#### 1

# **ASSIGNMENT-2**

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Download all python codes from

https://github.com/ThurpuNaveena/ASSIGNMENT -2/tree/main/CODES

and latex-tikz codes from

https://github.com/ThurpuNaveena/ASSIGNMENT -2/tree/main

## 1 QUESTION NO-2.14 (LINEAR FORMS)

Find the equation of the line satisfying the following conditions

- 1) Intersecting the x-axis at a distance of 3 units to the left of the origin with slope -2.
- 2) Intersecting the y-axis at a distance of 2 units above the origin and making an angle of 30° with the positive direction of the x-axis.

## 2 Solution

1) Given point  $\mathbf{A} = \begin{pmatrix} -3 \\ 0 \end{pmatrix}$  and slope m = -2.

The direction vector is  $\mathbf{m} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$ . Hence, the normal vector

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

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

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

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

$$\implies (2 \quad 1)\mathbf{x} = -6 \tag{2.0.4}$$

Plot of the line AB

2) Given point  $\mathbf{A} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$ . From the given information we have,  $\tan 30^\circ = m = \frac{1}{\sqrt{3}}$ .

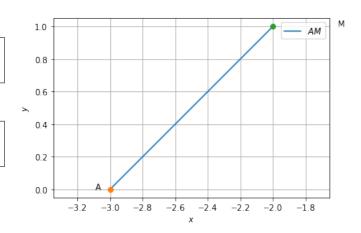


Fig. 2.1: Plot of Line AB (Part-1)

The direction vector is  $\mathbf{m} = \begin{pmatrix} 1 \\ \tan 30^{\circ} \end{pmatrix}$ . Hence, the normal vector

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

$$= \begin{pmatrix} -\tan 30^{\circ} \\ 1 \end{pmatrix} \tag{2.0.6}$$

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

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

$$\implies \left(-1 \quad \sqrt{3}\right)\mathbf{x} = 2\sqrt{3} \tag{2.0.8}$$

Plot of the line AB

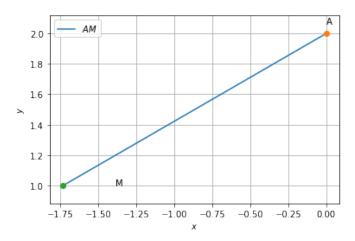


Fig. 2.2: Plot of Line AB (Part-2)