

Equation of Line

1 11th Maths - Chapter 10

This is Problem-5 from Exercise 10.2

1. Intersecting the x-axis at a distance of 3 units to the left of origin with slope of -2.

Solution:

Let

$$\mathbf{x} = \begin{pmatrix} x \\ y \end{pmatrix} \quad (1)$$

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

$$\mathbf{m} = -2 \quad (3)$$

$$\mathbf{n} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ m \end{pmatrix} \quad (4)$$

$$\mathbf{n} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \end{pmatrix} \quad (5)$$

\Rightarrow The normal vector \mathbf{n} to the line is given as

$$\mathbf{n} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \quad (6)$$

The equation of a line with normal vector \mathbf{n} and passing through a point \mathbf{A} is given by

$$\mathbf{n}^T (\mathbf{x} - \mathbf{A}) = 0 \quad (7)$$

$$\begin{pmatrix} 2 & 1 \end{pmatrix} \left(\mathbf{x} - \begin{pmatrix} -3 \\ 0 \end{pmatrix} \right) = 0 \quad (8)$$

$$\begin{pmatrix} 2 & 1 \end{pmatrix} \mathbf{x} + 6 = 0 \quad (9)$$

$$\begin{pmatrix} 2 & 1 \end{pmatrix} \mathbf{x} = -6 \quad (10)$$

The line segment is as shown in Figure 1.

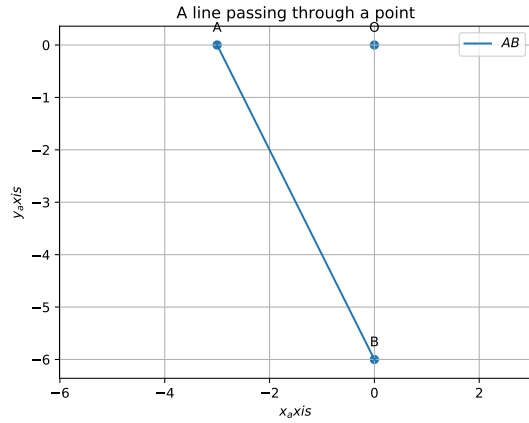


Figure 1