

# 4-4.2-1

EE24BTECH11005 - Arjun Pavanje

Question:

Find the direction and normal vectors of the given line  $2x + 3y = 9$

Variable	Description
$2x + 3y = 9$	given line

TABLE I: Variables Used

**Solution:** The equation of the line is given by,

$$y = mx + c \quad (1)$$

$$\mathbf{x} = \begin{pmatrix} 0 \\ c \end{pmatrix} + x \begin{pmatrix} 1 \\ m \end{pmatrix} \quad (2)$$

$$\mathbf{x} = \mathbf{h} + k\mathbf{m} \quad (3)$$

here,  $\mathbf{m} = \begin{pmatrix} 1 \\ m \end{pmatrix}$  where  $\mathbf{m}$  is direction vector  
given line can be written as

$$\mathbf{x} = \begin{pmatrix} 0 \\ 3 \end{pmatrix} + k \begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

$$\mathbf{m} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

equation of line in terms of normal vector  $\mathbf{n}$  is,

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

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

Here,

$$\mathbf{n} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

Direction vector:  $\mathbf{m} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

Normal Vector:  $\mathbf{n} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$

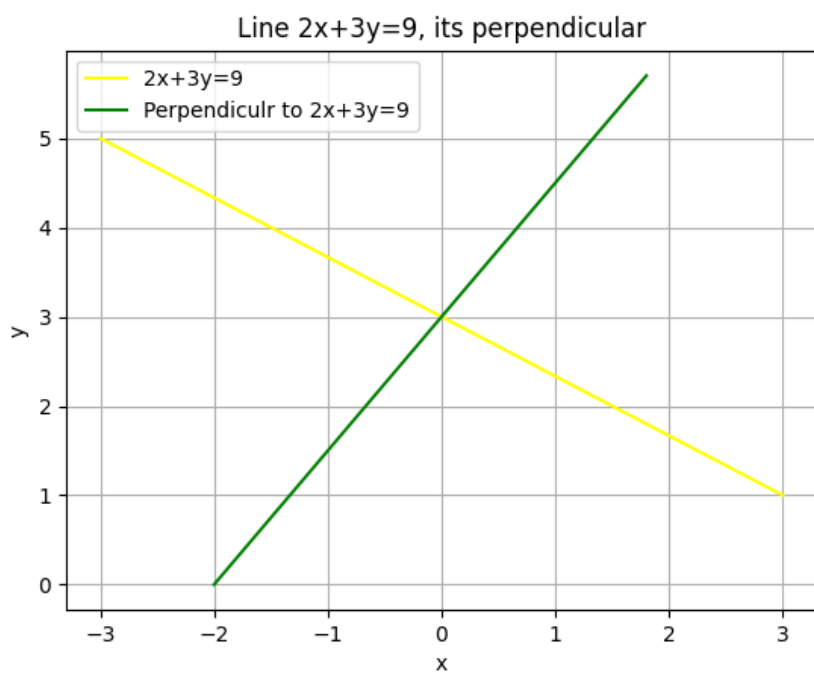


Fig. 1: Plot of the line