# EE25btech11028 - J.Navya sri

#### **Question:**

Find the distance of the plane 2x - 3y + 4z - 6 = 0 from the origin.

#### **Solution:**

We want to find the distance of the plane

$$2x - 3y + 4z - 6 = 0 (1)$$

from the origin using the vector approach

### **Step 1: Identify the normal vector.**

The general equation of a plane is

$$\mathbf{n} \cdot \mathbf{r} = D \quad (2) \tag{2}$$

where

$$\mathbf{n} = \begin{pmatrix} A \\ B \\ C \end{pmatrix} \tag{3}$$

is the normal vector of the plane and D is a constant.

From the given plane (2x - 3y + 4z = 6), we have

$$\mathbf{n} = \begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix}, \quad D = 6. \quad (4) \tag{4}$$

## Step 2: Distance formula.

The distance of a point  $\mathbf{r}_0$  from the plane is given by

Distance = 
$$\frac{|\mathbf{n} \cdot \mathbf{r}_0 - D|}{\|\mathbf{n}\|}$$
 (5).

For the origin,  $\mathbf{r}_0 = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$ , so

Distance = 
$$\frac{|\mathbf{n} \cdot \mathbf{r}_0 - 6|}{\sqrt{2^2 + (-3)^2 + 4^2}}$$
= 
$$\frac{|(2)(0) + (-3)(0) + (4)(0) - 6|}{\sqrt{4 + 9 + 16}}$$
= 
$$\frac{|-6|}{\sqrt{29}} = \frac{6}{\sqrt{29}} \quad (6).$$

1

Answer:



# **Graph presentation:**

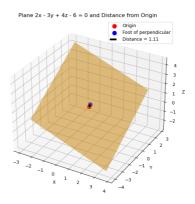


Fig. 1