Solution to 1.1.5

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Given:

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

for AB:

$$\mathbf{m} = \mathbf{B} - \mathbf{A} \tag{1}$$
$$= \begin{pmatrix} -4-1 \\ 6+1 \end{pmatrix} \tag{2}$$
$$= \begin{pmatrix} -5 \\ 7 \end{pmatrix} \tag{3}$$

parametric form of equation of line AB:

$$\mathbf{x} = \mathbf{A} + \mathbf{m}k \tag{4}$$
$$= \begin{pmatrix} 1 \\ -1 \end{pmatrix} + \begin{pmatrix} -5 \\ 7 \end{pmatrix} k \tag{5}$$

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

$$\implies n^\top m = 0 \tag{6}$$
$$\implies n^\top = \begin{pmatrix} 7 & 5 \end{pmatrix} \tag{7}$$

normal form of equation of line AB:

$$\implies n^\top(\mathbf{x} - \mathbf{A}) = 0 \tag{8}$$
$$\implies n^\top \mathbf{x} = n^\top \mathbf{A} \tag{9}$$
$$\implies \begin{pmatrix} 7 & 5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = 2 \tag{10}$$
$$\implies 7x + 5y = 2 \tag{11}$$