Eliezer Cavazos Rochin A00835194 08/08/2024

$f(x) = \int_0^2 cx^2 = 1$

$c\int_0^2 x^2 = 1 \to \frac{x^3}{3} \to \frac{(2)^3}{3} + \frac{(0)^3}{3}$

$\frac{1}{\frac{8}{3}} \to 0.375 \to 3/8$

$\boxed{C = 3/8}$

$\int_0^1 \frac{3}{8} x^2 \qquad \frac{3}{8} \cdot \frac{x^3}{3} = \frac{3}{8} \cdot \frac{(1)^3}{3} = 1/8$

constante

$\boxed{C = 3/8}$

2. $P(0 < X \leq 1) = 1/8$

2) $f(x) = \begin{cases} \frac{K}{x^4}, & \text{si } x \geq 1 \\ 0 & \text{si } x < 1 \end{cases}$

a) $\int_1^\infty \frac{K}{x^4} dx = Kx^{-4} \Rightarrow \int_1^\infty \frac{Kx^{-3}}{-3}$

$\frac{K}{-3x^3} \xrightarrow{x=1} \frac{K}{-3(1)^3} \rightarrow \frac{K}{3} = \boxed{K=3}$

B) $E(x) = \int_{-\infty}^{\infty} x f(x) dx \quad f(x) = \frac{3}{x^4}$

cuando $x > 1$

$E(x) = \int_1^\infty x \cdot \frac{3}{x^4} dx$

$3\int_1^\infty x \cdot \frac{1}{x^4} \Rightarrow 3\int_1^\infty \frac{x}{x^4}$

$\int_1^\infty x^{-3} \rightarrow \frac{x^{-2}}{-2} \rightarrow -\frac{1}{2x^2}$

$x=1$

$-\frac{1}{2(1)^2} = -\frac{1}{2} \rightarrow \left(0 - \left(-\frac{1}{2}\right)\right) \rightarrow 3\left(\frac{1}{2}\right)$

B

Valor Esperado $= \frac{3}{2}$

Varianza ?

$V(x) = E(x^2) - \mu^2$

$E(x^2) = \int_1^\infty x^2 \cdot \frac{3}{x^4}\, dx = 3\int_1^\infty \frac{x^2}{x^4}\, dx$

$\int_1^\infty x^{-2}\, dx = \frac{x^{-1}}{1} = -\frac{1}{x}\Big|_1^\infty \; 0 \; \frac{1}{(1)} = -1$

$3(0-(-1)) = 3 \to E(x^2)$

$V(x) = 3 - \left(\frac{3}{2}\right)^2 = \frac{3}{4}$

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c.-

$$P(X>2) = \int_2^{\infty} \frac{3}{x^4}\,dx$$

$$3\int_2^{\infty} x^{-4} \to \frac{x^{-3}}{-3} \to -\frac{1}{3x^3}\Big]_2^{\infty} \qquad \infty \to 0, \quad 2 \to -\frac{1}{24}$$

$$3\cdot\left(0-\left(-\frac{1}{24}\right)\right) = \frac{3}{24}$$

$$P(X>2) = \frac{1}{8}$$

$$P(X\le 2) = \int_1^2 \frac{3}{x^4} \to -\frac{1}{3x^3}\Big]_1^2 \qquad 2 \to -\frac{1}{24}, \quad 1 \to -\frac{1}{3}$$

$$3\cdot\left(-\frac{1}{24}+\frac{1}{3}\right) \to 3\left(\frac{-1+8}{24}\right)$$

$$3\left(\frac{7}{24}\right) \to \frac{7}{8} \to \boxed{P(X\le 2) = 7/8}$$

$$P(X<x) = \int_1^x \frac{3}{x^4}\,dx \to -\frac{1}{3x^3}\Big]_1^x \qquad 1 \to -\frac{1}{3}$$

$$3\left(-\frac{1}{3x^3} - \left(-\frac{1}{3}\right)\right) = 3\left(\frac{x^3-1}{3x^3}\right) = 1-\frac{1}{x^3}$$

$$\boxed{P(X<x) = 1-\frac{1}{x^3}}$$