1.10.24

EE25BTECH11058 - Tangellapalli Mohana Krishna Sushma

Question: Find the direction cosines of the unit vector perpendicular to the plane

$$\vec{r} \cdot (6\hat{\imath} - 3\hat{\jmath} - 2\hat{k}) + 1 = 0$$

passing through the origin.

Solution:

Given:

Plane equation,

$$\vec{r} \cdot (6\hat{\imath} - 3\hat{\jmath} - 2\hat{k}) + 1 = 0 \tag{1}$$

Let the unit vector perpendicular to the plane passing through the origin be $\vec{u}$.
From above,
The plane's normal vector,

$$\vec{n} = \begin{pmatrix} 6 \\ -3 \\ -2 \end{pmatrix} \tag{2}$$

Norm of the vector $\vec{n}$,

$$\vec{u} = \frac{1}{\|\vec{n}\|}\vec{n} = \frac{1}{7}\begin{pmatrix} 6 \\ -3 \\ -2 \end{pmatrix} = \begin{pmatrix} \frac{6}{7} \\ -\frac{3}{7} \\ -\frac{2}{7} \end{pmatrix} \tag{3}$$

The direction cosines of the unit vector perpendicular to the plane are

$$\left(\frac{6}{7}, -\frac{3}{7}, -\frac{2}{7}\right)$$

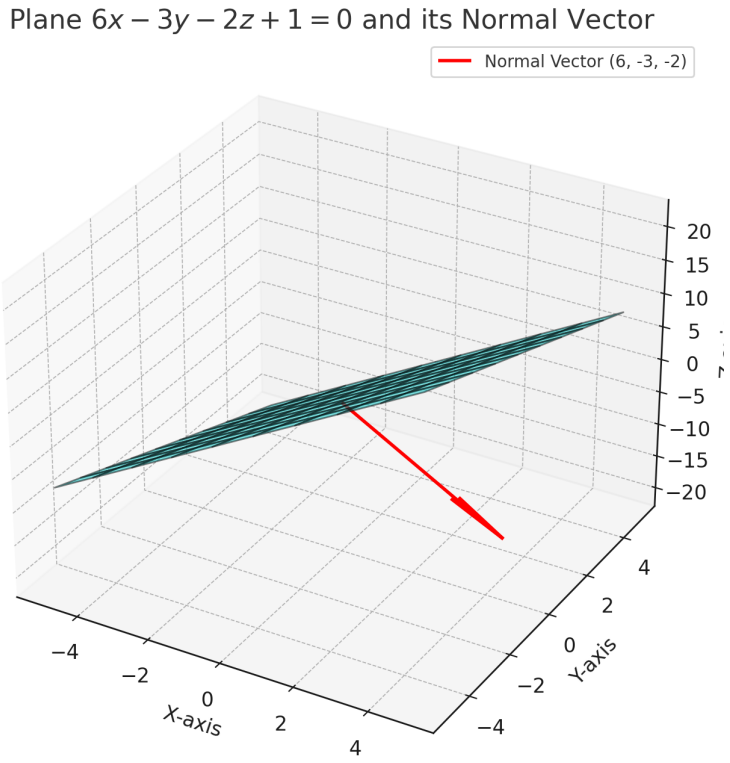

Fig. 0: Plane with Perpendicular Normal Vector