4-4.2-12

EE24BTECH11005 - Arjun Pavanje

Question:
Find the direction and normal vectors of the given line $3 = 2x + y$

Variable	Description
$\mathbf{m}$	Direction vector
$\mathbf{n}$	Normal vector
$\mathbf{h}$	$\begin{pmatrix}0\\c\end{pmatrix}$

TABLE I: Variables Used

Solution: The equation of the line is given by,

$$y = mx + c \tag{1}$$

$$\mathbf{x} = \begin{pmatrix}0\\c\end{pmatrix} + x\begin{pmatrix}1\\m\end{pmatrix} \tag{2}$$

$$\mathbf{x} = \mathbf{h} + k\mathbf{m} \tag{3}$$

here, $\mathbf{m} = \begin{pmatrix}1\\m\end{pmatrix}$ where $\mathbf{m}$ is direction vector
given line can be written as

$$\mathbf{x} = \begin{pmatrix}0\\3\end{pmatrix} + k\begin{pmatrix}3\\-2\end{pmatrix} \tag{4}$$

$$\mathbf{m} = \begin{pmatrix}1\\-2\end{pmatrix} \tag{5}$$

equation of line in terms of normal vector $\mathbf{n}$ is,

$$\mathbf{n}^T\mathbf{x} = c \tag{6}$$

$$\mathbf{n} = \begin{pmatrix}-m\\1\end{pmatrix} \tag{7}$$

$$\text{Here, } \mathbf{n} = \begin{pmatrix}2\\1\end{pmatrix} \tag{8}$$

Direction vector: $\mathbf{m} = \begin{pmatrix}1\\-2\end{pmatrix}$

Normal Vector: $\mathbf{n} = \begin{pmatrix}2\\1\end{pmatrix}$

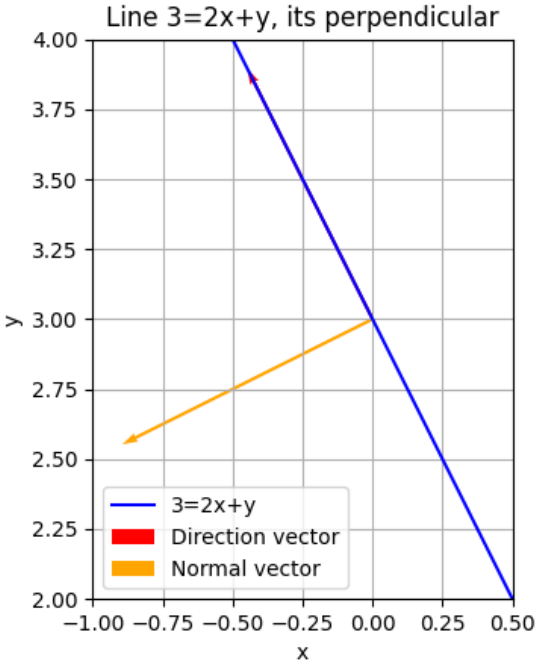

Fig. 1: Plot of the line