

# Intercepts Lines

## 11<sup>th</sup> Maths - Chapter 10

This is Problem-3 from Exercise 10.4

1. Find the equations of the lines, which cut-off intercepts on the axes whose sum and product are 1 and -6, respectively.

### 1 Solution

Let the x intercept be a and the y intercept be b ,Then

$$(a + b) = 1 \quad (1)$$

$$(ab) = -6 \quad (2)$$

upon simplifying (1) and (2)

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

$$\mathbf{a} - \mathbf{b} = \begin{pmatrix} 3 \\ 0 \end{pmatrix} - \begin{pmatrix} 0 \\ -2 \end{pmatrix} \quad (4)$$

$$= \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad (5)$$

$$\mathbf{m} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \text{ or } \begin{pmatrix} -2 \\ 3 \end{pmatrix} \quad (6)$$

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

$$\mathbf{n} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad (7)$$

$$= \begin{pmatrix} -2 \\ 3 \end{pmatrix} \quad (8)$$

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

$$\mathbf{n}^\top (\mathbf{x} - \mathbf{A}) = 0 \quad (9)$$

$$\begin{pmatrix} -2 & 3 \end{pmatrix} \mathbf{x} = 6 \quad (10)$$

Or

$$\mathbf{n} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} -2 \\ 3 \end{pmatrix} \quad (11)$$

$$= \begin{pmatrix} -3 \\ -2 \end{pmatrix} \quad (12)$$

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

$$\begin{pmatrix} -3 & -2 \end{pmatrix} \mathbf{x} = 6 \quad (13)$$

The line segment is as shown in Figure ??.

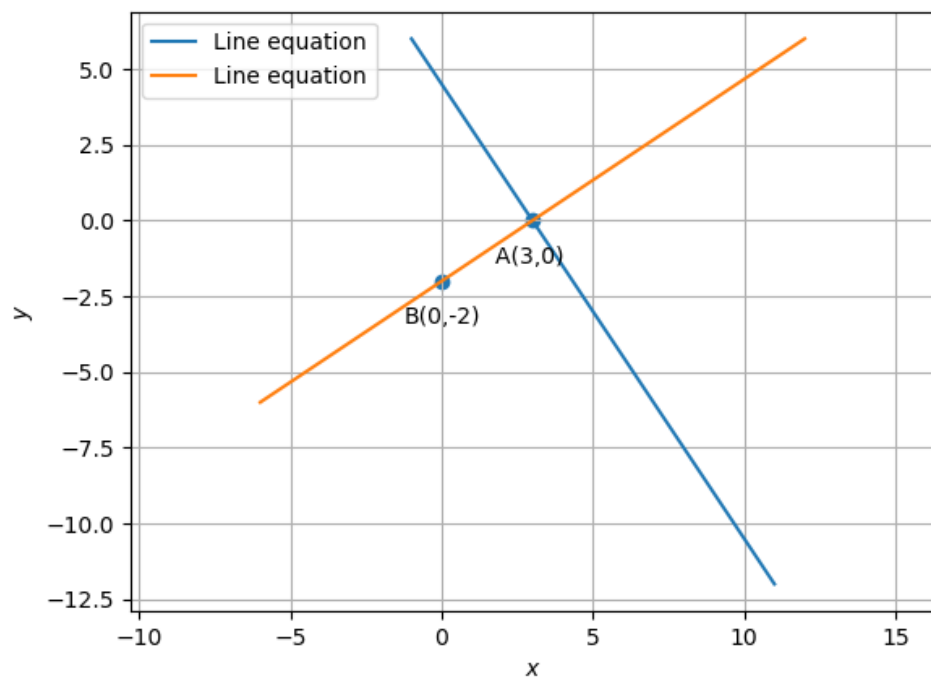


Figure 1