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6. Exercise: Memorylessness of the exponential

Exercises due Mar 13, 2020 05:29 IST Completed

Exercise: Memorylessness of the exponential

3/3 points (graded)

Let X be an exponential random variable with parameter λ .

a) The probability that $X > 5$ is

☐ $\lambda e^{-5\lambda}$

☒ $e^{-5\lambda}$

☐ none of the above



b) The probability that $X > 5$ given that $X > 2$ is

☐ $\lambda e^{-5\lambda}$

☐ $e^{-5\lambda}$

☐ $\lambda e^{-3\lambda}$

☒ $e^{-3\lambda}$

☐ none of the above





c) Given that $X > 2$, and for a small $\delta > 0$, the probability that $4 \leq X \leq 4 + 2\delta$ is approximately

☐ $\lambda\delta$

☐ $2\lambda\delta$

☐ $\delta e^{-4\lambda}$

☐ $\lambda\delta e^{-4\lambda}$

☐ $\lambda\delta e^{-2\lambda}$

☒ $2\lambda\delta e^{-2\lambda}$

☐ none of the above



Solution:

a) We have seen in the past that for an exponential random variable with parameter λ , $\mathbf{P}(X > a) = e^{-\lambda a}$, and so $\mathbf{P}(X > 5) = e^{-5\lambda}$.

b) Because of the memorylessness property, given that $X > 2$, the remaining time $X - 2$ is again exponential with the same parameter. Thus,

$$\mathbf{P}(X > 5 | X > 2) = \mathbf{P}(X - 2 > 3 | X > 2) = \mathbf{P}(X > 3) = e^{-3\lambda}.$$

c) By memorylessness, this is the same as the unconditional probability that an exponential takes values in the interval $[2, 2 + 2\delta]$, which is approximately the length, 2δ , of the small interval times the density evaluated at 2, yielding $2\lambda\delta e^{-2\lambda}$.

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You have used 2 of 2 attempts



i Answers are displayed within the problem






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- ☒ Confused on question c 10
why can't I say that by memorylessness this is the same as the unconditional probability that an expone...
- ? About the answer to (c) 1
Why is the answer not $2 \cdot \lambda \cdot \Delta \cdot e^{-(2 \cdot \lambda \cdot \Delta)}$? why is the the minus sign to the e? Thank you all...
-  Question of b) 1
Why there used $X-2$?
-  I dont understand how we find question c) 3 new_ 8
I dont understand how we find question c).
-  Need help understanding the answer on question c 3
Hi, I'm having issues with problem c, so I got it up to $P(4 < x < 4 + 2d | x > 2)$ then I tried to just solve it using ca...
-  [STAFF] Typo in title 2
Hello, I know this is of minor importance but there's a typo in letter b. The word *probability* is written ...
- ☒ submit disabled 2
having a problem submitting my answers anyone knows how to solve this and the deadline has not yet r...
- ☒ Cannot figure out Q2 1 new_ 3
- ? For exponential r.v. 's why is "approximating probability within a small time interval" different (non-conditional) than "computing probability within a large/open-ended time interval" (conditional)? 4
With regards to conditional probability of a lightbulb failing (a continuous exponential r.v.)... After the bu...
-  Lengths of intervals 1
Attention! Not all intervals have the same length.
- ☒ Answer c, confusion 4
I don't know why we didn't omit the 4s inside the probability and get the length of the small interval time...