

Assignment 1

Probability And Random Processes

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I. QUESTION 1.3.5

Verify

$$(\mathbf{A} - \mathbf{H})^\top (\mathbf{B} - \mathbf{C}) = 0$$

II. SOLUTION

Given,

$$\mathbf{A} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} -3 \\ -5 \end{pmatrix}$$

Also, we have a point $\mathbf{H} = \begin{pmatrix} \frac{17}{6} \\ \frac{-5}{6} \end{pmatrix}$

According to the question:

$$\mathbf{A} - \mathbf{H} = \begin{pmatrix} \frac{-11}{6} \\ \frac{-1}{6} \end{pmatrix} \quad (1)$$

$$\mathbf{B} - \mathbf{C} = \begin{pmatrix} -1 \\ 11 \end{pmatrix} \quad (2)$$

To verify answer:

$$(\mathbf{A} - \mathbf{H})^\top (\mathbf{B} - \mathbf{C}) = \begin{pmatrix} \frac{-11}{6} \\ \frac{-1}{6} \end{pmatrix}^\top \begin{pmatrix} -1 \\ 11 \end{pmatrix} \quad (3)$$

$$= \begin{pmatrix} \frac{-11}{6} & \frac{-1}{6} \end{pmatrix} \begin{pmatrix} -1 \\ 11 \end{pmatrix} \quad (4)$$

$$= 0 \quad (5)$$

Hence, verified.