ASSIGNMENT-2

R.YAMINI

1 QUESTION NO-2.14 (Linear forms)

Find the equation of the line satisfying the following conditions.

1) passing through the point $\begin{pmatrix}-4\\3\end{pmatrix}$ and with slope $\frac{1}{2}$.
2) passing through the point $\begin{pmatrix}2\\2\sqrt{3}\end{pmatrix}$ and inclined with the x-axis at an angle of $75°$.

2 Solution

1) Given point $\mathbf{P} = \begin{pmatrix}-4\\3\end{pmatrix}$ and slope $m = \frac{1}{2}$. The direction vector is $\mathbf{m} = \begin{pmatrix}2\\1\end{pmatrix}$. Hence, the normal vector

$$\mathbf{n} = \begin{pmatrix}0 & -1\\1 & 0\end{pmatrix}\mathbf{m} \tag{2.0.1}$$

$$= \begin{pmatrix}-1\\2\end{pmatrix} \tag{2.0.2}$$

The equation of the line in terms of the normal vector is then obtained as

$$\mathbf{n}^T(\mathbf{x}-\mathbf{A}) = 0 \tag{2.0.3}$$

$$\implies \begin{pmatrix}-1 & 2\end{pmatrix}\mathbf{x} = 10 \tag{2.0.4}$$

Plot of the line AB

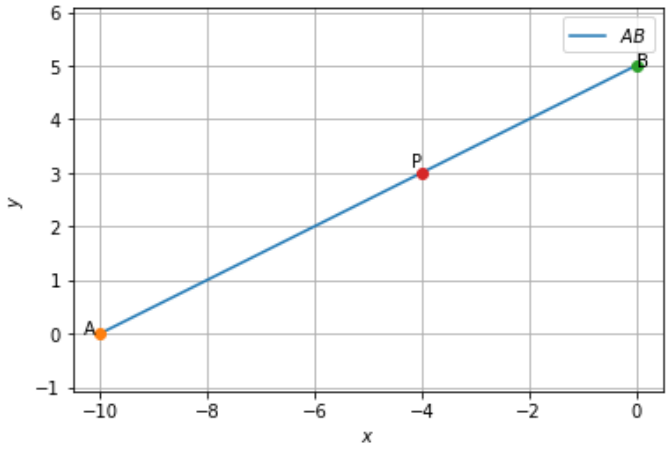

Fig. 2.1: Plot of Line AB (Part-1)

2) Given point $\mathbf{P} = \begin{pmatrix}2\\2\sqrt{3}\end{pmatrix}$.From the given information we have, $\tan 75° = m = \frac{\sqrt{3}+1}{\sqrt{3}-1}$.

The direction vector is $\mathbf{m} = \begin{pmatrix}1\\\tan 75°\end{pmatrix}$. Hence, the normal vector

$$\mathbf{n} = \begin{pmatrix}0 & -1\\1 & 0\end{pmatrix}\mathbf{m} \tag{2.0.5}$$

$$= \begin{pmatrix}-\tan 75°\\1\end{pmatrix} \tag{2.0.6}$$

The equation of the line in terms of the normal vector is then obtained as

$$\mathbf{n}^T(\mathbf{x}-\mathbf{A}) = 0 \tag{2.0.7}$$

$$\implies \begin{pmatrix}-\sqrt{3}+1 & \sqrt{3}-1\end{pmatrix}\mathbf{x} = -4\left(\sqrt{3}-1\right) \tag{2.0.8}$$

Plot of the line AB

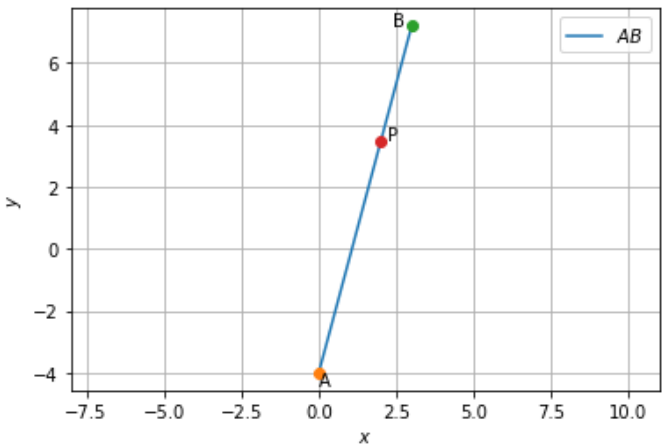

Fig. 2.2: Plot of Line AB (Part-2)