Probability Assignment 2

Task Requirements Document

The Learning Hub

Task Requirements

Random Variables

1. Explain the concept of variance in the context of random variables. How does it help in understanding the spread of possible outcomes?

Probability Mass Function (PMF)

2. For a discrete random variable (X), the PMF is given by ($P(X = x) = 1/6$) for (x = 1, 2, 3, 4, 5, 6). Verify that this is a valid PMF.

3. Given the PMF ($P(X = x) = x/15$) for (x = 1, 2, 3, 4, 5), calculate the probability that (X = 3).

4. For the PMF ($P(X = x) = 1/6$) for (x = 1, 2, 3, 4, 5, 6), calculate the expected value (E[X]) and the variance (Var(X)).

Task Requirements

Probability Density Function (PDF)

5. Given a PDF $(f(x) = 1/2)$ for $(0 \leq x \leq 2)$, calculate the probability that (X) is between 0.5 and 1.5.

6. Suppose a continuous random variable (Z) has the PDF $(f(z) = 3z^2)$ for $(0 \leq z \leq 1)$. What is the probability that $(Z \leq 0.5)$?

7. Given the PDF $(f(x) = 3x^2)$ for $(0 \leq x \leq 1)$, calculate $(E[X])$.

Task Requirements

Cumulative Distribution Function (CDF)

8. If the CDF of a random variable (X) is $(F(x) = 1 - e^{-x})$ for $(x \geq 0)$, find the probability that $(X \leq 1)$.

9. Describe a scenario in which using the CDF is more beneficial than using the PMF or PDF directly.

Evaluation Criteria

- 80% overall solution structure.
- 5% Screenshots of all steps.
- 15% Apply methods of linear algebra.

Deadline

30/10/2024 at 1:00 pm

Notes

- Submit your unique solution.
- Have fun and enjoy 😊.