

# 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)

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

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

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

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

2.  $\implies$  The normal vector  $\mathbf{n}$  to the line is given as

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

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

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

$$(-2 \ 3) \mathbf{x} = 6 \quad (10)$$

**or**

3.  $\implies$  The normal vector  $\mathbf{n}$  to the line is given as

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

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

$$\mathbf{n}^\top (\mathbf{x} - \mathbf{B}) = 0 \quad (13)$$

$$(-3 \ -2) \mathbf{x} = 6 \quad (14)$$

The equation of a line with normal vector  $\mathbf{n}$  and passing through a point  $\mathbf{A}$  is given by  $(-2, 3)\mathbf{x} = 6$  and for  $\mathbf{B}$  is  $(-3, -2)\mathbf{x} = 6$

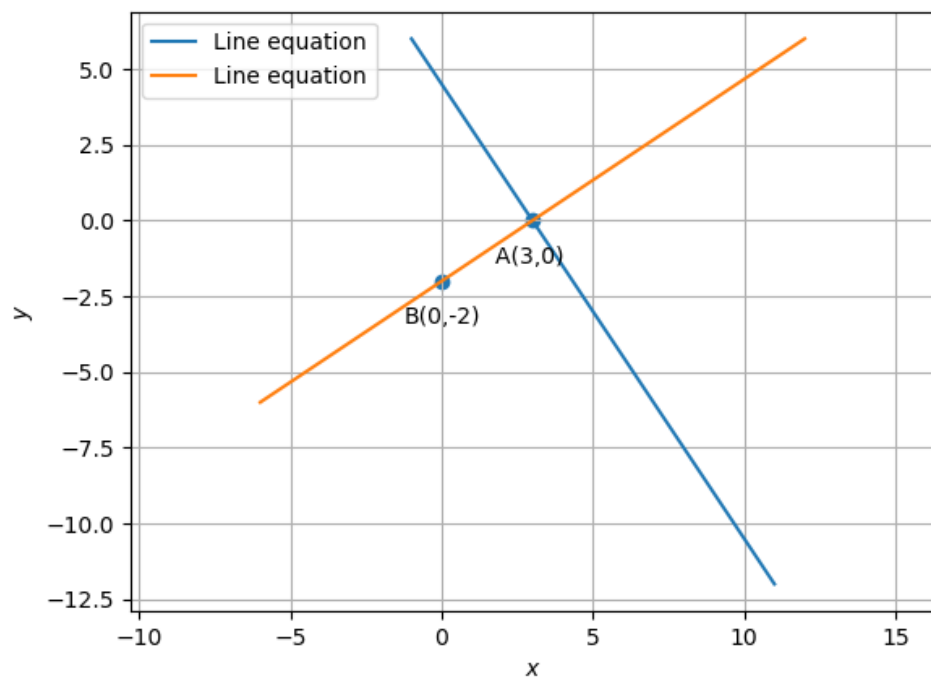


Figure 1