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Markov Inequality and Chebyshev Inequality - Quiz

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Question 1

1/1 point (graded)

Suppose you have a probability distribution for a non-negative random variable X, where the expectation of X is given by $E[X] = 5$. The probability that X is greater than or equal to 10 is _____.

- a. no more than 0.5 ✔
- b. no more than 0.8
- c. no less than 1.25
- d. exactly 1.25

Explanation

The Markov inequality provides an upper bound for the probability that X is greater than or equal to t. The inequality states that for any $t > 0, P(X \geq t) \leq E[X]/t$. In other words, the probability that X is greater than or equal to 10 is no more than $5/10 = 0.5$.

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✔ Correct (1/1 point)

Question 2

1/1 point (graded)

Now suppose that you have a random variable X, where $E[X] = 6$ and $Var[X] = 2$. The probability that X is greater than 11 or less than 1 is no more than _____.

Please give your answer to two decimal places.

0.08 ✔ **Answer:** 0.08

0.08

Explanation

We know that $E[X] = 6$, and we are interested in the probability that X is greater than 11 or less than 1. Hence, we are interested in the case where $t = 5$. Using the Chebyshev Inequality,

$$P(|X - E[X]| \geq t) \leq \frac{Var(x)}{t^2}$$

$$P(|X - 6| \geq 5) \leq \frac{2}{5^2} = \frac{2}{25} = 0.08$$

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