

Name: _____

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The exam is in three pages

1. Why is it necessary in some problems to use true random numbers? And why is it hard to use them?

2. Suppose that X and Y are random variables such that $Y = aX + b$, a and b are constants. Show that, the correlation

$$Cor(X, Y) = \begin{cases} 1 & \text{if } a > 0 \\ -1 & \text{if } a < 0 \end{cases}$$

3. Suppose that X and Y are jointly continuous random variables with

$$f(x, y) = \begin{cases} 8xy & \text{if } 0 \leq x \leq y, 0 \leq y \leq 1, \\ 0 & \text{if } \textit{otherwise} \end{cases}$$

Compute the covariance, $Cov(X, Y)$

4. Find the random numbers in $(0, 1]$ generated by the Linear Congruential generation method, LCD, where $c = 8, x_0 = 2, c_0 = 3, M = 10$. (note that c is the coefficient of x and c_0 is the const term)

5. Suppose X and Y are two independent random variables such that

$$E(X) = -1, \sigma_X = 2, E(Y) = -7, \sigma_Y = 3$$

Let $W = 5 - 3X + Y$. Compute the following:

(a) $E(W) =$

(b) $\sigma_W =$

(c) $E(X^2) =$

(d) $E(Y^2) =$

(e) $E[XY(X - Y)] =$