1.9.32

EE25BTECH11044 - Sai Hasini Pappula

Question:

If the distance between the points $(3, -5)$ and $(x, -5)$ is 15 units, then find the values of x using matrices.

Solution:

Let

$$\mathbf{A} = \begin{bmatrix} 3 \\ -5 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} x \\ -5 \end{bmatrix}.$$

The distance between two points is given by

$$d = \|\mathbf{B} - \mathbf{A}\|.$$

So,

$$d^2 = (\mathbf{B} - \mathbf{A})^T (\mathbf{B} - \mathbf{A}).$$

Substituting,

$$d^2 = \begin{bmatrix} x-3 \\ 0 \end{bmatrix}^T \begin{bmatrix} x-3 \\ 0 \end{bmatrix} = (x-3)^2.$$

Given $d = 15$, we have

$$(x-3)^2 = 225.$$

Taking square roots,

$$x - 3 = \pm 15.$$

Hence,

$$x = 18 \quad \text{or} \quad x = -12.$$