Linear Forms

11^{th} Maths - Chapter 10

The following problem is question 15 from exercise 10.3:

1. The perpendicular from the origin to the line $y = mx + c$ meets it at the point $(-1, 2)$. Find the values of m and c.

Solution:
Given ,
the line line equation is

$$y = mx + c \tag{1}$$

$$\mathbf{P} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \tag{2}$$

$$\mathbf{O} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{3}$$

Direction Vector from $\mathbf{O}$ to point $\mathbf{P}$ is given by

$$\mathbf{O} - \mathbf{P} = \begin{pmatrix} 1 \\ -2 \end{pmatrix} \tag{4}$$

If the lines are perpendicular then,

$$(\mathbf{O}-\mathbf{P})^{\top}\mathbf{m}=0 \tag{5}$$

$$\begin{pmatrix}1 & -2\end{pmatrix}\begin{pmatrix}1\\ m\end{pmatrix}=0 \tag{6}$$

$$1-2m=0 \tag{7}$$

$$m=\frac{1}{2} \tag{8}$$

By substituting the m value in (1), we get

$$2=\frac{1}{2}(-1)+c \tag{9}$$

$$c=\frac{5}{2} \tag{10}$$

therefore, Values of m and c are $\frac{1}{2}$ and $\frac{5}{2}$

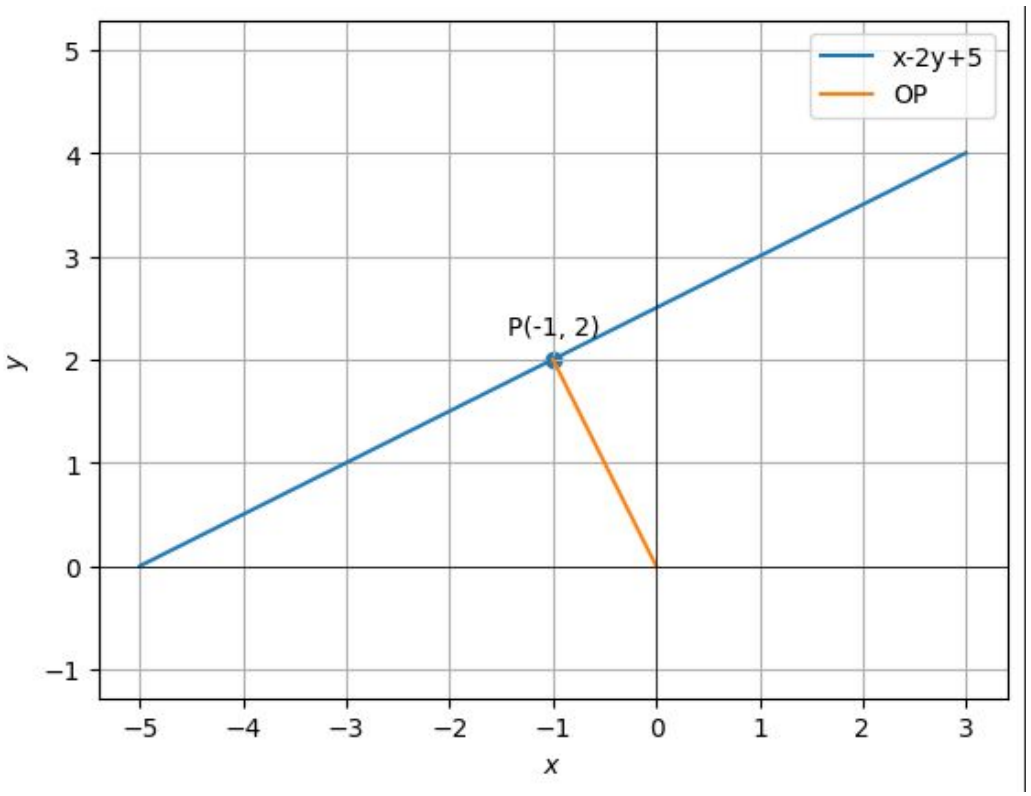

Figure 1: Graph