

PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Exam 2

Probability Theory

30–12–2019

1. (2pt) Find k for the given joint probability density function

$$f(x, y) = \begin{cases} k(x + y) & \text{for } 0 < x < 1; 0 < y < 2 \\ 0 & \text{otherwise} \end{cases}$$

2. (3pt) Compute $E(X)$ and $E(4X + 3)$ for the given probability distribution

x	0	1	2	3
$f(x)$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{4}$

3. (3pt) Compute μ and σ^2 for the given probability density function

$$f(x) = \begin{cases} \frac{x}{2} & \text{for } 0 < x < 2 \\ 0 & \text{otherwise} \end{cases}$$

4. (6pt) Given the joint probability density function

$$f(x, y) = \begin{cases} 60x^2y & \text{for } 0 < x, y < 1; x + y < 1 \\ 0 & \text{otherwise} \end{cases}$$

- (a) Compute the marginal density of X
- (b) Prove X and Y independent or dependent
- (c) Compute the conditional density of Y given $X = \frac{1}{2}$

5. (6pt) Given the joint probability density function

$$f(x, y) = \begin{cases} 2x(x - y) & \text{for } 0 < x < 1; -x < y < x \\ 0 & \text{otherwise} \end{cases}$$

- (a) Compute $P(X \geq \frac{1}{2}; Y < 1)$
- (b) Compute $P(X < 1; Y < \frac{1}{2})$