

# Question-3-3.2-22

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## Question:

Find the direction and normal vectors of the following line:

$$x+2y=6$$

## Solution:

Vector	Value
Directional vector	$\begin{pmatrix} 1 \\ m \end{pmatrix}$
Normal vector	$\begin{pmatrix} -m \\ 1 \end{pmatrix}$

TABLE 0: variables used

$$y = mx + c \quad (0.1)$$

$$x = 0 \Rightarrow y = c \quad (0.2)$$

$$x = 1 \Rightarrow y = mx + c \quad (0.3)$$

$$x = h + m \quad (0.4)$$

$$m^\top n = 0 \quad (0.5)$$

$$n^\top x = n^\top h + \kappa n^\top m \quad (0.6)$$

$$\Rightarrow n(x - h) = 0 \quad (0.7)$$

$$n^\top x = c \quad (0.8)$$

$$c = n^\top h \quad (0.9)$$

$$\text{where } n = \begin{pmatrix} -m \\ 1 \end{pmatrix} \quad (0.10)$$

For the line  $2y + x = 6$ :

$$m = -\frac{1}{2} \quad (0.11)$$

$$\text{Direction vector } m = \begin{pmatrix} 1 \\ m \end{pmatrix} = \begin{pmatrix} 1 \\ -\frac{1}{2} \end{pmatrix} \quad (0.12)$$

$$\Rightarrow \begin{pmatrix} -2 \\ 1 \end{pmatrix} \quad (0.13)$$

The normal vector is defined by:

$$n = \begin{pmatrix} -m \\ 1 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} \\ 1 \end{pmatrix} \quad (0.14)$$

$$\Rightarrow \begin{pmatrix} 1 \\ 2 \end{pmatrix} \quad (0.15)$$

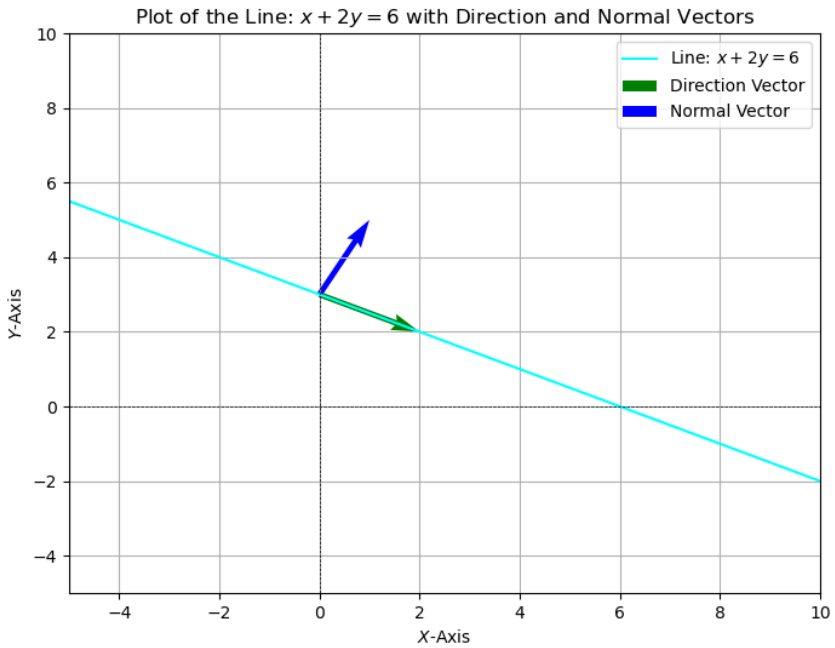


Fig. 0.1: Line  $Line x + 2y = 6$