

# 4.7.61

EE25BTECH11064 - Yojit Manral

## Question:

Find the coordinates of the foot of the perpendicular drawn from the origin to the plane  $2x - 3y + 4z - 6 = 0$

## Solution:

→ From the equation of a general plane,

$$\mathbf{n}^T \mathbf{x} = c \quad (1)$$

→ A vector perpendicular to the plane and passing through the origin can be given as

$$\mathbf{y} = \alpha \mathbf{n} \quad (2)$$

→ The foot of perpendicular must be the intersection of (1) and (2)...

$$\mathbf{n}^T (\alpha \mathbf{n}) = c \quad (3)$$

$$\alpha \mathbf{n}^T \mathbf{n} = c \quad (4)$$

$$\alpha = \frac{c}{\|\mathbf{n}\|^2} \quad (5)$$

→ Now we can find the foot of perpendicular as

$$\mathbf{x}_\perp = \alpha \mathbf{n} = \frac{c}{\|\mathbf{n}\|^2} \mathbf{n} \quad (6)$$

→ Given that

$$\mathbf{n} = \begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix} \Rightarrow \|\mathbf{n}\|^2 = 29 \quad \text{and} \quad c = 6 \quad (7)$$

$$\Rightarrow \mathbf{x}_\perp = \frac{6}{29} \begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix} = \begin{pmatrix} 12/29 \\ -18/29 \\ 24/29 \end{pmatrix} \quad (8)$$

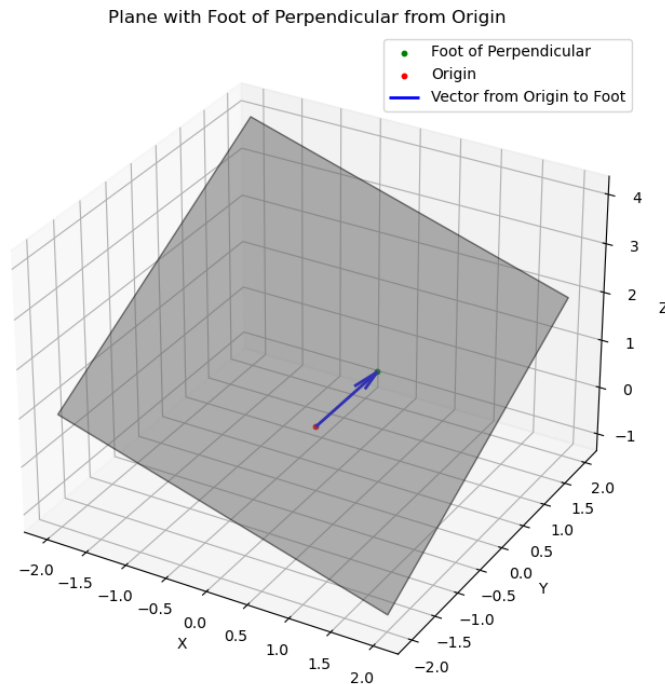


Fig. 0: Foot of perpendicular of plane from origin