

4.2.4

EE24BTECH11016 - Dhwanith M Doddahundi

Question: Find the direction and normal vectors of the line $x = 3y$
Solution:

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

TABLE 0: Variables Used

$$x - 3y = 0 \quad (0.1)$$

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

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

$$\Rightarrow \mathbf{n} = \begin{pmatrix} 1 \\ -3 \end{pmatrix} \quad (0.4)$$

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

$$\begin{pmatrix} 1 & m \end{pmatrix} \begin{pmatrix} 1 \\ -3 \end{pmatrix} = 0 \quad (0.6)$$

$$1 - 3m = 0 \quad (0.7)$$

$$m = \frac{1}{3} \quad (0.8)$$

$$\Rightarrow \mathbf{m} = \begin{pmatrix} 3 \\ 1 \end{pmatrix} \quad (0.9)$$

The normal vector and direction vector of line $x = 3y$ are **m** and **n** respectively,

$$\mathbf{m} = \begin{pmatrix} 3 \\ 1 \end{pmatrix} \quad (0.10)$$

$$\mathbf{n} = \begin{pmatrix} 1 \\ -3 \end{pmatrix} \quad (0.11)$$

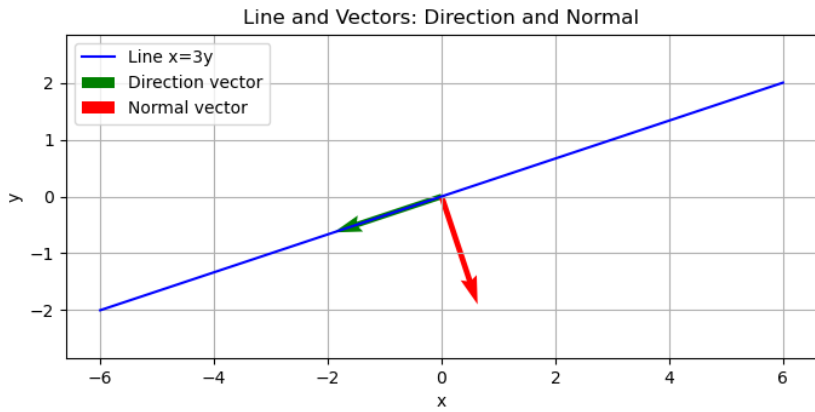


Fig. 0.1