STRAIGHT LINES

1 11th Maths - Chapter 10

This is Problem 11 from Exercise-10.3

1. Prove that the line through the point(x_1, y_1) and parallel to the line $Ax+By+C=0$ is $A(x - x_1)+B(y - y_1)=0$.

   Solution: Given

$$\text{Let } \mathbf{P} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix} \tag{1}$$

$$Ax + By + C = 0 \tag{2}$$

The line equation is

$$\mathbf{n}^\top \mathbf{x} = c \tag{3}$$

from (2)

$$\mathbf{n} = \begin{pmatrix} A \\ B \end{pmatrix} \tag{4}$$

The line passing through the $\mathbf{P}$ is parallel to line $Ax + By + C = 0$.
The line equation for line passing through $\mathbf{P}$ is

$$\mathbf{n}^\top \mathbf{m} = 0 \tag{5}$$

$$\mathbf{n}^\top (\mathbf{x} - \mathbf{P}) = 0 \tag{6}$$

$$\begin{pmatrix} A & B \end{pmatrix} \left(\begin{pmatrix} x \\ y \end{pmatrix} \begin{pmatrix} x_1 \\ y_1 \end{pmatrix} \right) = 0 \tag{7}$$

$$\begin{pmatrix} A & B \end{pmatrix} \begin{pmatrix} x - x_1 \\ y - y_1 \end{pmatrix} = 0 \tag{8}$$

$$A(x - x_1) + B(y - y_1) = 0 \tag{9}$$

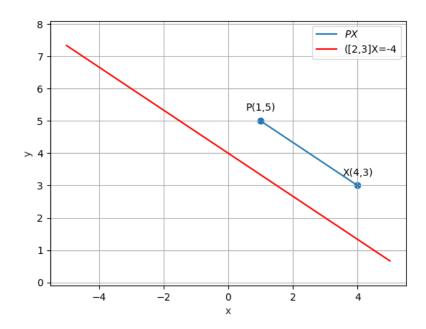Figure 1