

## 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:

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

$$\Rightarrow \begin{pmatrix} 0 & -1 \end{pmatrix} \begin{pmatrix} x - 2 \\ y + 4 \end{pmatrix} = 0 \quad (5)$$

$$\Rightarrow x - 2 = 0 \quad (6)$$

### Final Answer

$$\boxed{x = 2} \quad (7)$$

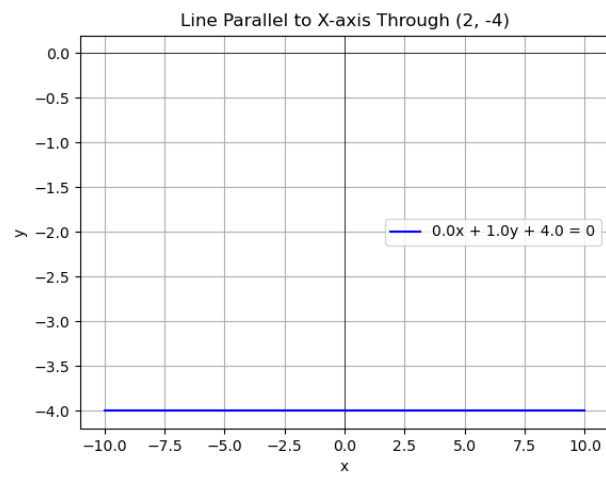


Figure 1