

This is a preview of what students will see when they are submitting the assignment. Interactive features are disabled.

Quiz1

Due: Thursday September 17, 2020 7:00 PM (EDT)

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After you have completed the assignment, please save, scan, or take photos of your work and upload your files to the questions below. Crowdmark accepts PDF, JPG, and PNG file formats.

Q1 (6 points)

Let X_1, \dots, X_n be independent and identically distributed random variables with expected value μ and variance σ^2 , and let $\bar{X}_n = \frac{1}{n} \sum_{i=1}^n X_i$. Calculate $Cov(X_4, \bar{X}_n)$. Show your work. Circle your final answer.

Q2 (4 points)

$$\text{Let } \mathbf{v} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \text{ and } \mathbf{A} = \begin{pmatrix} 4 & 0 & -2 \\ 0 & 5 & 1 \\ -2 & 1 & 3 \end{pmatrix}$$

Calculate $\mathbf{v}'\mathbf{A}\mathbf{v}$. The answer is a number. Show some work. Circle your answer.

Quiz One Key

$$\begin{aligned} \textcircled{1} \quad \text{Cov}(X_4, \bar{X}_n) &= \text{Cov}\left(X_4, \frac{1}{n} \sum_{i=1}^n X_i\right) = \frac{1}{n} \text{Cov}\left(X_4, \sum_{i=1}^n X_i\right) \\ &= \frac{1}{n} \sum_{i=1}^n \text{Cov}(X_4, X_i) \\ &= \frac{1}{n} \left(\text{Cov}(X_4, X_4) + \sum_{i \neq 4} \text{Cov}(X_i, X_4) \right) \\ &= \frac{1}{n} \left(\text{Var}(X_4) + \sum_{i \neq 4} 0 \leftarrow \text{by independence} \right) \\ &= \frac{\sigma^2}{n} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad \sigma^T A \sigma &= (1 \ 1 \ 1) \begin{pmatrix} 4 & 0 & -2 \\ 0 & 5 & 1 \\ -2 & 1 & 3 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \\ &= (2 \ 6 \ 2) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = 10 \end{aligned}$$