



Indian Institute of Information Technology, Vadodara (IIITV)  
IIITV- International Campus Diu  
**Probability and Statistics (MA201)**



**TUTORIAL 5**

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1. For two RVs  $X$  and  $Y$ , the joint PDF is given as

$$f_{X,Y}(x,y) = \begin{cases} 4xy, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{elsewhere.} \end{cases}$$

Are  $X$  and  $Y$  independent?

2. Let  $X$  and  $Y$  be independent random variables that are uniformly distributed in  $[0, a]$ . Find  $P[X + Y \leq b \in [0, a]]$ .
3. For two RVs  $X$  and  $Y$ , the joint PDF is given as

$$f_{X,Y}(x,y) = \begin{cases} \frac{1}{2}, & 0 \leq x \leq y, 0 \leq y \leq 2 \\ 0, & \text{elsewhere.} \end{cases}$$

Are  $X$  and  $Y$  independent? Also find  $f_X(\frac{y}{x})$  and  $f_Y(\frac{x}{y})$ .

4. Find the  $C$  and the marginal PDFs for the following PDF. Are  $X$  and  $Y$  independent? Also find  $P[X + Y \leq 1]$ .

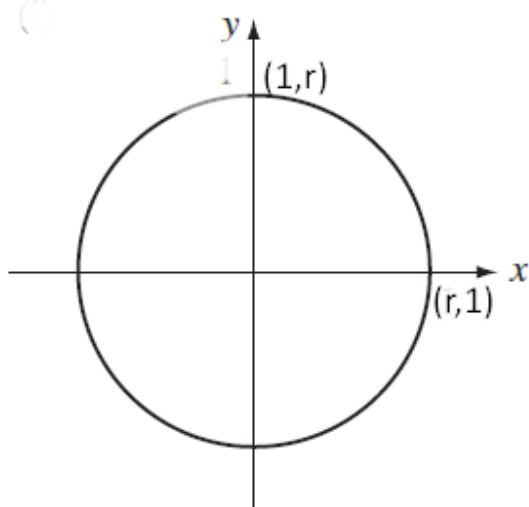
$$f_{X,Y}(x,y) = \begin{cases} Ce^{-x}e^{-y}, & 0 \leq y \leq x \leq \infty \\ 0, & \text{elsewhere.} \end{cases}$$

5. RVs  $X$  and  $Y$  are jointly Gaussian and their joint distribution is given by,

$$f_{X,Y}(x,y) = \frac{1}{2\pi\sqrt{1-\rho^2}} e^{\frac{-(x^2-2\rho xy+y^2)}{2(1-\rho^2)}}, -\infty < x, y < \infty.$$

Find the marginal PDFs. Are  $X$  and  $Y$  independent?

6. In  $\mathcal{R}^2$ , The random vector  $X$  and  $Y$  is uniformly distributed (i.e.,  $f_{(X,Y)}(x,y) = k$ ) in the regions shown in Figure and zero elsewhere. Here,  $r = 1$ .



- (a) Find the value of  $k$ .
- (b) Find the marginal pdf for  $X$  and for  $Y$ .
7. Let  $X$  and  $Y$  have joint pdf:  $f_{(X,Y)}(x,y) = k(x+y), 0 \leq x,y \leq 1$ . Find  $P[X < 0.5, Y < 0.5]$

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**Best wishes**