4-4.2-2

AI24BTECH11003 - Vijaya Sreyas

Question:
Find the direction and normal vectors of the following line: $x - \frac{y}{5} - 10 = 10$

Solution:

Information	Symbolic Form	Value
Given Line	$\mathbf{X} = \mathbf{h} + k\mathbf{m}$	$x - \frac{y}{5} - 10 = 10$
Direction Vector	$\mathbf{m}$	$\begin{pmatrix}1\\5\end{pmatrix}$
Normal Vector	$\mathbf{n}$	$\begin{pmatrix}-5\\1\end{pmatrix}$

TABLE 0: Final Information

The equation of the given line is:

$$10 = x - \frac{y}{5} - 10 \tag{0.1}$$

$$y = 5x + 100 \tag{0.2}$$

$$\implies \begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}x\\5x+100\end{pmatrix} = \begin{pmatrix}0\\100\end{pmatrix} + x\begin{pmatrix}1\\5\end{pmatrix} \tag{0.3}$$

$$\mathbf{X} = \mathbf{h} + k\mathbf{m} \tag{0.4}$$

Thereby yielding the direction vector:

$$\mathbf{m} = \begin{pmatrix}1\\5\end{pmatrix} \tag{0.5}$$

From (**??**) and (**??**), we get:

$$\mathbf{n} = \begin{pmatrix}-5\\1\end{pmatrix} \tag{0.6}$$

Therefore, the direction vector of the line can be given by $\mathbf{m} = \begin{pmatrix}1\\5\end{pmatrix}$ and the normal vector by $\mathbf{n} = \begin{pmatrix}-5\\1\end{pmatrix}$.

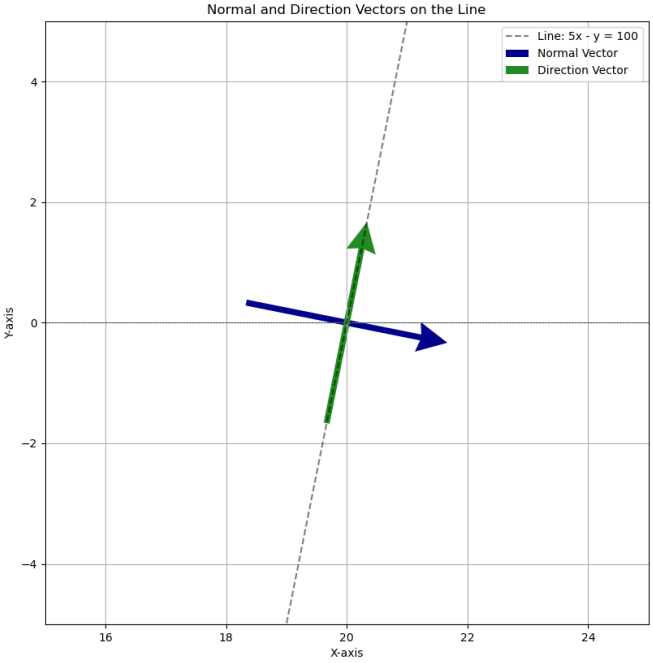

Fig. 0.1: Line and Vectors