Equation of Line

1 11^{th} Maths - Chapter 10

This is Problem-5 from Exercise 10.2

1. Instersecting the x-axis at a distance of 3 units to the left of origin with slope of -2.
   Solution:
   Let

$$m = -2, \mathbf{A} = \begin{pmatrix} -3 \\ 0 \end{pmatrix} \tag{1}$$

$$\mathbf{n} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ m \end{pmatrix} \tag{2}$$

$$\mathbf{n} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \end{pmatrix} \tag{3}$$

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

$$\mathbf{n} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \tag{4}$$

   The equation of a line with normal vector $\mathbf{n}$ and passing through a point $\mathbf{A}(-3, 0)$ is given by

$$\mathbf{n}^\top (\mathbf{x} - \mathbf{A}) = 0 \tag{5}$$

$$\begin{pmatrix} 2 & 1 \end{pmatrix} \left(\mathbf{x} - \begin{pmatrix} -3 \\ 0 \end{pmatrix} \right) = 0 \tag{6}$$

$$\begin{pmatrix} 2 & 1 \end{pmatrix} \mathbf{x} + 6 = 0 \tag{7}$$

$$\begin{pmatrix} 2 & 1 \end{pmatrix} \mathbf{x} = -6 \tag{8}$$

   The line segment is as shown in Figure 1.

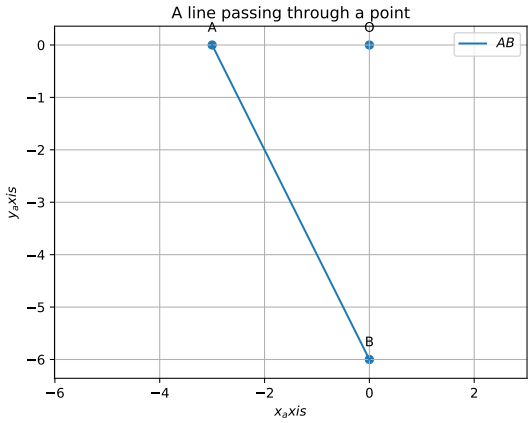

Figure 1