

# Quiz 4

February 12, 2015

1. You are given a random variable  $X$  with the cdf (cumulative distribution function) given by

$$F(x) = \begin{cases} 0 & x < 0 \\ 0.06 & 0 \leq x < 1 \\ 0.19 & 1 \leq x < 2 \\ 0.39 & 2 \leq x < 3 \\ 0.67 & 3 \leq x < 4 \\ 0.92 & 4 \leq x < 5 \\ 0.97 & 5 \leq x < 6 \\ 1 & 6 \leq x \end{cases}.$$

- (a) Find  $P(2 \leq X \leq 5)$   
 $F(5) - F(1) = 0.97 - 0.19 = 0.78.$
- (b) Find  $P(2 < X < 5)$   
 $F(4) - F(2) = 0.92 - 0.39 = 0.53.$
- (c) Find  $P(X > 3)$   
 $1 - F(3) = 1 - 0.67 = 0.33.$

2. You are given that

$$\begin{aligned} E(X) &= \sum xp(x) \\ V(X) &= \sum (x - \mu)^2 p(x) \\ &= \left( \sum x^2 p(x) \right) - \mu^2. \end{aligned}$$

The pmf (probability mass function) of a random variable  $X$  is given by

$x$	1	2	4	8	16
$p(x)$	0.05	0.10	0.35	0.40	0.10

- (a) Compute  $E(X)$  or  $\mu$ . Show how you use the formula.

$$E(x) = 1(0.05) + 2(0.10) + 4(0.35) + 8(0.40) + 16(0.1) = 6.45.$$

(b) Compute  $E(3X + 10)$ . Hint: Use your answer in part (a).

$$E(3X + 10) = 3(6.45) + 10 = 29.35.$$

(c) True or False?  $E(X^3) = \mu^3$ . False in general.

(d) Use one formula of your choice for  $V(X)$  to find  $V(X)$ . Show how you use the formula.

$$V(X) = 1^2(0.05) + 2^2(0.10) + 4^2(0.35) + 8^2(0.40) + 16^2(0.1) - 6.45^2 = 15.6475$$