

Solution to 1.1.5

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Question: The normal form of equation of AB is

$$\mathbf{n}^T(\mathbf{x} - \mathbf{A}) = 0 \quad (1)$$

where

$$\mathbf{n}^T \mathbf{m} = \mathbf{n}^T (\mathbf{B} - \mathbf{A}) \quad (2)$$

Find the normal form of the equation of AB.

Given:

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

$$\mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} \quad (4)$$

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

Solution: for AB:-

$$\mathbf{m} = \mathbf{B} - \mathbf{A} \quad (6)$$

$$= \begin{pmatrix} -4 - 1 \\ 6 + 1 \end{pmatrix} \quad (7)$$

$$= \begin{pmatrix} -5 \\ 7 \end{pmatrix} \quad (8)$$

we have to find \mathbf{n} ,

$$\mathbf{n} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \mathbf{m} \quad (9)$$

$$= \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} -5 \\ 7 \end{pmatrix} \quad (10)$$

$$= \begin{pmatrix} 7 \\ 5 \end{pmatrix} \quad (11)$$

now the transpose of \mathbf{n} is,

$$\mathbf{n}^T = \begin{pmatrix} 7 & 5 \end{pmatrix} \quad (12)$$

normal form of equation of line AB:

$$\Rightarrow \mathbf{n}^T(\mathbf{x} - \mathbf{A}) = 0 \quad (13)$$

$$\Rightarrow \mathbf{n}^T \mathbf{x} = \mathbf{n}^T \mathbf{A} \quad (14)$$

$$\Rightarrow \mathbf{n}^T \mathbf{x} = \begin{pmatrix} 7 & 5 \end{pmatrix} \begin{pmatrix} 1 \\ -1 \end{pmatrix} \quad (15)$$

$$\Rightarrow \begin{pmatrix} 7 & 5 \end{pmatrix} \mathbf{x} = 2 \quad (16)$$

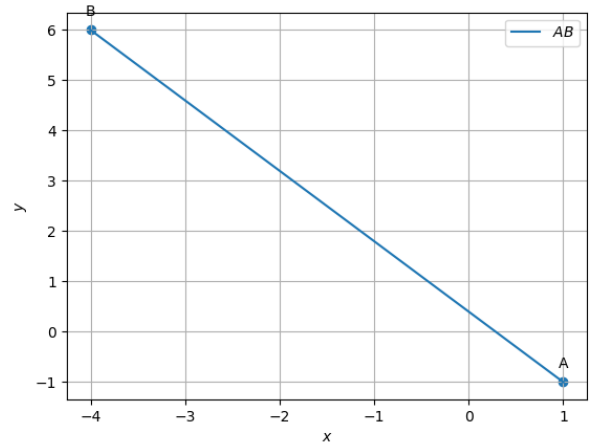


Fig. 0. Line AB