

Question 1.5.5

Repeat the above exercise for the sides AB and AC .

Solution:

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

$$= \begin{pmatrix} -1.48 \\ -0.79 \end{pmatrix} \quad (2)$$

1) Distance from AB

Equation of line AB is

$$\begin{pmatrix} -7 & -5 \end{pmatrix} \mathbf{x} = -2 \quad (3)$$

Then distance of \mathbf{I} from AB is

$$= \frac{\left| \begin{pmatrix} -7 & -5 \end{pmatrix} \mathbf{I} + 2 \right|}{\left\| \begin{pmatrix} -7 \\ -5 \end{pmatrix} \right\|} \quad (4)$$

$$= \frac{\left| \begin{pmatrix} -7 & -5 \end{pmatrix} \begin{pmatrix} -1.48 \\ -0.79 \end{pmatrix} + 2 \right|}{\sqrt{74}} \quad (5)$$

$$= \frac{16.31}{\sqrt{74}} \quad (6)$$

$$= 1.9 \quad (7)$$

2) Distance from AC

Equation of line AC is

$$\begin{pmatrix} -1 & 1 \end{pmatrix} \mathbf{x} = -2 \quad (8)$$

Then distance of \mathbf{I} from AC is

$$= \frac{\left| \begin{pmatrix} -1 & 1 \end{pmatrix} \mathbf{I} + 2 \right|}{\left\| \begin{pmatrix} -1 \\ 1 \end{pmatrix} \right\|} \quad (9)$$

$$= \frac{\left| \begin{pmatrix} -1 & 1 \end{pmatrix} \begin{pmatrix} -1.48 \\ -0.79 \end{pmatrix} + 2 \right|}{\sqrt{2}} \quad (10)$$

$$= \frac{2.69}{\sqrt{2}} \quad (11)$$

$$= 1.9 \quad (12)$$

We can infer that point \mathbf{I} is at the same distance from AB and AC