

Equation of Unit Vector

1 12th Maths - Chapter 11

This is Problem-2 from Exercise 3.2

1. Find the vector equation of a plane which is at a distance of 7 units from the origin and normal to the vector $3\hat{i} + 5\hat{j} - 6\hat{k}$

2 Solution

Normal vector to the plane is

$$\mathbf{n} = \begin{pmatrix} 3 \\ 5 \\ -6 \end{pmatrix} \quad (1)$$

$$d = \frac{|\mathbf{n}^\top \mathbf{n} - \mathbf{c}|}{\|\mathbf{n}\|} \quad (2)$$

$$\Rightarrow 7 = \frac{|\mathbf{c}|}{\|\mathbf{n}\|} \quad (3)$$

$$\|\mathbf{n}\| = \sqrt{(3 \ 5 \ -6) \begin{pmatrix} 3 \\ 5 \\ -6 \end{pmatrix}} \quad (4)$$

$$= \sqrt{70} \quad (5)$$

$$\Rightarrow |\mathbf{c}| = 7\sqrt{70} \quad (6)$$

$$(7)$$

vector equation of plane is

$$\Rightarrow \mathbf{c} = \pm 7\sqrt{70} \quad (8)$$