# CHAPTER-10
# LINES

January 13, 2023

## Excercise 10.2

Q4. Passing through $(2, 2\sqrt{3})$ and inclined with the x-axis at an angle of $75°$.

### Solution

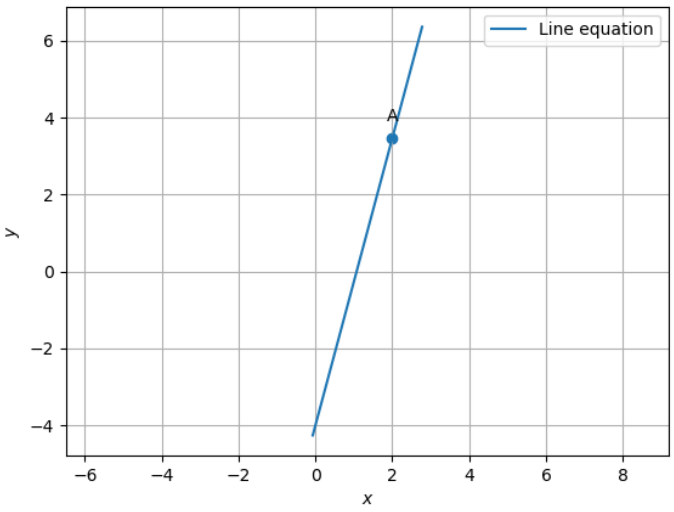


Figure 1:

## 1 construction

| Point | Value |
|---|---|
| A | $\begin{pmatrix} 2 \\ 2\sqrt{3} \end{pmatrix}$ |
| $\theta$ | $75°$ |

## 2 Assumptions

To find the line equation through the point $(2, 2\sqrt{3})$

The Directional vector is:

$$\mathbf{m} = \begin{pmatrix} 1 \\ 2+\sqrt{3} \end{pmatrix} \tag{1}$$

## 3 Proof:

we know that the Normal vector is:

$$\mathbf{n} = \begin{pmatrix} 2+\sqrt{3} \\ -1 \end{pmatrix} \tag{2}$$

$$\mathbf{m} = \begin{pmatrix} 1 \\ 2+\sqrt{3} \end{pmatrix} \tag{3}$$

$$\mathbf{n} = \begin{pmatrix} 2+\sqrt{3} \\ -1 \end{pmatrix} \tag{4}$$

$$\mathbf{n^T} = \begin{pmatrix} 2+\sqrt{3} & -1 \end{pmatrix} \tag{5}$$

Where line equation is given by:

$$\mathbf{n^T}(\mathbf{x} - \mathbf{p}) = 0 \tag{6}$$

By substituting the values in the above equation:

$$\begin{pmatrix} 2+\sqrt{3} & -1 \end{pmatrix} \left( \begin{pmatrix} x \\ y \end{pmatrix} - \begin{pmatrix} 2 \\ 2\sqrt{3} \end{pmatrix} \right) = 0 \tag{7}$$

$$\begin{pmatrix} 2+\sqrt{3} & -1 \end{pmatrix} (\mathbf{x}) = 4 \tag{8}$$