QUESTION 2

EE22BTECH11059

1.3.1 D_1 is a point on BC such that $AD_1 \perp BC$ and AD_1 is defined to be the altitude. Find the normal vector of AD_1.

Solution: Given:

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

$$\mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} \tag{2}$$

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

$$\tag{4}$$

Direction vector $\mathbf{m}_{BC}$

$$= \mathbf{C} - \mathbf{B} \tag{5}$$

$$= \begin{pmatrix} -3 \\ -5 \end{pmatrix} - \begin{pmatrix} -4 \\ 6 \end{pmatrix} \tag{6}$$

$$= \begin{pmatrix} 1 \\ -11 \end{pmatrix} \tag{7}$$

Direction vector $(\mathbf{n}_{AD_1})$:

$$\mathbf{n} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} m \tag{8}$$

$$\mathbf{n}_{AD_1} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ -11 \end{pmatrix} \tag{9}$$

$$= \begin{pmatrix} -11 \\ -1 \end{pmatrix} \tag{10}$$

Normal vector of $\mathbf{n}_{AD_1}$:

$$\mathbf{n}_{AD_1 \perp} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} -11 \\ -1 \end{pmatrix} \tag{11}$$

$$= \begin{pmatrix} -1 \\ 11 \end{pmatrix} \tag{12}$$