

- 1) Please attempt each problem on a new page and write on one side only.
- 2) Show all your work clearly.

1. Problem 2.4 of the textbook on page 76.
2. Problem 2.6 of the textbook on page 76.
3. X and Y are two random variables with joint pdf

$$p_{XY}(x, y) = \begin{cases} C & x \geq 0, y \geq 0, x + y < 1 \\ 0 & \text{otherwise} \end{cases}$$

- (a) Find the constant C .
 - (b) Find $P(2X \geq Y)$.
 - (c) Find $F_X(\alpha)$.
 - (d) Are X and Y independent? Justify.
4. X and Y are two random variables with joint pdf

$$p_{XY}(x, y) = \begin{cases} .25 & |x| < y, 0 \leq y \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

Let C be the event that $0 \leq Y < 1$.

- (a) Find $p_X(x|C)$.
 - (b) Find $E[X|C]$.
5. Problem 2.12 of the textbook on page 77.
 6. X_1 and X_2 are two independent Gaussian random variables each with mean zero and unit variance. Let

$$Y_1 = 2X_1 + X_2 + 3 \tag{1}$$

$$Y_2 = X_1 - X_2 - 1 \tag{2}$$

Find the joint probability density function of Y_1 and Y_2 .

7. Problem 2.21 of the textbook on page 78.