4.4.25

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Question

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

Solution

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

The normal vector $\mathbf{n}$

$$\mathbf{n} = \begin{pmatrix} m \\ -1 \end{pmatrix} \tag{1}$$

$$\mathbf{n} = \begin{pmatrix} 0 \\ -1 \end{pmatrix} \tag{2}$$

Solution

Using the dot product form of a line:

$$\mathbf{n}^T(\mathbf{x}-\mathbf{p})=0 \tag{3}$$

Substitute:

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

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

$$\Rightarrow x-2=0 \tag{6}$$

$$\boxed{x=2} \tag{7}$$

Plot

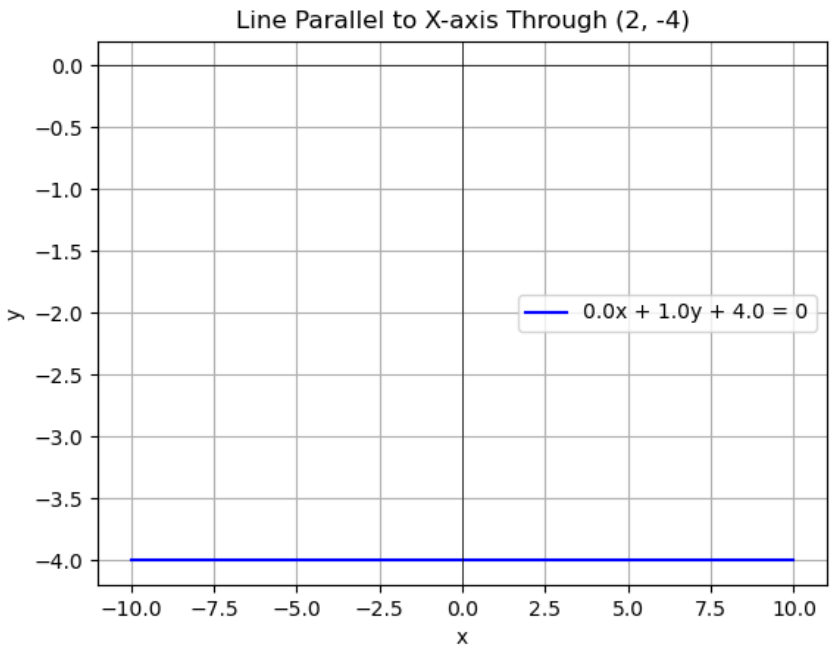
Line Parallel to X-axis Through (2, -4)
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
y
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
x
0.0x + 1.0y + 4.0 = 0

Figure: