4.12.28

AI25BTECH11023 - Pratik R

Question

The value of the λ, if the lines $(2x + 3y + 4) + \lambda(6x - y + 12) = 0$ are

1. parallel to Y axis is	a) $\lambda = -\frac{3}{4}$
2. perpendicular to $7x + y - 4 = 0$ is	b) $\lambda = -\frac{1}{3}$
3. passes through (1, 2) is	c) $\lambda = -\frac{17}{41}$
4. parallel to X axis is	d) $\lambda = 3$

TABLE 0: 1

Solution:

Equation of line is given by

$$\begin{pmatrix} 2 + 6\lambda & 3 - \lambda \end{pmatrix} x = -4 - 12\lambda \tag{0.1}$$

$$\implies n^\top x = c; \tag{0.2}$$

where $n^\top = \begin{pmatrix} 2 + 6\lambda & 3 - \lambda \end{pmatrix}$
and $c = -4 - 12\lambda$.

1) If the line is parallel to Y axis

$$n^\top e_2 = 0 \tag{1.1}$$

$$3 - \lambda = 0 \tag{1.2}$$

$$\lambda = 3 \tag{1.3}$$

2) If the line is perpendicular to $7x + y - 4 = 0$, that is, $n_1^\top = \begin{pmatrix} 7 & 1 \end{pmatrix}$

$$n_1^\top n = 0 \tag{2.1}$$

$$41\lambda = -17 \tag{2.2}$$

$$\lambda = \frac{-17}{41} \tag{2.3}$$

3) If the line passes through $P(1, 2)$

$$n^\top P = c \tag{3.1}$$

$$16\lambda = -12 \tag{3.2}$$

$$\lambda = \frac{-3}{4} \tag{3.3}$$

4) If the line is parallel to X axis

$$n^\top e_1 = 0 \tag{4.1}$$

$$2 + 6\lambda = 0 \tag{4.2}$$

$$\lambda = \frac{-1}{3} \tag{4.3}$$

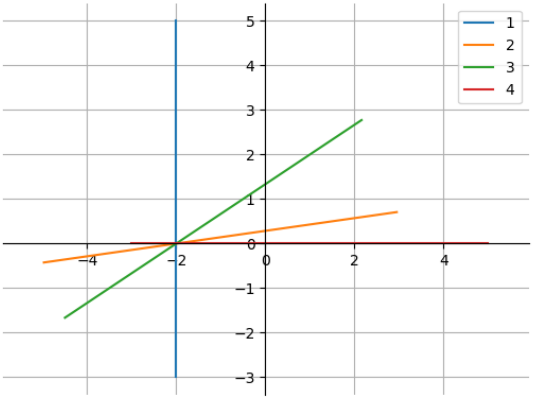

Fig. 4.1: plane