

# 4-4.2-13

AI24BTECH11003 - K.AKSHAY TEJA

## Question:

Find the direction and normal vectors of the following line:  $y = x$

## Solution:

Information	Symbolic Form	Value
Given line	$\mathbf{X} = \mathbf{h} + k\mathbf{m}$	$y = x$

TABLE 0

The equation of the given line is:

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

$$\Rightarrow \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x \\ x \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} + x \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (0.2)$$

$$= \mathbf{h} + k\mathbf{m} \quad (0.3)$$

So, direction vector is:

$$\mathbf{m} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (0.4)$$

From

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

We get:

$$\mathbf{n} = \begin{pmatrix} -1 \\ 1 \end{pmatrix} \quad (0.6)$$

Therefore, the direction and normal vector of the line can be given by  $\mathbf{m} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$  and

$$\mathbf{n} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}.$$

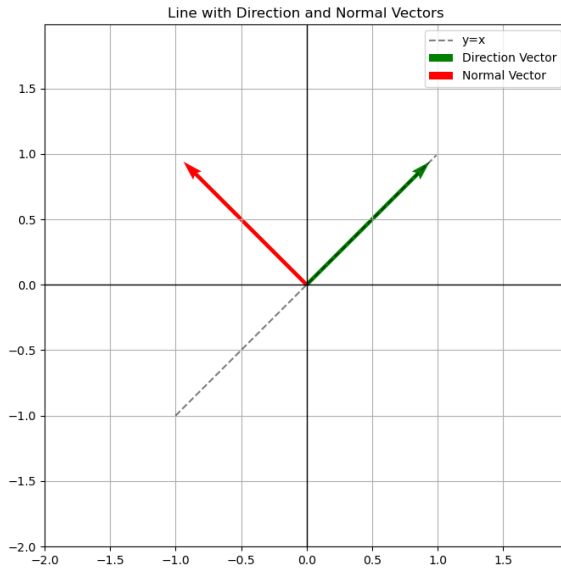


Fig. 0.1: Direction and Unit Vectors of line