

CLASS-12
CHAPTER-11
THREE DIMENSIONAL GEOMETRY

Exercise 11.4

Q1. Show that the line joining the origin to the point $(2, 1, 1)$ is perpendicular to the line determined by the points $(3, 5, -1), (4, 3, -1)$.

Solution:

Given:

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

From the given points \mathbf{A} and \mathbf{B} , the directional vector is given by:

$$\mathbf{m} = \mathbf{A} - \mathbf{B} = \begin{pmatrix} -1 \\ 2 \\ 0 \end{pmatrix} \quad (2)$$

1. check whether two vectors are perpendicular to each other or not using:

$$\mathbf{m}^\top \mathbf{P} = 0 \quad (3)$$

$$(-1 \ 2 \ 0) \begin{pmatrix} 2 \\ 1 \\ 1 \end{pmatrix} = 0 \quad (4)$$

2. check whether two vectors are perpendicular to each other or not using:

$$\mathbf{P}^\top \mathbf{m} = 0 \quad (5)$$

$$(2 \ 1 \ 1) \begin{pmatrix} -1 \\ 2 \\ 0 \end{pmatrix} = 0 \quad (6)$$

Hence, it satisfies both the above conditions, shows that line passing through origin is perpendicular to the line passing through points \mathbf{A} and \mathbf{B} .