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:

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

$$\mathbf{B}-\mathbf{C}=\begin{pmatrix}-1\\11\end{pmatrix} \tag{2}$$

To verify answer:

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

$$=\begin{pmatrix}\frac{-11}{6} & \frac{-1}{6}\end{pmatrix}\begin{pmatrix}-1\\11\end{pmatrix} \tag{4}$$

$$=0 \tag{5}$$

Hence,verified.