

# Homework based on Chapter 10

## Computational Probability and Statistics

### CIS 2033, Section 002

Due: 9:00 AM, Friday, Mar. 27, 2015

**Question 1** The probability distribution of a discrete random variable  $X$  is given by  $P(X = -1) = 1/4$ ,  $P(X = 0) = 2/4$ ,  $P(X = 1) = 1/4$ .  $Y = X^2$ .

- a. Draw the joint distribution table, add their marginal distribution to the table.
- b. Calculate the  $Cov(X, Y)$ .
- c. Calculate the  $\rho(X, Y)$ . Are they correlated or not correlated?
- d. Does  $X$  and  $Y$  independent or not?

**Question 2** Let  $P(X = a, Y = b)$  is given by the following table.

b	a		
	-1	0	1
4	$\lambda - \frac{1}{16}$	$-\lambda$	$\frac{1}{4}$
5	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{4}$
6	$\lambda$	$\frac{1}{8}$	$\frac{1}{4} - \lambda$

- a. What value can  $\lambda$  take such that the joint distribution is valid?
- b. Calculate the marginal distribution  $p(x)$  and  $p(y)$ .
- c. Calculate  $E[X]$ ,  $E[Y]$ ,  $Var[X]$ ,  $Var[Y]$ .
- d. Calculate  $E[XY]$  and  $E[X]E[Y]$ . Check whether  $E[XY] = E[X]E[Y]$ .
- e. Calculate  $E[X + Y]$ . Check whether  $E[X + Y] = E[X] + E[Y]$ .
- f. Calculate  $Cov(X, Y)$  and  $\rho(X, Y)$ . Are they correlated or not correlated?

g. Does  $X$  and  $Y$  independent or dependent?

Extra credits (1). Calculate  $Var[XY]$ . Check whether  $Var[XY] = Var[X]Var[Y]$ .

Extra credits (1). Calculate  $Var[X + Y]$ . Check whether  $Var[X + Y] = Var[X] + Var[Y]$ .