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

$$x - y = 2 \tag{0.1}$$

$$\begin{pmatrix} 1 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = 2 \tag{0.2}$$

$$\mathbf{n}^\top \mathbf{x} = c \tag{0.3}$$

$$\implies \mathbf{n} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \tag{0.4}$$

$$\mathbf{m}^\top \mathbf{n} = 0 \tag{0.5}$$

$$\begin{pmatrix} 1 & m \end{pmatrix} \begin{pmatrix} 1 \\ -1 \end{pmatrix} = 0 \tag{0.6}$$

$$1 - m = 0 \tag{0.7}$$

$$m = 1 \tag{0.8}$$

$$\implies \mathbf{m} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \tag{0.9}$$

The normal vector and direction vector of line $x - y = 2$ are $\mathbf{m}$ and $\mathbf{n}$ respectively,

$$\mathbf{n} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}, \mathbf{m} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \tag{0.10}$$

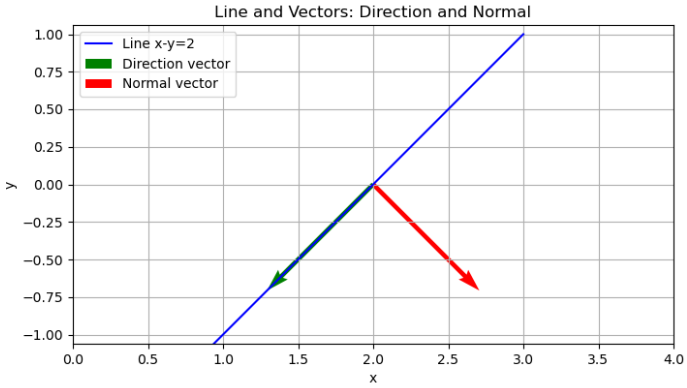

Fig. 0.1: Plot of the line, Direction Vector and Normal Vector