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NPTEL

reviewer3@nptel.iitm.ac.in ▾

Courses » Introduction to Probability Theory and Stochastic Processes

Announcements **Course** Ask a Question Progress Mentor FAQ

Unit 9 - Week 7

Course outline

Assignment 7

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2018-09-19, 23:59 IST.

Each of the following questions has four options out of which one or more options can be correct. Individual marks are mentioned corresponding to each question. In the case of multiple answers, no partial marks will be awarded if all the correct choices are not selected. 0 marks for questions not attempted.

1) Let X be a random variable which is uniformly distributed over the interval (0,1). *2 points*
Let Y be chosen from interval $(0, X]$ according to the pdf

$$f(y/x) = \begin{cases} 1/x, & 0 < y \leq x \\ 0, & \text{otherwise.} \end{cases}$$

Then, for any positive integer k, $E(Y^k)$ is given by

- $\frac{1}{k^2}$
- $\frac{1}{(k+1)^2}$
- k^2
- $(k+1)^2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{1}{(k+1)^2}$

2) Consider Bacteria reproduction by cell division. In any time t, a bacterium will either die (with probability 0.25), stay the same (with probability 0.25), or split into 2 parts (with probability 0.5). *2 points*

1000

No, the answer is incorrect.
Score: 0

Accepted Answers:
1250

3) Let X and Y be continuous random variables with joint PDF given by *2 points*

$$f(x,y) = \begin{cases} 8xy, & 0 < x < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

The correlation coefficient between X and Y is given by

- 0.25
- 0.49
- 0.55
- 0

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.49

4) Let (X,Y) be jointly distributed with density function given by *2 points*

$$f(x,y) = \begin{cases} \dfrac{y}{(1+x)^4} e^{-\frac{y}{1+x}}, & x, y \geq 0 \\ 0, & \text{otherwise.} \end{cases}.$$

Then, $E(Y/x)$ where $x \geq 0$, equals

- $1+x$
- $\frac{1}{1+x}$
- $2(1+x)$
- $\frac{2}{1+x}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$2(1+x)$

5) Let $\mathbf{X} = (X_1, X_2, X_3)$ be a three dimensional normal random variable such that $\mathbf{X} \sim N(\mu, \Sigma)$ *2 points*

where $\mu = (1,1,1)$ and $\Sigma = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 3 & k \\ 1 & k & 2 \end{pmatrix}$

where k is a constant. For what value of k, the random variables X_2 and $-X_1 + X_2 - X_3$ are independent.

- -2
- 0
- 2
- 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
2

6) Let X and Y are two independent random variables such that $X \sim Poisson(\lambda_1)$ and $Y \sim Poisson(\lambda_2)$. Then, $Var(X \mid X+Y=t)$ is ***2 points***

- $\frac{t\lambda_1\lambda_2}{(\lambda_1+\lambda_2)^2}$
- $\frac{t\lambda_1}{\lambda_1+\lambda_2}$
- $\frac{t\lambda_2}{\lambda_1+\lambda_2}$
- $t\lambda_1\lambda_2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{t\lambda_1\lambda_2}{(\lambda_1+\lambda_2)^2}$

7) Suppose that, for constants a and b, $E(Y|\ X) = a + bX$. Which of the following are correct? ***2 points***

- $b = cov(X,Y)/Var(X)$
- $b = cov(X,Y)/Var(Y)$
- $a = E(Y) - \frac{cov(X,Y)E(X)}{Var(X)}$
- $a = E(Y) - \frac{cov(X,Y)E(Y)}{Var(Y)}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$b = cov(X,Y)/Var(X)$
$a = E(Y) - \frac{cov(X,Y)E(X)}{Var(X)}$

8) Pick the point (X,Y) uniformly in the triangle $\{(x,y) \mid 0 \leq x \leq 1 \text{ and } 0 \leq y \leq x\}$. Then $E[(X-Y)^2/X=x]$ equals ***2 points***

- $\frac{x}{3}$
- $\frac{x^2}{1+x}$
- x
- $\frac{x^2}{3}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{x^2}{3}$

9) Suppose that (X, Y) is a two dimensional random variable with marginal distribution of X being $N(0,1)$ and $E(Y \mid X = x) = x^2$, $\forall x \in \mathbb{R}$. Then, which of the following statements are correct? *2 points*

- $Corr(X, Y) > 0$
- $E(Y) = 1$
- $Corr(X, Y) = 0$
- $Corr(X, Y) < 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$E(Y) = 1$
$Corr(X, Y) = 0$

10) Let X and Y be continuous random variables with joint PDF given by *2 points*

$$f(x, y) = \begin{cases} x + y, & 0 < x, y < 1 \\ 0, & \text{otherwise} \end{cases}$$

Which of the following are incorrect?

- $E(X \mid Y = \frac{1}{2}) = \frac{1}{4}$
- $E(X \mid Y = \frac{1}{2}) = \frac{7}{12}$
- $E(X \mid Y = \frac{1}{4}) = \frac{11}{18}$
- $E(X \mid Y = \frac{1}{4}) = \frac{5}{12}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$E(X \mid Y = \frac{1}{2}) = \frac{7}{12}$
$E(X \mid Y = \frac{1}{4}) = \frac{11}{18}$

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