

# Equation of Perpendicular

## 1 12<sup>th</sup> Maths - Chapter 11

This is Problem-2 from Exercise 11.2

1. 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).

2. Solution :

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

$$\mathbf{AB} = (\mathbf{A} - \mathbf{B}) = \left( \begin{pmatrix} 1 \\ -1 \\ 2 \end{pmatrix} - \begin{pmatrix} 3 \\ 4 \\ -2 \end{pmatrix} \right) = \begin{pmatrix} 2 \\ 5 \\ -4 \end{pmatrix} \quad (2)$$

$$\mathbf{CD} = (\mathbf{C} - \mathbf{D}) = \left( \begin{pmatrix} 0 \\ 3 \\ 2 \end{pmatrix} - \begin{pmatrix} 3 \\ 5 \\ 6 \end{pmatrix} \right) = \begin{pmatrix} 3 \\ 2 \\ 4 \end{pmatrix} \quad (3)$$

If two vectors are perpendicular

$$\mathbf{AB}^\top \mathbf{CD} = \mathbf{0} \quad (4)$$

$$\begin{pmatrix} 2 & 5 & -4 \end{pmatrix} \begin{pmatrix} 3 \\ 2 \\ 4 \end{pmatrix} = \mathbf{0} \quad (5)$$

$$\implies 6 + 10 - 16 = 0 \quad (6)$$

We know that  $\mathbf{AB}$  and  $\mathbf{CD}$  ,  $\mathbf{AB} \perp \mathbf{CD}$