Probability Assignment 2

EE22BTECH11026 - KARTHIKEYA HANU PRAKASH KANITHI

Question : Verify that

$$(\mathbf{A}-\mathbf{H})^{\top}(\mathbf{B}-\mathbf{C})=0 \tag{1}$$

Solution: Given that,

$$\mathbf{A}=\begin{pmatrix}1\\-1\end{pmatrix} \quad \mathbf{B}=\begin{pmatrix}-4\\6\end{pmatrix} \quad \mathbf{C}=\begin{pmatrix}-3\\-5\end{pmatrix} \tag{2}$$

From Problem 1.3.4 We know that, The point $\mathbf{H}$ is

$$\mathbf{H}=\begin{pmatrix}\frac{17}{6}\\\frac{-5}{6}\end{pmatrix} \tag{3}$$

From the values of $\mathbf{A},\mathbf{B},\mathbf{C}$ and $\mathbf{H}$,

$$\mathbf{A}-\mathbf{H}=\begin{pmatrix}1\\-1\end{pmatrix}-\begin{pmatrix}\frac{17}{6}\\\frac{-5}{6}\end{pmatrix} \tag{4}$$

$$=\begin{pmatrix}\frac{-11}{6}\\\frac{-1}{6}\end{pmatrix} \tag{5}$$

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

$$=\begin{pmatrix}-1\\11\end{pmatrix} \tag{7}$$

Evaluating the L.H.S of (1), we get

$$(\mathbf{A}-\mathbf{H})^{\top}(\mathbf{B}-\mathbf{C})=\begin{pmatrix}\frac{-11}{6} & \frac{-1}{6}\end{pmatrix}\begin{pmatrix}-1\\11\end{pmatrix} \tag{8}$$

$$=0 \tag{9}$$

From the fig0, $AH \perp BC$ and Hence proved that

$$(\mathbf{A}-\mathbf{H})^{\top}(\mathbf{B}-\mathbf{C})=0 \tag{10}$$

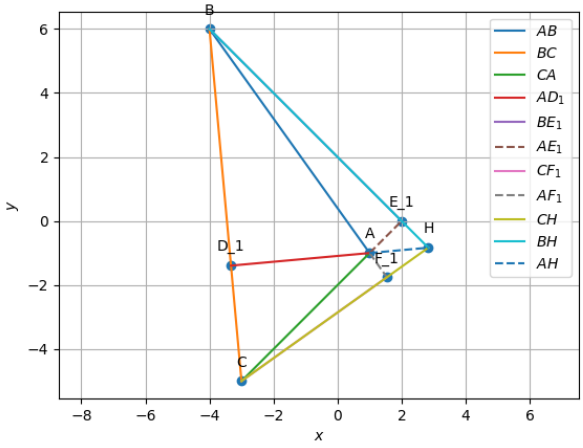

Fig. 0. In triangle ABC, $AH \perp BC$