

# 2.4.18

EE25BTECH11022 - sankeertthan

**Question:** show that the line through the points  $(1, -1, 2)$ ,  $(3, 4, -2)$  is perpendicular to the line through the points  $(0, 3, 2)$  and  $(3, 5, 6)$

**solution:**

$$\text{let } \mathbf{A} = (1, -1, 2), \mathbf{B} = (3, 4, -2), \mathbf{C} = (0, 3, 2), \mathbf{D} = (3, 5, 6) \quad (1)$$

Direction vector of line joining points  $\mathbf{A}$  and  $\mathbf{B}$  is

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 3 - 1 \\ 4 - (-1) \\ -2 - 2 \end{pmatrix} \quad (2)$$

$$= \begin{pmatrix} 2 \\ 5 \\ -4 \end{pmatrix} \quad (3)$$

(4)

Direction vector of line joining points  $\mathbf{C}$  and  $\mathbf{D}$  is

$$\mathbf{C} - \mathbf{D} = \begin{pmatrix} 3 - 0 \\ 5 - 3 \\ 6 - 2 \end{pmatrix} \quad (5)$$

$$= \begin{pmatrix} 3 \\ 2 \\ 4 \end{pmatrix} \quad (6)$$

(7)

$$(\mathbf{B} - \mathbf{A})^T (\mathbf{D} - \mathbf{C}) = \begin{pmatrix} 2 & 5 & -4 \end{pmatrix} \begin{pmatrix} 3 \\ 2 \\ 4 \end{pmatrix} \quad (8)$$

$$= 2(3) + 5(2) + (-4)(4) \quad (9)$$

$$= 6 + 10 - 16 \quad (10)$$

$$= 0 \quad (11)$$

$$(\mathbf{B} - \mathbf{A})^T (\mathbf{D} - \mathbf{C}) = 0 \quad (12)$$

Therefore, the lines joining points  $\mathbf{A}, \mathbf{B}$  and  $\mathbf{C}, \mathbf{D}$  are perpendicular

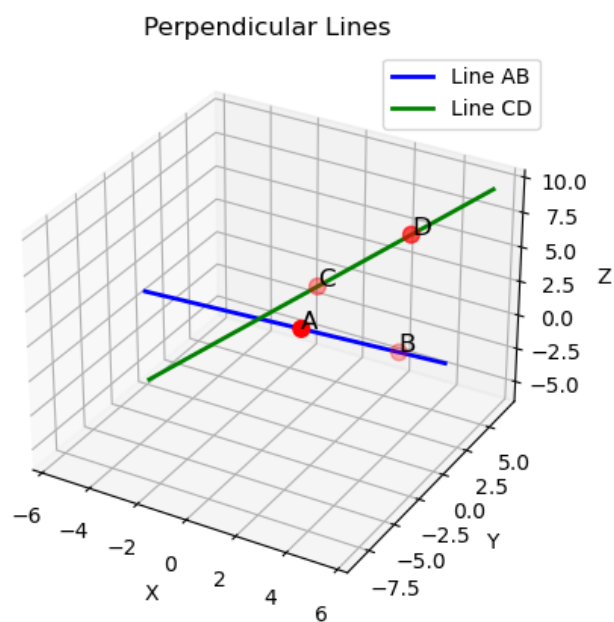


Fig. 0