ASSIGNMENT 1

1

Yogitha Reddy-EE22BTECH11059*

1.5.4 Find distance from I to BC.

Solution: Given:

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

We know incentre

$$\mathbf{I} = \frac{1}{\sqrt{37} + 4 + \sqrt{61}} \begin{pmatrix} \sqrt{61} - 16 - 3\sqrt{37} \\ -\sqrt{61} + 24 - 5\sqrt{37} \end{pmatrix}$$
 (2)

Equation of BC:

$$\mathbf{n}^{\mathsf{T}}\mathbf{x} = c \tag{3}$$

$$\begin{pmatrix} 11\\1 \end{pmatrix}^{\mathsf{T}} \mathbf{x} = -38 \tag{4}$$

Distance from I to BC

$$= \frac{\left|\mathbf{n}^{\top}\mathbf{I} - c\right|}{\|\mathbf{n}\|}$$

$$= \frac{\left|\begin{pmatrix} 11\\1 \end{pmatrix}^{\top} \frac{1}{\sqrt{37} + 4 + \sqrt{61}} \begin{pmatrix} \sqrt{61} - 16 - 3\sqrt{37}\\ -\sqrt{61} + 24 - 5\sqrt{37} \end{pmatrix} + 38 \right|}{\left\|\begin{pmatrix} 11\\1 \end{pmatrix}\right\|}$$

$$= \frac{1}{\sqrt{37} + 4 + \sqrt{61}} \frac{\left|\begin{pmatrix} 11\\1 \end{pmatrix} \begin{pmatrix} \sqrt{61} - 16 - 3\sqrt{37}\\ -\sqrt{61} + 24 - 5\sqrt{37} \end{pmatrix} + 38 \right|}{\left\|\begin{pmatrix} 11\\1 \end{pmatrix} \right\|}$$

$$= \frac{1}{(\sqrt{37} + 4 + \sqrt{61})\sqrt{122}} \left|10\sqrt{61} - 114 - 38\sqrt{37} \right|$$

$$= \frac{1}{(\sqrt{37} + 4 + \sqrt{61})\sqrt{122}} \left|10\sqrt{61} - 114 - 38\sqrt{37} \right|$$

$$= \frac{1}{(\sqrt{37} + 4 + \sqrt{61})\sqrt{122}} \left|10\sqrt{61} - 114 - 38\sqrt{37} \right|$$

$$= \frac{1}{(\sqrt{37} + 4 + \sqrt{61})\sqrt{122}} \left|10\sqrt{61} - 114 - 38\sqrt{37} \right|$$

$$= \frac{1}{(\sqrt{37} + 4 + \sqrt{61})\sqrt{122}} \left|10\sqrt{61} - 114 - 38\sqrt{37} \right|$$

$$= \frac{1}{(\sqrt{37} + 4 + \sqrt{61})\sqrt{122}} \left|10\sqrt{61} - 114 - 38\sqrt{37} \right|$$