5. Exercise: Linear functions of continuous r.v.'s

Exercise: Linear functions of continuous r.v.'s

1/2 points (graded)

(a) Let X be an exponential random variable and let $Y = aX + b$. The random variable Y is exponential if and only if (choose one of the following statements):

- always.
- $a \neq 0$.
- $a \neq 0$ and $b = 0$
- $a > 0$
- $a > 0$ and $b = 0$ ✔
- $a = 1$

(b) Let X be a continuous random variable, uniformly distributed on some interval, and let $Y = aX + b$. The random variable Y will be a continuous random variable with a uniform distribution if and only if (choose one of the following statements):

- always.
- $a > 0$.
- $a \neq 0$ ✔
- $a \neq 0$ and $b = 0$

Solution:

(a) For Y to be exponential, its range must be $[0, \infty)$. This will be the case only if $a > 0$ and $b = 0$. And if indeed $a > 0$ and $b = 0$, and X has parameter λ, then, for $y \geq 0$, $f_Y(y) = (1/a) f_X(y/a) = (\lambda/a) e^{-\lambda y/a}$, which is exponential (with parameter λ/a).

(b) A scaled and shifted uniform is uniform, except that if $a = 0$, then Y is a constant random variable, and therefore no longer continuous.

提交 You have used 2 of 2 attempts

Answers are displayed within the problem

讨论

显示讨论

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