Assignment-1

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Question 1.1.6.)The area of Δ ABC is defined as

$$\frac{1}{2}\|(\mathbf{A}-\mathbf{B})\times\mathbf{A}-\mathbf{C}\|$$

where

$$\mathbf{A}\times\mathbf{B}=\begin{vmatrix}1 & -4\\ -1 & 6\end{vmatrix}$$

Find the area of Δ ABC.

Ans) Given,

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

Formula for Area of ΔABC $=\frac{1}{2}\|(\mathbf{A}-\mathbf{B})\times(\mathbf{A}-\mathbf{C})\|$

$$\mathbf{A}-\mathbf{B}=\begin{pmatrix}1\\-1\end{pmatrix}-\begin{pmatrix}-4\\6\end{pmatrix}=\begin{pmatrix}5\\-7\end{pmatrix} \tag{2}$$

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

$$\therefore(\mathbf{A}-\mathbf{B})\times(\mathbf{A}-\mathbf{C})=\begin{vmatrix}5 & 4\\ -7 & 4\end{vmatrix} \tag{4}$$

The value of Determinant is

$$\begin{vmatrix}5 & 4\\ -7 & 4\end{vmatrix}=5\times4-4\times(-7)=20+28=48 \tag{5}$$

$$\implies \frac{1}{2}\|(\mathbf{A}-\mathbf{B})\times(\mathbf{A}-\mathbf{C})\|=\frac{48}{2}=24 square.units \tag{6}$$