

Probability Density Functions

Learning Objectives

- Understand the properties of probability density functions
 - Compute probability using a continuous probability density function
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Understand the properties of probability density functions

1. Consider the function $f(x) = Cx(1 - x^2)$, $0 \leq x \leq 1$. Find the value of C that makes this function a probability density function.

Compute probability using a continuous probability density function

2. Consider the probability density function $f(x) = \frac{3}{4}x^2(2 - x)$, $0 \leq x \leq 2$. Use this function to evaluate the following probabilities.

a. $P(x \leq 1)$

b. $P(x \geq 1.5)$

c. $P\left(\frac{1}{2} \leq x < \frac{3}{2}\right)$

- Probability density functions $f(x)$ defined on $[a, b]$, have the property that $\int_a^b f(x) dx = 1$.
- $P(c < x < d) = P(c \leq x \leq d) = \int_c^d f(x) dx$.

ANSWER KEY

1. $C = 4, f(x) = 4x(1 - x^2)$

2. a. $P(x \leq 1) = \frac{5}{16}$, b. $P(x \geq 1.5) = 67/256 \approx 0.2617$, c. $P\left(\frac{1}{2} \leq x < \frac{3}{2}\right) = \frac{11}{16}$