



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



Bookmarks

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Unit overview

Lec. 11: Derived distributions

Exercises 11 due Mar 30, 2016 at 23:59 UTC

Unit 6: Further topics on random variables > Lec. 12: Sums of independent r.v.'s; Covariance and correlation > Lec 12 Sums of independent r v s Covariance and correlation vertical2



Bookmark

Exercise: Sum of normals

(3/3 points)

Let \mathbf{X} and \mathbf{Y} be independent normal random variables.a) Is $2\mathbf{X} - 4$ always normal?

True ▾



Answer: True

b) Is $3\mathbf{X} - 4\mathbf{Y}$ always normal?

True ▾



Answer: True

c) Is $\mathbf{X}^2 + \mathbf{Y}$ always normal?

False ▾



Answer: False

Answer:

a) This is a fact that we are already familiar with: a linear function of a normal random variable is normal.

b) Since \mathbf{X} and \mathbf{Y} are independent and normal, the random variables $3\mathbf{X}$ and $-4\mathbf{Y}$ are also independent and normal. Since the sum of independent normals is normal, it follows that $3\mathbf{X} - 4\mathbf{Y}$ is normal.c) There is no reason for this to be the case. To see this, consider an extreme case where $\mathbf{Y} = \mathbf{0}$ (a degenerate case of a normal). Then the random variable $\mathbf{X}^2 + \mathbf{Y}$ is nonnegative, which is incompatible with having a normal distribution.

You have used 1 of 1 submissions

Lec. 12: Sums of independent r.v.'s; Covariance and correlation

Exercises 12 due Mar 30, 2016 at 23:59 UTC

Lec. 13: Conditional expectation and variance revisited; Sum of a random number of independent r.v.'s

Exercises 13 due Mar 30, 2016 at 23:59 UTC

Solved problems

Additional theoretical material

Problem Set 6

Problem Set 6 due Mar 30, 2016 at 23:59 UTC

Unit summary

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