

Straight Lines Assignment

Gautam Singh

Abstract—This document contains the solution to Question 4 of Exercise 2 in Chapter 10 of the class 11 NCERT textbook.

- 1) Find the equation of the line passing through $\mathbf{A} = \begin{pmatrix} 2 \\ 2\sqrt{3} \end{pmatrix}$ and inclined with the x-axis at an angle of 75° .

Solution: Since $\tan 75^\circ = 2 + \sqrt{3}$, the direction vector of the line is

$$\mathbf{m} = \begin{pmatrix} 2 + \sqrt{3} \\ 1 \end{pmatrix} \quad (1)$$

and hence the normal vector is

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

The equation of the line is

$$\mathbf{n}^\top (\mathbf{x} - \mathbf{A}) = 0 \quad (3)$$

$$\Rightarrow \mathbf{n}^\top \mathbf{x} = \mathbf{n}^\top \mathbf{A} = 4(\sqrt{3} + 1) \quad (4)$$

$$\Rightarrow \begin{pmatrix} -1 \\ 2 + \sqrt{3} \end{pmatrix}^\top \mathbf{x} = 4(\sqrt{3} + 1) \quad (5)$$

The line is plotted in Fig. 1 generated by the Python code `codes/line.py`

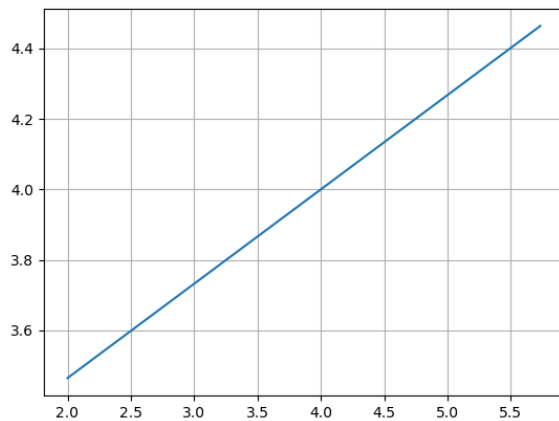


Fig. 1: Line represented by (5).