4.7.53

ee25btech11056 - Suraj.N

Question : If $\mathbf{O}$ is the origin and $\mathbf{P} = \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}$, then find the equation of the plane passing through $\mathbf{P}$ and perpendicular to OP.

Solution :

Description	Value
Normal vector	$\mathbf{n} = \mathbf{P} - \mathbf{O} = \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}$
Point on plane	$\mathbf{h} = \mathbf{P} = \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}$

Table : Plane

The normal vector to the plane is

$$\mathbf{n} = \mathbf{P} - \mathbf{O} = \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix} \tag{1}$$

The plane equation is written in the form

$$\mathbf{n}^\top \mathbf{x} = \mathbf{n}^\top \mathbf{h} \tag{2}$$

where $\mathbf{h}$ is a point on the plane. Here $\mathbf{h} = \mathbf{P}$

$$\mathbf{n}^\top \mathbf{x} = \begin{pmatrix} 1 & 2 & -3 \end{pmatrix} \mathbf{P} \tag{3}$$

$$\mathbf{n}^\top \mathbf{x} = \begin{pmatrix} 1 & 2 & -3 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix} \tag{4}$$

Hence, the equation of the plane is

$$\mathbf{n}^\top \mathbf{x} = 14 \tag{5}$$

$$\begin{pmatrix} 1 & 2 & -3 \end{pmatrix} \mathbf{x} = 14 \tag{6}$$

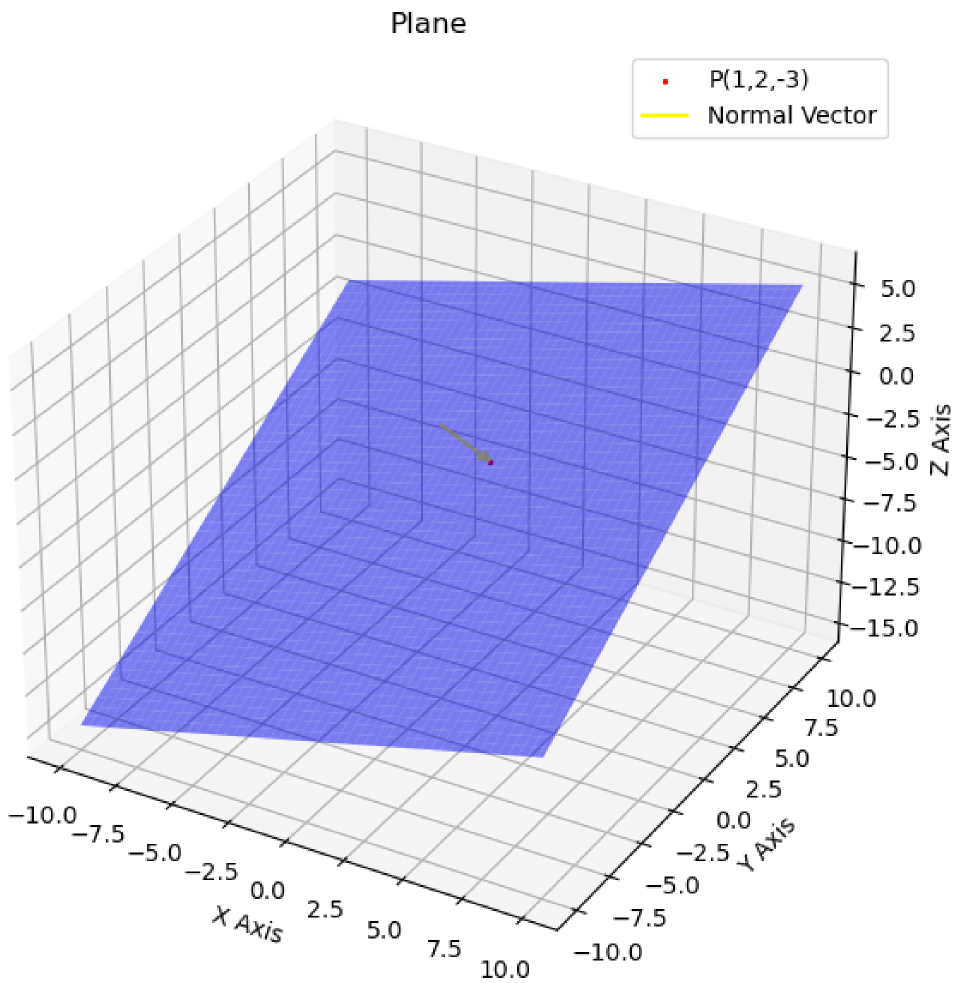
Plane
P(1,2,-3)
Normal Vector
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
−12.5
−15.0
Z Axis
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
Y Axis
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
X Axis

Fig : Plane