



MITx: 6.041x Introduction to Probability - The Science of Uncertainty



Bookmarks

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- ▶ Unit 1: Probability models and axioms
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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

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 vertical1



Bookmark

Exercise: Memorylessness of the exponential

(3/3 points)

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
☐ $\lambda\delta$
☐ $2\lambda\delta$
☐ $\delta e^{-4\lambda}$

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

Exercises 10 due Mar
 16, 2016 at 23:59 UTC

Standard normal
 table

Solved problems

Problem Set 5

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

Unit summary

☐ $\lambda \delta e^{-4\lambda}$

☐ $\lambda \delta e^{-2\lambda}$

☒ $2\lambda \delta e^{-2\lambda}$ ✓

☐ none of the above

Answer:

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,

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

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 $2\lambda \delta e^{-2\lambda}$.

You have used 1 of 2 submissions

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