4.4.2.11

EE24BTECH11032 - John Bobby

Question: Find the direction vector and the normal vector for the line $y = 3x$

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

TABLE 0: Input Parameters

Solution:

$$y = 3x \tag{0.1}$$

$$\begin{pmatrix} -3 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = 0 \tag{0.2}$$

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

$$\implies \mathbf{n} = \begin{pmatrix} -3 \\ 1 \end{pmatrix} \tag{0.4}$$

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

$$\begin{pmatrix} 1 & m \end{pmatrix} \begin{pmatrix} -3 \\ 1 \end{pmatrix} = 0 \tag{0.6}$$

$$-3 + m = 0 \tag{0.7}$$

$$\implies m = 3 \tag{0.8}$$

the normal vector and the direction vector of the line $y = 3x$ can be represented as $\mathbf{n}$ and $\mathbf{m}$

$$\mathbf{m} = \begin{pmatrix} 1 \\ 3 \end{pmatrix} \tag{0.9}$$

$$\mathbf{n} = \begin{pmatrix} -3 \\ 1 \end{pmatrix} \tag{0.10}$$

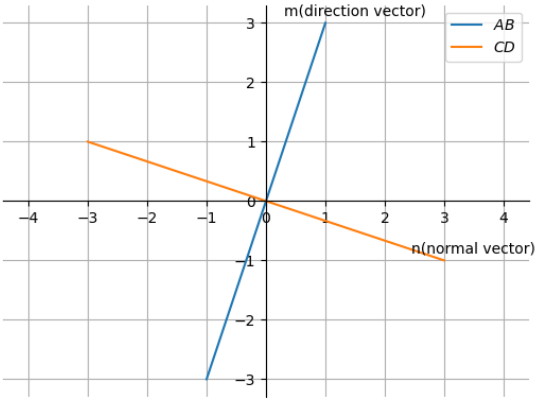

Fig. 0.1: Plot of normal vector and directon vector