4.8.23

AI25BTECH11027 - NAGA BHUVANA

October 7, 2025

Question:

Find the values of λ,for which the distance of point $(2, 1, \lambda)$ from plane $3x + 5y + 4z = 11$ is $2\sqrt{2}$ units.

Solution:

The normal vector of the plane is $\begin{pmatrix} 3 \\ 5 \\ 4 \end{pmatrix}$ and $\mathbf{P} = \begin{pmatrix} 2 \\ 1 \\ \lambda \end{pmatrix}$

The equation of the plane be $\mathbf{n}^T\mathbf{x} = c$

$$distance = \frac{|\mathbf{n}^T\mathbf{p} - 11|}{\|\mathbf{n}\|} \tag{0.1}$$

$$2\sqrt{2} = \frac{|\begin{pmatrix} 3 & 5 & 4 \end{pmatrix}\begin{pmatrix} 2 \\ 1 \\ \lambda \end{pmatrix} - 11|}{5\sqrt{2}} \tag{0.2}$$

$$\frac{|4\lambda|}{5\sqrt{2}} = 2\sqrt{2} \tag{0.3}$$

$$|4\lambda| = 20 \tag{0.4}$$

$$4\lambda = 20 \quad \text{or} \quad 4\lambda = -20 \tag{0.5}$$

$$\lambda = 5 \quad \text{or} \quad \lambda = -5 \tag{0.6}$$

$\therefore$The values of $\lambda = 5$ or -5