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Unit overview

Lec. 11: Derived distributions

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

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Derived distributions vertical3

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Exercise: Using the formula for the monotonic case

(6/6 points)

The random variable X is exponential with parameter $\lambda = 1$. The random variable Y is defined by $Y = g(X) = 1/(1 + X)$.

a) The inverse function h , for which $h(g(x)) = x$, is of the form $ay^b + c$. Find a , b , and c .

$a =$ ✓ Answer: 1

$b =$ ✓ Answer: -1

$c =$ ✓ Answer: -1

b) For $y \in (0, 1]$, the PDF of Y is of the form $f_Y(y) = y^a e^{(b/y)+c}$. Find a , b , and c .

$a =$ ✓ Answer: -2

$b =$ ✓ Answer: -1

$c =$ ✓ Answer: 1

Answer:

a) If x and y obey the relation $y = g(x) = 1/(1 + x)$, then $y + yx = 1$, so that

$$x = h(y) = \frac{1 - y}{y} = \frac{1}{y} - 1.$$

Note that we are interested in $x \geq 0$ which restricts y to the range $(0, 1]$. Notice also that the functions g and h are monotonically decreasing on the relevant ranges of values.

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

b) Note that

$$\frac{dh}{dy}(y) = -\frac{1}{y^2}.$$

Therefore,

$$f_Y(y) = f_X(h(y)) \left| \frac{dh}{dy}(y) \right| = e^{-(1/y)+1} \cdot \frac{1}{y^2}.$$

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