Solution to 1.1.5

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Question:
The normal form of equation of AB is

$$\mathbf{n}^\top(\mathbf{x} - \mathbf{A}) = 0 \tag{1}$$

where

$$\mathbf{n}^\top\mathbf{m} = \mathbf{n}^\top(\mathbf{B} - \mathbf{A}) \tag{2}$$

Find the normal form of the equation of AB.
Given:

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

$$\mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} \tag{4}$$

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

Solution:
for AB:

$$\mathbf{m} = \mathbf{B} - \mathbf{A} \tag{6}$$

$$= \begin{pmatrix} -4 - 1 \\ 6 + 1 \end{pmatrix} \tag{7}$$

$$= \begin{pmatrix} -5 \\ 7 \end{pmatrix} \tag{8}$$

we have to find $\mathbf{n}^\top$ such that,

$$\implies \mathbf{n}^\top\mathbf{m} = 0 \tag{9}$$

$$\implies \mathbf{n}^\top = \begin{pmatrix} 7 & 5 \end{pmatrix} \tag{10}$$

normal form of equation of line AB:

$$\implies \mathbf{n}^\top(\mathbf{x} - \mathbf{A}) = 0 \tag{11}$$

$$\implies \mathbf{n}^\top\mathbf{x} = \mathbf{n}^\top\mathbf{A} \tag{12}$$

$$\implies \begin{pmatrix} 7 & 5 \end{pmatrix}\mathbf{x} = 2 \tag{13}$$