

4.3.49

EE25BTECH11059 - Vaishnavi Ramkrishna Anantheertha

Question: Write the equation of the lines for which $\tan \theta = \frac{1}{2}$, where θ is the inclination of the line, and

- (a) y intercept $-\frac{3}{2}$
- (b) x intercept 4

Solution 1:

Variable	Value
A	$(0, -\frac{3}{2})$
m	$\frac{1}{2}$

TABLE 0: Variables Used

$$\mathbf{A} = \begin{pmatrix} 0 \\ -\frac{3}{2} \end{pmatrix} \quad (0.1)$$

$$\text{Let } \mathbf{M} = \begin{pmatrix} 1 \\ m \end{pmatrix} \quad (0.2)$$

$$\mathbf{M} = \begin{pmatrix} 1 \\ \frac{1}{2} \end{pmatrix} \quad (0.3)$$

Let eq of line be

$$\mathbf{n}^T(\mathbf{x} - \mathbf{A}) = 0 \quad (0.4)$$

where,

$$\mathbf{n}^T \mathbf{M} = 0 \quad (0.5)$$

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

$$\mathbf{n} = \begin{pmatrix} -\frac{1}{2} \\ 1 \end{pmatrix} \quad (0.7)$$

Hence eq of line is

$$\begin{pmatrix} -\frac{1}{2} & 1 \end{pmatrix} (\mathbf{x} - \begin{pmatrix} 0 \\ -\frac{3}{2} \end{pmatrix}) = 0 \quad (0.8)$$

$$\begin{pmatrix} -\frac{1}{2} & 1 \end{pmatrix} \mathbf{x} = -\frac{3}{2} \quad (0.9)$$

Refer to Figure

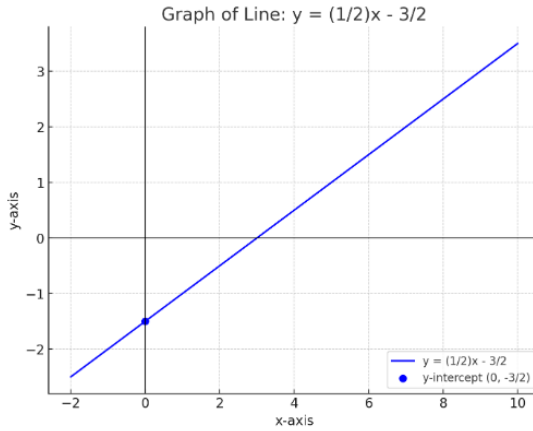


Fig. 0.1

Solution 2:

Variable	Value
A	$(4, 0)$
m	$\frac{1}{2}$

TABLE 0: Variables Used

Let \mathbf{B} be a point on the line

$$\mathbf{A} = \begin{pmatrix} 4 \\ 0 \end{pmatrix} \quad (0.10)$$

$$\text{Let } \mathbf{M} = \begin{pmatrix} 1 \\ m \end{pmatrix} \quad (0.11)$$

$$\mathbf{M} = \begin{pmatrix} 1 \\ \frac{1}{2} \end{pmatrix} \quad (0.12)$$

Let eq of line be

$$\mathbf{n}^T(\mathbf{x} - \mathbf{A}) = 0 \quad (0.13)$$

where

$$\mathbf{n}^T \mathbf{M} = 0 \quad (0.14)$$

$$\mathbf{n} = \begin{pmatrix} -m \\ 1 \end{pmatrix} \quad (0.15)$$

$$\mathbf{n} = \begin{pmatrix} -\frac{1}{2} \\ 1 \end{pmatrix} \quad (0.16)$$

$$\begin{pmatrix} -\frac{1}{2} & 1 \end{pmatrix} \left(\mathbf{x} - \begin{pmatrix} 4 \\ 0 \end{pmatrix} \right) = 0 \quad (0.17)$$

$$\begin{pmatrix} -\frac{1}{2} & 1 \end{pmatrix} \mathbf{x} = -2 \quad (0.18)$$

Refer to Figure

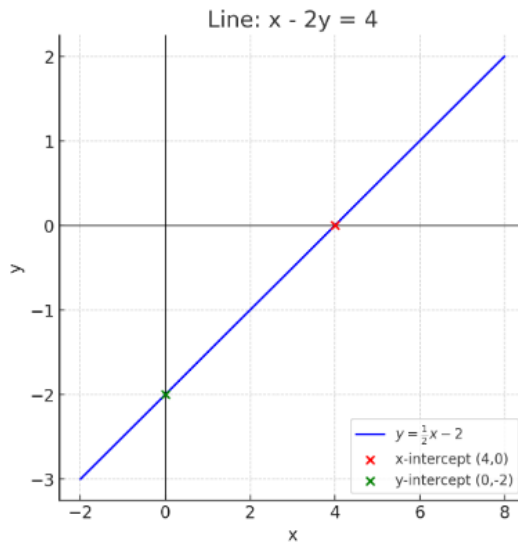


Fig. 0.2