



Bookmarks



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Unit overview

Lec. 8: Probability density functions

Exercises 8 due Mar 16, 2016 at 23:59 UTC

Lec. 9: Conditioning on an event; Multiple r.v.'s

Exercises 9 due Mar 16, 2016 at 23:59 UTC

Lec. 10: Conditioning on a random variable; Independence; Bayes' rule

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Standard normal table

Solved problems

Problem Set 5

Unit 5: Continuous random variables > Lec. 9: Conditioning on an event; Multiple r.v.'s > Lec 9 Conditioning on an event Multiple r v s vertical8

Exercise: Joint CDFs

(3/3 points)

a) Is it always true that if $x < x'$, then $F_{X,Y}(x, y) \leq F_{X,Y}(x', y)$?

Yes ▾



Answer: Yes

b) Suppose that the random variables X and Y are jointly continuous and take values on the set where $0 \leq x, y \leq 1$. Is $F_{X,Y}(x, y) = (x + 2y)^2/9$ a legitimate joint CDF? Hint: Consider $F_{X,Y}(0, 1)$.

No ▾



Answer: No

c) Suppose that the random variables X and Y are jointly continuous and take values on the unit square, i.e., $0 \leq x \leq 1$ and $0 \leq y \leq 1$. The joint CDF on that set is of the form $xy(x + y)/2$. Find an expression for the joint PDF which is valid for (x, y) in the unit square. Enter an algebraic function of x and y using standard notation .

x+y



Answer: x+y

Answer:

a) Since $x < x'$, the event $\{X \leq x, Y \leq y\}$ is a subset of the event $\{X \leq x', Y \leq y\}$, and therefore

$$F_{X,Y}(x, y) = \mathbf{P}(X \leq x, Y \leq y) \leq \mathbf{P}(X \leq x', Y \leq y) = F_{X,Y}(x', y).$$


b) Since the random variables are nonnegative, we have

$$F_{X,Y}(0, 1) = \mathbf{P}(X \leq 0 \text{ and } Y \leq 1) = \mathbf{P}(X = 0 \text{ and } Y \leq 1) \leq \mathbf{P}(X = 0) =$$

where the last equality holds because X is a continuous random variable. But zero is different from $(0 + 2 \cdot 1)^2/9$. Therefore, we do not have a legitimate joint CDF.

c) The joint CDF is of the form $x^2y/2 + y^2x/2$. The partial derivative with respect to x is $xy + y^2/2$. Taking now the partial derivative with respect to y , we obtain $x + y$.

You have used 1 of 2 submissions

Problem Set 5 due Mar
16, 2016 at 23:59 UTC 

Unit summary

- ▶ Unit 6: Further topics on random variables

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