Straight Lines

11^{th} Maths - Chapter 10

This is Problem-8 from Exercise 10.3

1. Find the equation of line perpendicular to the line $x - 7y + 5 = 0$ and having x intercept 3.
   Solution: Given line is

$$x - 7 + 5 = 0 \tag{1}$$

   A line equation can be expressed as

$$\mathbf{n}^\top \mathbf{x} = c \tag{2}$$

$$\text{where } \mathbf{n} = \begin{pmatrix} 1 \\ -7 \end{pmatrix}, c = -5 \tag{3}$$

   the equation of line which is perpendicular with a x intercept 3 is given by

$$\mathbf{m}^\top (\mathbf{x} - \mathbf{A}) = 0 \tag{4}$$

   here $\mathbf{m}$ and $\mathbf{A}$ are

$$\mathbf{m} = \begin{pmatrix} 7 \\ 1 \end{pmatrix} \tag{5}$$

$$\mathbf{m}^\top = \begin{pmatrix} 7 & 1 \end{pmatrix} \tag{6}$$

$$\mathbf{A} = \begin{pmatrix} 3 \\ 0 \end{pmatrix} \tag{7}$$

Substituting the value of $\mathbf{m}$ and $\mathbf{A}$ in (4)

$$\begin{pmatrix} 7 & 1 \end{pmatrix} \left(\mathbf{x} - \begin{pmatrix} 3 \\ 0 \end{pmatrix} \right) = 0 \tag{8}$$

$$\begin{pmatrix} 7 & 1 \end{pmatrix} \mathbf{x} - 21 = 0 \tag{9}$$

$$\begin{pmatrix} 7 & 1 \end{pmatrix} \mathbf{x} = 21 \tag{10}$$

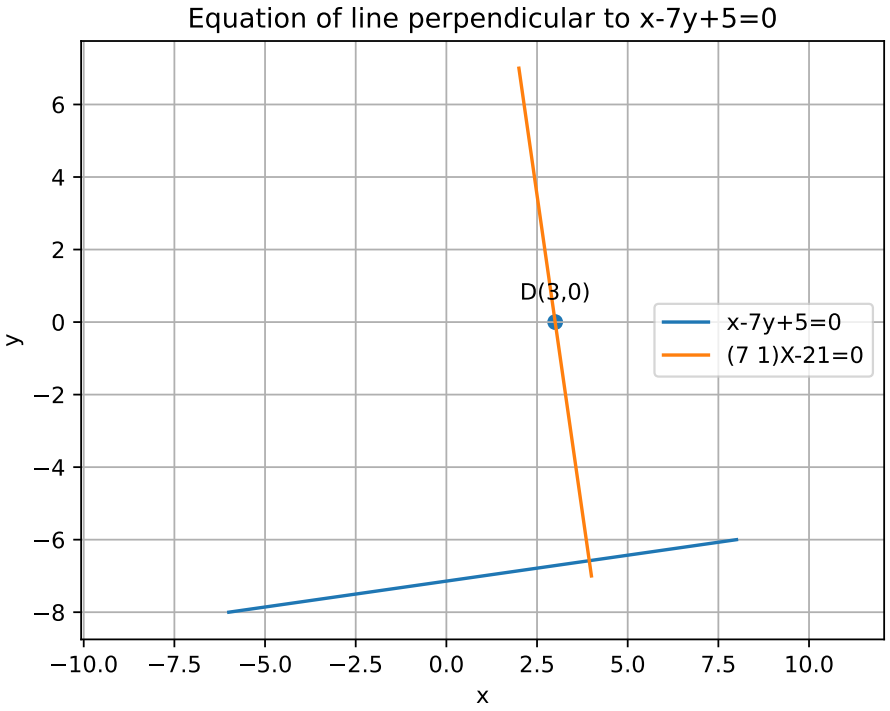

Figure 1