

Assignment-1

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Question 1.1.6) The area of $\triangle ABC$ 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 $\triangle ABC$.

Ans. Given,

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

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

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

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

$$= 20 + 28 \quad (6)$$

$$= 48 \quad (7)$$

$$\Rightarrow \frac{1}{2} \|(\mathbf{A} - \mathbf{B}) \times (\mathbf{A} - \mathbf{C})\| = \frac{48}{2} = 24 \quad (8)$$