# 4.7.44

EE25BTECH11047 - RAVULA SHASHANK REDDY

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**Question:**

Find the distance of the plane from the origin.

$$\mathbf{r}^T \begin{pmatrix} \frac{2}{7} \\ \frac{3}{7} \\ -\frac{6}{7} \end{pmatrix} = 1$$

**Solution:**

Equation of plane

$$\mathbf{n}^T\mathbf{x} = 1, \tag{1}$$

$$\mathbf{n} = \begin{pmatrix} \frac{2}{7} \\ \frac{3}{7} \\ -\frac{6}{7} \end{pmatrix}. \tag{2}$$

$$d = \frac{|\mathbf{n}^T\mathbf{x}_0 - 1|}{\|\mathbf{n}\|}. \tag{3}$$

$$d = \frac{|\mathbf{n}^T\mathbf{0} - 1|}{\|\mathbf{n}\|} \tag{4}$$

$$= \frac{|0 - 1|}{\|\mathbf{n}\|} \tag{5}$$

$$= \frac{1}{\|\mathbf{n}\|}. \tag{6}$$

$$\|\mathbf{n}\| = \sqrt{\mathbf{n}^T\mathbf{n}} \tag{7}$$

$$= \sqrt{\left(\frac{2}{7}\right)^2 + \left(\frac{3}{7}\right)^2 + \left(-\frac{6}{7}\right)^2} \tag{8}$$

$$= \sqrt{\frac{49}{49}} \tag{9}$$

$$= 1. \tag{10}$$

Therefore, the required distance is

$$d = \frac{1}{1} = \boxed{1}. \tag{11}$$

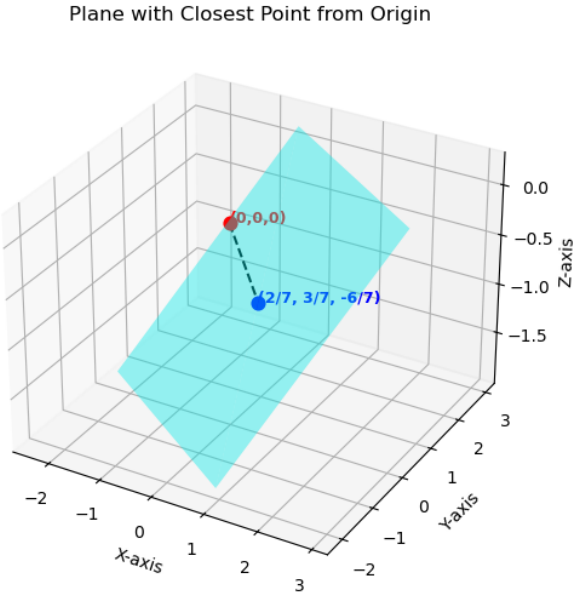
Plane with Closest Point from Origin
(0,0,0)
(2/7, 3/7, -6/7)
X-axis
Y-axis
Z-axis
−2
−1
0
1
2
3
0.0
−0.5
−1.0
−1.5

Figure 1