

4.2.10

EE24BTECH11019 - DWARAK A

Question: Find the direction and normal vectors of the line $x - y = 2$ **Solution:**

| Variable | Description |
|----------|--|
| m | Direction vector |
| n | Normal vector |
| x | Vector which represents points on the line |

TABLE 0: Variables Used

$$x - y = 2 \quad (0.1)$$

$$\begin{pmatrix} 1 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = 2 \quad (0.2)$$

Comparing with line equation,

$$\mathbf{n}^T \mathbf{x} = c \quad (0.3)$$

$$\Rightarrow \mathbf{n} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \quad (0.4)$$

Direction vector is orthogonal to Normal vector,

$$\mathbf{m}^T \mathbf{n} = 0 \quad (0.5)$$

$$\begin{pmatrix} 1 & m \end{pmatrix} \begin{pmatrix} 1 \\ -1 \end{pmatrix} = 0 \quad (0.6)$$

$$1 - m = 0 \quad (0.7)$$

$$m = 1 \quad (0.8)$$

$$\Rightarrow \mathbf{m} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (0.9)$$

Finally,

$$\mathbf{n} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \quad (0.10)$$

$$\mathbf{m} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (0.11)$$

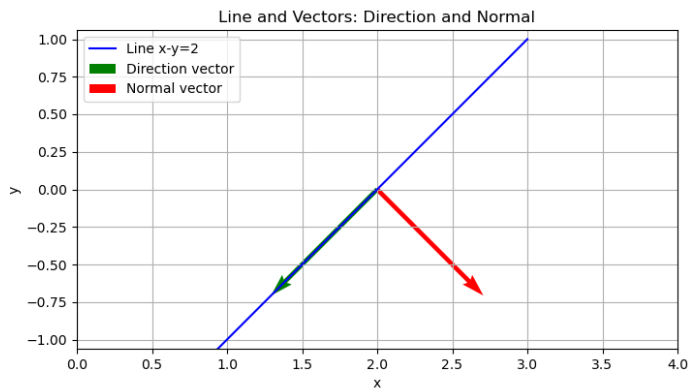


Fig. 0.1: Plot of the line, Direction Vector and Normal Vector