

4.4.2.7

EE24BTECH11024 - Abhimanyu Koushik

Question:

Find the direction and normal vectors of the given line $5 = 2x$

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

TABLE I: Variables Used

Solution: The normal vector can be found out as

$$x + y(0) = \frac{5}{2} \quad (1)$$

$$\begin{pmatrix} 1 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \frac{5}{2} \quad (2)$$

$$\begin{pmatrix} 1 & 0 \end{pmatrix} \mathbf{x} = \frac{5}{2} \quad (3)$$

$$\mathbf{n}^T \mathbf{x} = c \quad (4)$$

$$\mathbf{n} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (5)$$

The direction vector is perpendicular to normal vector

$$\mathbf{n}^T \mathbf{m} = 0 \quad (6)$$

$$\begin{pmatrix} 1 & 0 \end{pmatrix} \mathbf{m} = 0 \quad (7)$$

$$\begin{pmatrix} 1 & 0 \end{pmatrix} \begin{pmatrix} m_1 \\ m_2 \end{pmatrix} = 0 \quad (8)$$

$$m_1(1) + m_2(0) = 0 \quad (9)$$

$$m_1 = 0 \quad (10)$$

$$\mathbf{m} = \begin{pmatrix} 0 \\ m_2 \end{pmatrix} \quad (11)$$

$$\mathbf{m} = m_2 \begin{pmatrix} 0 \\ 1 \end{pmatrix} \quad (12)$$

$$\mathbf{m} \equiv \begin{pmatrix} 0 \\ 1 \end{pmatrix} \quad (13)$$

Direction vector: $\mathbf{m} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$

Normal vector: $\mathbf{n} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$

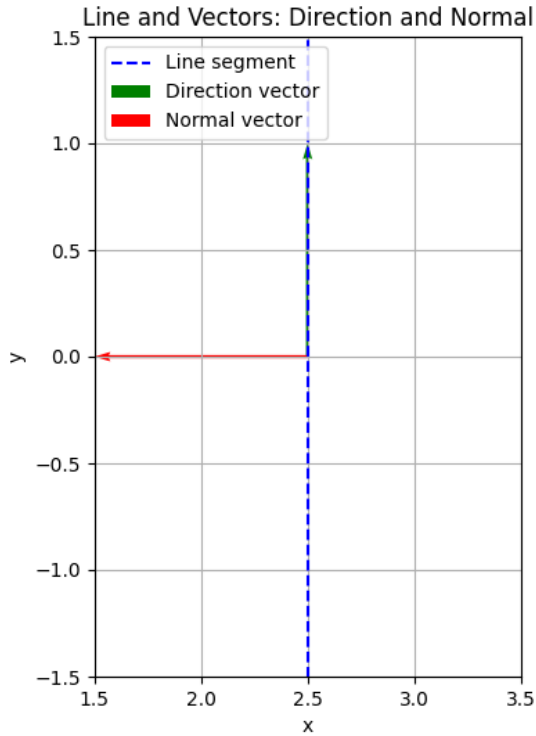


Fig. 1: Plot of the line, Direction Vector and Normal Vector