Name: Feedback

SA402 · Dynamic and Stochastic Models Fall 2022 · Uhan

Quiz 1 – 8/31/2022

Instructions. You have 15 minutes to complete this quiz. You may use your plebe-issue calculator. You may not use any other materials (e.g., notes, homework, website).

Show all your work. To receive full credit, your solutions must be completely correct, sufficiently justified, and easy to follow.

Problem	Weight	Score
1	1	
2	1	
3	1	
4	1	
5	1	
Total		/ 50

For Problems 1 and 2, consider the random variable X with the following pdf:

$$f_X(a) = \begin{cases} 0 & \text{if } a < 0, \\ \frac{3}{8}a^2 & \text{if } 0 \le a \le 2, \\ 0 & \text{if } a > 2. \end{cases}$$

Problem 1. What is the probability that $0 \le X \le 1$?

See Example 2a in the Lesson 2 Exercises for a similar example.

Problem 2. Professor I. M. Wright peeks over your shoulder and declares,

> "The probability that $X = 1$ is $\frac{3}{8}$, since $f_X(1) = \frac{3}{8}$."

Is Professor Wright correct? Briefly explain.

Most of you correctly identified that Professor Wright is incorrect. However, a number of you struggled with explaining why Professor Wright is incorrect. A few hints:

- What kind of random variable has a pdf?
- How do you compute probabilities for such a random variable?
- What is the probability that such a random variable is equal to a specific value?

For Problems 3, 4 and 5, consider the random variable X with the following cdf:

$$F_X(a) = \begin{cases} 0 & \text{if } a < 1, \\ 2/7 & \text{if } 1 \le a < 3, \\ 5/7 & \text{if } 3 \le a < 4, \\ 6/7 & \text{if } 4 \le a < 8, \\ 1 & \text{if } a \ge 8. \end{cases}$$

Problem 3. What is the probability that $2 < X \le 6$?

Take a look at the bottom of page 2 in Lesson 2 to see how to compute probabilities on intervals using a cdf.

Problem 4. What is the probability that $X = 3$?

See Problem 1a from the Lesson 2 Exercises for a similar example.

Problem 5. Is X discrete or continuous? Briefly explain.

Most of you correctly identified that X is a discrete random variable. However, many of you struggled with explaining why. Some hints:

- How many values can a discrete random variable take?
- What shape does the cdf of a discrete random variable take?
- Be precise with your language:
  - A piecewise function is not necessarily a step function: for example,

$$f(a) = \begin{cases} a^2 & \text{if } a < 0 \\ a & \text{if } a \ge 0 \end{cases}$$

    is a piecewise function, but is not a step function – in fact, it is continuous.
  - A constant can be a function: for example, $f(a) = 0.5$.