

STA 4321

Spring 2019

Quiz 7

Full Name: \_\_\_\_\_

On my honor, I have neither given nor received unauthorized aid on this quiz

Signature: \_\_\_\_\_

This is a 10 minute quiz. There are 5 multiple choice problems, each having EXACTLY ONE correct answer. You may *not* use any books, other references, or text-capable electronic devices.

1. If  $X$  and  $Y$  are independent random variables with  $E[X^3] = 10$  and  $E[Y] = 14$ , then

- (a)  $E[X^3Y] = 10$ .
- (b)  $E[X^3Y] = 14$ .
- (c)  $E[X^3Y] = 140$ .
- (d)  $E[X^3Y] = 24$ .

By independence,  $E[X^3Y] = E[X^3]E[Y]$   
 $= 10 \cdot 14 = 140$

2. If  $V(X_1) = 7$ ,  $V(X_2) = 8$ , and  $Cov(X_1, X_2) = 4$ , then

- (a)  $V(X_1 + X_2) = 15$ .
- (b)  $V(X_1 + X_2) = 23$ .
- (c)  $V(X_1 + X_2) = 7$ .
- (d)  $V(X_1 + X_2) = 19$ .

$$V(X_1 + X_2) = V(X_1) + V(X_2) + 2Cov(X_1, X_2)$$
$$= 7 + 8 + 8 = 23$$

3. If  $E[XY] = E[X]E[Y]$ , then

- (a)  $X$  and  $Y$  are statistically independent.
- (b)  $X$  and  $Y$  are discrete random variables.
- (c)  $Cov(X, Y) = 0$ .
- (d)  $X$  and  $Y$  have a Uniform[0, 1] distribution.

$$Cov(X, Y) = E[XY] - E[X]E[Y] = 0$$

4. If  $Cov(X, Y) = 4$ ,  $V(X) = 10$ , and  $V(Y) = 490$ , then

- (a)  $\rho_{X,Y} = \frac{4}{4900}$ .
- (b)  $\rho_{X,Y} = \frac{4}{10}$ .
- (c)  $\rho_{X,Y} = \frac{4}{490}$ .
- (d)  $\rho_{X,Y} = \frac{4}{70}$ .

$$\rho_{X,Y} = \frac{Cov(X, Y)}{\sqrt{V(X)V(Y)}} = \frac{4}{\sqrt{10 \cdot 490}} = \frac{4}{70}$$

5. For any two random variables  $X$  and  $Y$ ,  $E[X] = E[E[X | Y]]$ . This statement is

- (a) True.
- (b) False.

*See lecture notes.*