LINE

1 11^{th} Maths - EXERCISE-10.4

1. What are the points on the y-axis whose distance from the line $\frac{x}{3}+\frac{y}{4}=1$ is 4 units.

2 SOLUTION

Given line equation is

$$\frac{x}{3}+\frac{y}{4}=1 \tag{1}$$

$$\big(4x+3y-12\big)=0 \tag{2}$$

$$\mathbf{n}=\begin{pmatrix}4\\3\end{pmatrix} \tag{3}$$

$$c=12 \tag{4}$$

The distance of the line from y-axis

$$d=\frac{\mathbf{n}^{\top}\mathbf{P}-c}{|n|} \tag{5}$$

$$\implies \pm 4=\frac{\begin{pmatrix}4 & 3\end{pmatrix}\begin{pmatrix}0\\y\end{pmatrix}-12}{5} \tag{6}$$

$$\implies \pm 4=\frac{\begin{pmatrix}0\\3y\end{pmatrix}-12}{5} \tag{7}$$

$$\implies \pm 20=3y-12 \tag{8}$$

$$\implies 3y=20\pm 12 \tag{9}$$

$$\implies y=\frac{32}{3} \text{ or } y=\frac{-8}{3} \tag{10}$$

we find out the values of foot of the perpendicular in line equation for

$$y = \frac{32}{3} \text{ and } y = \frac{-8}{3} \tag{11}$$

$$\begin{pmatrix} \mathbf{m} & \mathbf{n} \end{pmatrix}^\top \mathbf{x} = \begin{pmatrix} \mathbf{m}^\top & \mathbf{P} \\ C & \end{pmatrix} \tag{12}$$

$$\begin{pmatrix} 3 & -4 \\ 4 & 3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \frac{-128}{3} \\ 12 \end{pmatrix} \tag{13}$$

$$\begin{pmatrix} 3x - 4y \\ 4x + 3y \end{pmatrix} = \begin{pmatrix} \frac{-128}{3} \\ 12 \end{pmatrix} \tag{14}$$

$$\begin{pmatrix} 3x - 4y \\ 4x + 3y \end{pmatrix} = \begin{pmatrix} 42.66 \\ 12 \end{pmatrix} \tag{15}$$

$$x = -3.2004 \text{ and } y = 8.2672 \tag{16}$$

$$\begin{pmatrix} \mathbf{m} & \mathbf{n} \end{pmatrix}^\top \mathbf{x} = \begin{pmatrix} \mathbf{m}^\top & \mathbf{P} \\ C & \end{pmatrix} \tag{17}$$

$$\begin{pmatrix} 3 & -4 \\ 4 & 3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \frac{-8}{3} \\ 12 \end{pmatrix} \tag{18}$$

$$\begin{pmatrix} 3x - 4y \\ 4x + 3y \end{pmatrix} = \begin{pmatrix} \frac{32}{3} \\ 12 \end{pmatrix} \tag{19}$$

$$\begin{pmatrix} 3x - 4y \\ 4x + 3y \end{pmatrix} = \begin{pmatrix} 10.66 \\ 12 \end{pmatrix} \tag{20}$$

$$x = 3.2 \text{ and } y = 0.266 \tag{21}$$

3 FIGURE

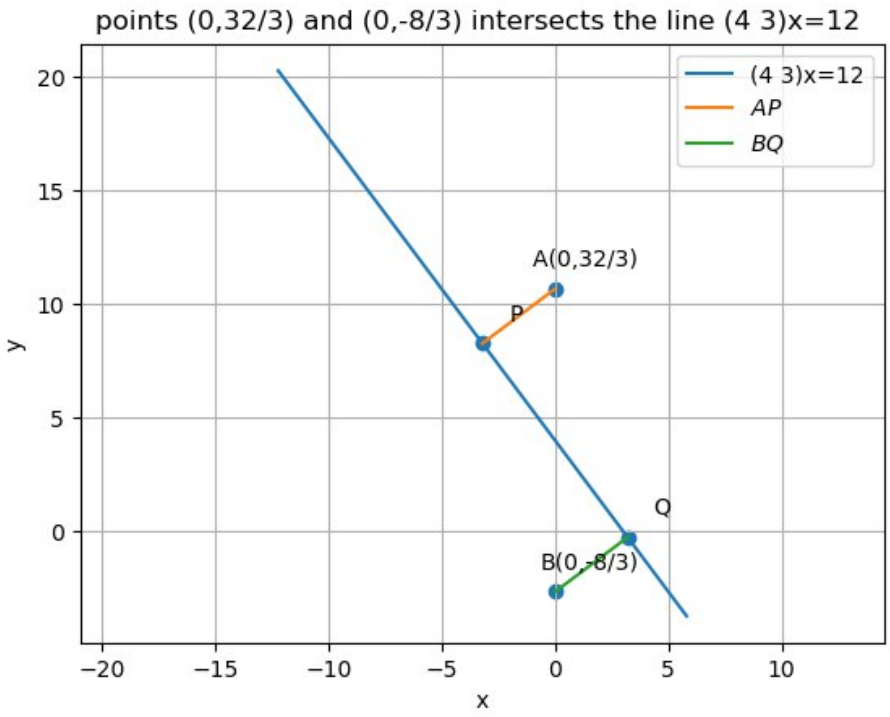

Figure 1: line