \infty, 0 \leq y \leq x \\ 0, & \text{otherwise} \end{cases}$$

Compute $Cov(X, Y)$.

- Chapter 7 Problem 53

A prisoner is trapped in a cell containing 3 doors. The first door leads to a tunnel that returns him to his cell after 2 days' travel. The second door leads to a tunnel that returns him to his cell after 4 days' travel. The third door leads to freedom after 1 day of travel. If it is assumed that the prisoner will always select doors 1, 2, and 3 with respective probabilities 0.5, 0.3, and 0.2, what is the expected number of days until the prisoner reaches freedom?

- Chapter 7 Problem 65

The number of winter storms in a good year is a Poisson random variable with mean 3, whereas the number in a bad year is Poisson random variable with mean 5. If next year will be a good year with probability 0.4 or a bad year with probability 0.6, find the expected value and variance of the number of storms that will occur.

Optional: if you feel like more practice

These will not be graded, but you are welcome to discuss these with me during the office hour.

- Textbook Chapter 7 Problems: 6, 31, 37, 39, 45
- Textbook Chapter 7 Theoretical exercise: 13, 20, 29