

Linear Forms

11th 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 Equation can be written in the form of $\mathbf{n}^\top \mathbf{a} = c$

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

The direction vector $\mathbf{D} = \begin{pmatrix} 1 \\ m \end{pmatrix}$

Vector from Origin to point $p(-1, 2)$ is given by

$$\mathbf{OP} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \quad (2)$$

If the lines are perpendicular then,

$$\mathbf{OP} \cdot \mathbf{D} = 0 \quad (3)$$

$$\begin{pmatrix} -1 \\ 2 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ m \end{pmatrix} = 0 \quad (4)$$

$$-1 + 2m = 0 \quad (5)$$

$$m = \frac{1}{2} \quad (6)$$

By substituting the m value in (1) we get

$$2 = \frac{1}{2}(-1) + c \quad (7)$$

$$c = \frac{5}{2} \quad (8)$$

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

By substituting m and c values in (1) we get

$$y = \frac{1}{2}(x) + c \quad (9)$$

The equation can be written in vectors form

$$\begin{pmatrix} \frac{-1}{2} \\ 1 \end{pmatrix} \mathbf{x} = \frac{5}{2} \quad (10)$$

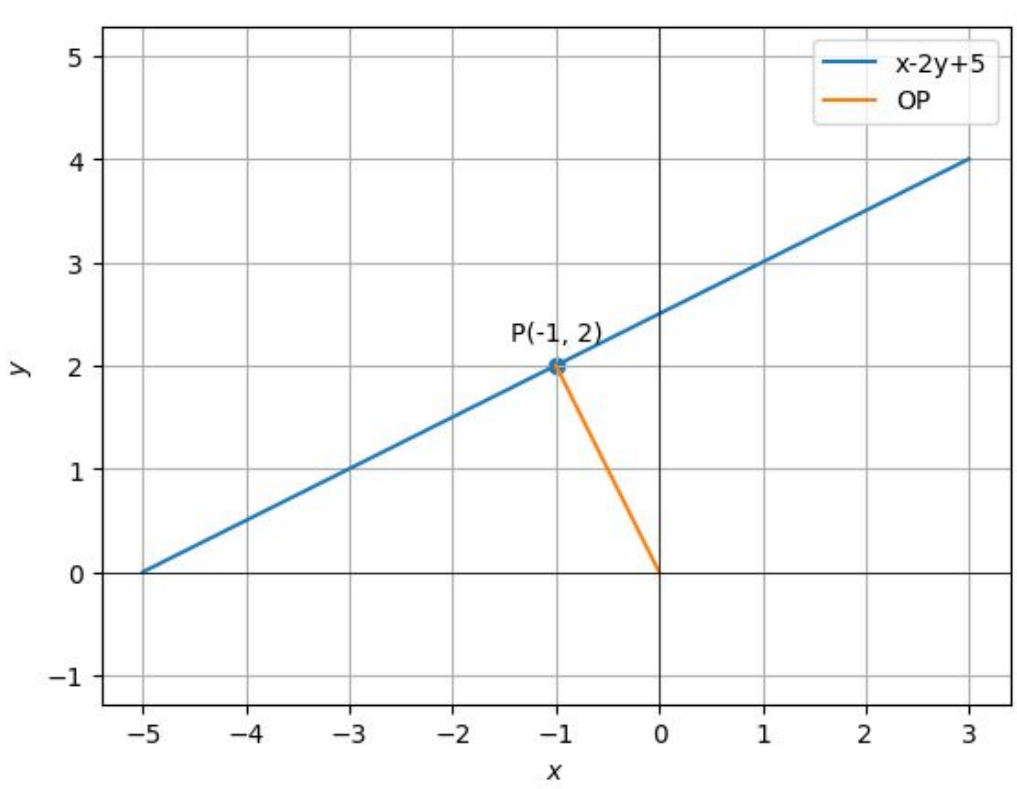


Figure 1: Graph