

4.7.39

EE25BTECH11042 - Nipun Dasari

Question:

The distance of the point P(2, 3) from the x-axis is?

Solution:

Let the position vector of the point P(2, 3) be represented as \mathbf{p} :

$$\mathbf{p} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad (0.1)$$

Consider the general line equation where

$$\mathbf{n}^T \mathbf{x} = c \quad (0.2)$$

Using the fact that all y-coordinates of x axis are zero

$$\mathbf{n} = \begin{pmatrix} 0 \\ 1 \end{pmatrix} \text{ and } c = 0 \quad (0.3)$$

The distance between a \mathbf{p} to its foot of perpendicular to a line is:

$$\text{Distance} = \frac{|\mathbf{n}^T \mathbf{p} - c|}{\|\mathbf{n}\|} \quad (0.4)$$

By (0.4) and (0.3):

$$\text{Distance} = \frac{|(0 \ 1) \begin{pmatrix} 2 \\ 3 \end{pmatrix} - 0|}{1} \quad (0.5)$$

$$= 2 \times 0 + 3 \times 1 = 3 \quad (0.6)$$

Therefore, the distance of point P from the x-axis is 3 units.

