

CLASS-11
CHAPTER-10
STRAIGHT LINES

Exercise 10.4

Q2. Find the values of θ and p , if the equation $x \cos \theta + y \sin \theta = p$ is the normal form of the line $\sqrt{3}x + y + 2 = 0$.

Solution:

From the given line equation:

$$\mathbf{m} = -\sqrt{3} \quad (1)$$

$$c = -2 \quad (2)$$

The directional vector is given by:

$$\mathbf{m} = \begin{pmatrix} 1 \\ -\sqrt{3} \end{pmatrix} \quad (3)$$

The normal vector is given by:

$$\mathbf{n} = \begin{pmatrix} -\sqrt{3} \\ -1 \end{pmatrix} \quad (4)$$

$$\mathbf{n}^\top = (-\sqrt{3} \quad -1) \quad (5)$$

Angle between perpendicular and the positive x -axis is given by:

$$\cos \theta = \frac{\mathbf{e}_1^\top \mathbf{n}}{\|\mathbf{e}_1\| \|\mathbf{n}\|} \quad (6)$$

$$= \frac{(1 \quad 0) \begin{pmatrix} -\sqrt{3} \\ -1 \end{pmatrix}}{2} \quad (7)$$

$$= -\frac{\sqrt{3}}{2} \quad (8)$$

$$\implies \theta = 210^\circ \quad (9)$$

The perpendicular distance to the line is given by:

$$p = \frac{|c|}{\|\mathbf{n}\|} = \frac{2}{2} = 1 \quad (10)$$

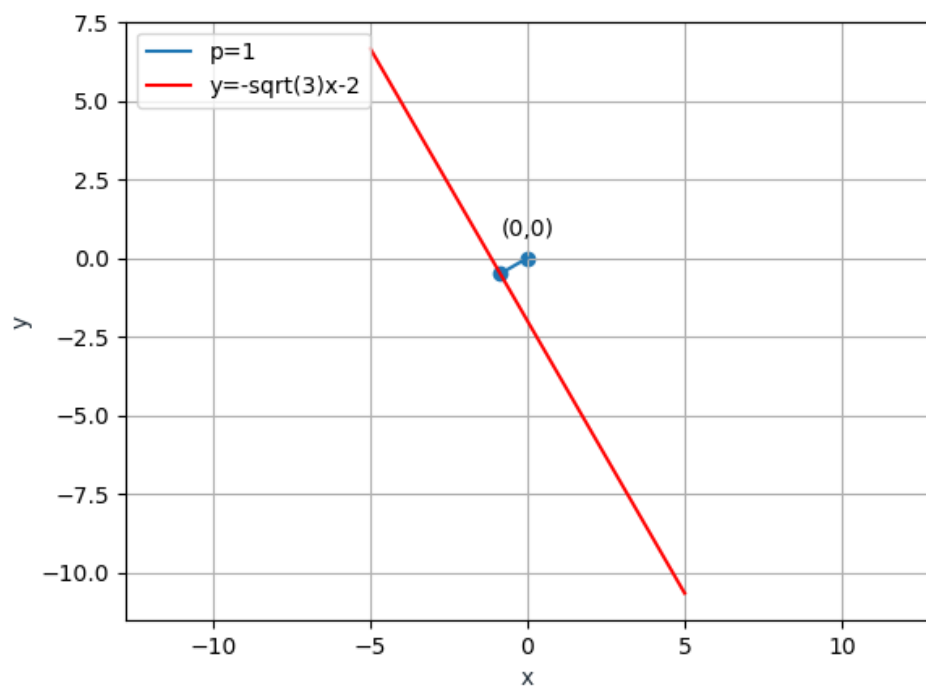


Figure 1: