



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



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

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

Unit summary

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Exercise: Exponential PDF

(2/2 points)

Let X be an exponential random variable with parameter $\lambda = 2$. Find the values of the following. Use 'e' for the base of the natural logarithm (e.g., enter $e^{(-3)}$ for e^{-3}).

a) $\mathbf{E}[(3X + 1)^2] =$ Answer: 8.5

b) $\mathbf{P}(1 \leq X \leq 2) =$ Answer: 0.11702

Answer:

a) By expanding the quadratic, using linearity of expectations, and the facts that $\mathbf{E}[X] = 1/\lambda$ and $\mathbf{E}[X^2] = 2/\lambda^2$, we have

$$\mathbf{E}[(3X + 1)^2] = 9\mathbf{E}[X^2] + 6\mathbf{E}[X] + 1 = 9 \cdot \frac{2}{2^2} + 6 \cdot \frac{1}{2} + 1 = \frac{17}{2}.$$

b) We have seen that for $a > 0$, we have $\mathbf{P}(X \geq a) = e^{-\lambda a}$, so that $\mathbf{P}(X \leq a) = 1 - e^{-\lambda a}$. Therefore,

$$\mathbf{P}(1 \leq X \leq 2) = \mathbf{P}(X \leq 2) - \mathbf{P}(X \leq 1) = (1 - e^{-4}) - (1 - e^{-2}) = e^{-2} - e^{-4}.$$

You have used 2 of 2 submissions



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