

Question

The equation of the line through $(2, -4)$ and parallel to the X axis is _____.

Solution

Given: $\mathbf{p} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

Step 1: Direction and Normal Vectors

The normal vector \mathbf{n}

$$\mathbf{n} = \begin{pmatrix} m \\ -1 \end{pmatrix} \quad (1)$$

$$\mathbf{n} = \begin{pmatrix} 0 \\ -1 \end{pmatrix} \quad (2)$$

Step 2: Dot Product Formulation

Using the dot product form of a line:

$$\mathbf{n}^T (\mathbf{X} - \mathbf{p}) = 0 \quad (3)$$

Substitute:

$$\begin{pmatrix} 0 & -1 \end{pmatrix} \left(\mathbf{X} - \begin{pmatrix} 2 \\ -4 \end{pmatrix} \right) = 0 \quad (4)$$

$$\Rightarrow \begin{pmatrix} 0 & -1 \end{pmatrix} \mathbf{X} - \begin{pmatrix} 0 & -1 \end{pmatrix} \begin{pmatrix} 2 \\ -4 \end{pmatrix} = 0 \quad (5)$$

$$\Rightarrow \begin{pmatrix} 0 & -1 \end{pmatrix} \mathbf{X} = -4 \quad (6)$$

Final Answer

$$\boxed{\begin{pmatrix} 0 & -1 \end{pmatrix} \mathbf{X} = -4} \quad (7)$$

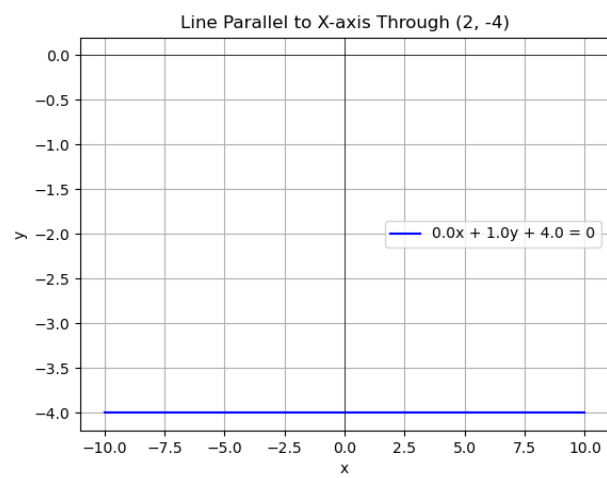


Figure 1