

# 4.2.18

EE25BTECH11015 - Bhoomika V

Question :-

Find the direction and normal vectors of each of the following line  $y = x - 2$

**Solution:**

$$y = x - 2 \quad (4.2.18.1)$$

$$\Rightarrow \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x \\ x - 2 \end{pmatrix} = \begin{pmatrix} 0 \\ -2 \end{pmatrix} + x \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (4.2.18.2)$$

yielding

$$\mathbf{x} = \mathbf{h} + \kappa \mathbf{m} \quad (4.2.18.3)$$

where  $\mathbf{h}$  is any point on the line and

$$\mathbf{m} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (4.2.18.4)$$

is the direction vector.

—  
*4.1.2 For normal vector*

$$\mathbf{m}^T \mathbf{n} = 0 \quad (4.2.18.5)$$

$$\mathbf{n}^T \mathbf{x} = \mathbf{n}^T \mathbf{h} + \kappa \mathbf{n}^T \mathbf{m} \quad (4.2.18.6)$$

$$\Rightarrow \mathbf{n}^T (\mathbf{x} - \mathbf{h}) = 0 \quad \text{or} \quad \mathbf{n}^T \mathbf{x} = c \quad (4.2.18.7)$$

for

$$c = \mathbf{n}^T \mathbf{h} \quad (4.2.18.8)$$

where

$$\mathbf{n} = \begin{pmatrix} -m \\ 1 \end{pmatrix} \quad (4.2.18.9)$$

$$\begin{pmatrix} -1 \\ 1 \end{pmatrix}$$

is defined to be the *normal vector* of the line.

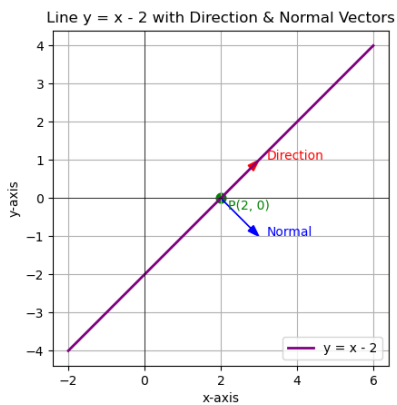


Fig. 0.1