Functions of a continuous random variable

Let X be a continuous random variable with the following probability density function: **1 point**

$$f_X(x) = \begin{cases} 3x^2 & 0 < x < 1 \\ 0 & \text{Otherwise} \end{cases}$$

Find the probability distribution function of $Y = X^2$.

- $f_Y(y) = \begin{cases} 3\sqrt{y} & 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$
- $f_Y(y) = \begin{cases} \frac{3}{2}\sqrt{y} & 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$
- $f_Y(y) = \begin{cases} 3y^2 & 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$
- $f_Y(y) = \begin{cases} \frac{3}{2}y & 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$

Let $X \sim \text{Uniform}([-3, 3])$. Find the PDF of $|X|$. **1 point**

- $|X| \sim \text{Uniform}[-3, 3]$
- $|X| \sim \text{Uniform}[0, 3]$
- $|X| \sim \text{Uniform}[1, 3]$
- $|X| \sim \text{Uniform}[0, 9]$

Let $X \sim \text{Uniform}[-3, 2]$. Find the CDF of $|X|$. **1 point**

- $F_Y(y) = \begin{cases} 0 & y < 0 \\ \frac{y}{3} & 0 \le y < 3 \\ 1 & y \ge 3 \end{cases}$

- $F_Y(y) = \begin{cases} 0 & y \le 0 \\ \frac{y}{2} & 0 < y \le 2 \\ \frac{y}{3} & 2 < y \le 3 \\ 1 & y > 3 \end{cases}$

- $F_Y(y) = \begin{cases} 0 & y \le 0 \\ \frac{2y}{5} & 0 < y \le 2 \\ \frac{3y}{5} & 2 < y \le 3 \\ 1 & y > 3 \end{cases}$

- $F_Y(y) = \begin{cases} 0 & y \le 0 \\ \frac{2y}{5} & 0 < y \le 2 \\ \frac{2+y}{5} & 2 < y \le 3 \\ 1 & y > 3 \end{cases}$

Let $X \sim \text{Uniform}[-3, 2]$. Find the PDF of $|X|$. ***1 point***

- $f_Y(y) = \begin{cases} \frac{1}{3} & 0 \le y < 3 \\ 0 & \text{otherwise} \end{cases}$

- $f_Y(y) = \begin{cases} \frac{1}{2} & 0 < y \le 2 \\ \frac{1}{3} & 2 < y \le 3 \\ 0 & \text{otherwise} \end{cases}$

- $f_Y(y) = \begin{cases} \frac{2}{5} & 0 < y \le 2 \\ \frac{3}{5} & 2 < y \le 3 \\ 0 & \text{otherwise} \end{cases}$

○ $f_Y(y) = \begin{cases} \frac{2}{5} & 0 < y \leq 2 \\ \frac{1}{5} & 2 < y \leq 3 \\ 0 & \text{otherwise} \end{cases}$

Let $X \sim \text{Exp}(\lambda)$. Find the PDF of $Y = X^3$. ***1 point***

○ $f_Y(y) = \begin{cases} \frac{\lambda}{3y^{\frac{2}{3}}}(e^{-\lambda y^{\frac{1}{3}}}) & y > 0 \\ 0 & \text{otherwise} \end{cases}$

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Let $X \sim \text{Normal}(\mu, \sigma^2)$. What will be the distribution of $aX + b$ where a and b are constants? ***1 point***

○ $X \sim \text{Normal}(\mu, a^2\sigma^2)$

○ $X \sim \text{Normal}(b + a\mu, a^2\sigma^2)$

○ $X \sim \text{Normal}(b - a\mu, a^2\sigma^2)$

○ $X \sim \text{Normal}(a - b\mu, a^2\sigma^2)$

1 point

Let X be a continuous random variable with probability density function

$$f_X(x) = \begin{cases} \frac{x}{12} & 1 < x < 5 \\ 0 & \text{otherwise} \end{cases}$$

Find the probability density function of $Y = 2X - 3$.

- $f_Y(y) = \begin{cases} \frac{y+3}{48} & -1 < y < 7 \\ 0 & \text{otherwise} \end{cases}$
- $f_Y(y) = \begin{cases} \frac{y+3}{12} & -1 < y < 7 \\ 0 & \text{otherwise} \end{cases}$
- $f_Y(y) = \begin{cases} \frac{y+12}{48} & -1 < y < 7 \\ 0 & \text{otherwise} \end{cases}$
- $f_Y(y) = \begin{cases} \frac{y+3}{16} & -1 < y < 7 \\ 0 & \text{otherwise} \end{cases}$