1. Let the joint pdf be

\[ f(x, y) = I(0 < x < 2)I(x < 2(1 - y)). \]

Find:
(a) \( P(X > 1, Y < 1/4) \).
(b) \( P(X > Y) \).
(c) \( P(X + Y > 1/2) \).

2. Let the joint pdf be

\[ f(x, y, z) = \frac{1}{3}(3x + 2y + z)I(0 < x < 1)I(0 < y < 1)I(0 < z < 1). \]

Find:
(a) \( P(X > 1/2, Y < 1/2, Z < 1/2) \)
(b) Marginal density of \( X \)
(c) Conditional density of \( f(z|x, y) \)
(d) Variance of \( V = XY \).

3. Let \( f(x) = \lambda e^{-\lambda x}I(x > 0) \). Find the moment generating function, and then use it to calculate first moment.

4. Let \( Z = aX + bY \) and \( f(x, y) = (1 - |x|)(1 - |y|)I(|x| < 1)I(|y| < 1) \).

Find the variance of \( Z \).

5. Let \( f(x) = (1 - x)I(0 < x < 1) + (x - 1)I(1 < x < 2) \). Find \( E(X^2|X > 1/2) \).