Answer on Question #47994-Geography-Other

Obtain the mean and variance of the continuous random variable X having the probability density function $f(x) = 2x$ for $0 \leq x \leq 1$ and 0 otherwise.

Solution

The mean of the continuous random variable X is

$$\mu = \int_{-\infty}^{\infty} xf(x)\,dx = \int_{0}^{1} x \cdot 2x\,dx = 2\left(\frac{x^3}{3}\right)_{0}^{1} = \frac{2}{3}.$$

The variance of the continuous random variable X is

$$\sigma^2 = \int_{-\infty}^{\infty} x^2 f(x)\,dx - \mu^2.$$

$$\int_{-\infty}^{\infty} x^2 f(x)\,dx = \int_{0}^{1} x^2 \cdot 2x\,dx = 2\left(\frac{x^4}{4}\right)_{0}^{1} = \frac{1}{2}.$$

$$\sigma^2 = \frac{1}{2} - \left(\frac{2}{3}\right)^2 = \frac{1}{18}.$$

Answer: $\frac{2}{3}$ and $\frac{1}{18}$.