

4.2.2

AI25BTECH11039-Harichandana Varanasi

Problem 1. Find the direction and normal vectors of the line

$$x - \frac{y}{5} - 10 = 10$$

Solution: Find the direction and normal vectors of the line

$$x - \frac{y}{5} - 10 = 10 \quad (1)$$

Rewriting (1),

$$x - \frac{y}{5} = 20 \quad (2)$$

Comparing with the standard form

$$\mathbf{n}^T \mathbf{x} = c, \quad (3)$$

we obtain

$$\mathbf{n} = \begin{pmatrix} 1 \\ -\frac{1}{5} \end{pmatrix}, \quad \mathbf{x} = \begin{pmatrix} x \\ y \end{pmatrix}, \quad c = 20 \quad (4)$$

Thus, the normal vector is

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

From the orthogonality condition,

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

Let

$$\mathbf{m} = \begin{pmatrix} 1 \\ 5 \end{pmatrix} \quad (7)$$

which satisfies (6).

Hence, the required vectors are

$$\text{Direction vector: } \mathbf{m} = \begin{pmatrix} 1 \\ 5 \end{pmatrix} \quad (8)$$

$$\text{Normal vector: } \mathbf{n} = \begin{pmatrix} 1 \\ -\frac{1}{5} \end{pmatrix} \quad (9)$$

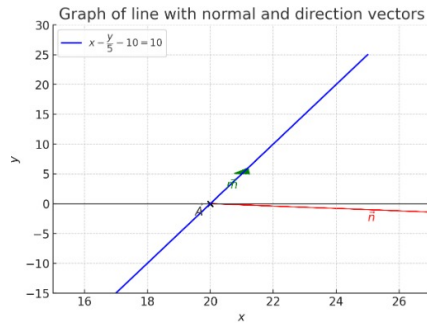


Fig. 0.1: Line $x - \frac{y}{5} - 10 = 10$ with direction \mathbf{m} and normal \mathbf{n} .