

Quiz 7

S Nithish

Abstract—This document contains the solution of the question from NCERT 11th standard chapter 10 exercise 10.2 problem 8

1 EXERCISE 10.2

- 1) Perpendicular distance from the origin in 5 units and the angle made by the perpendicular with the positive x-axis is 30 degrees.

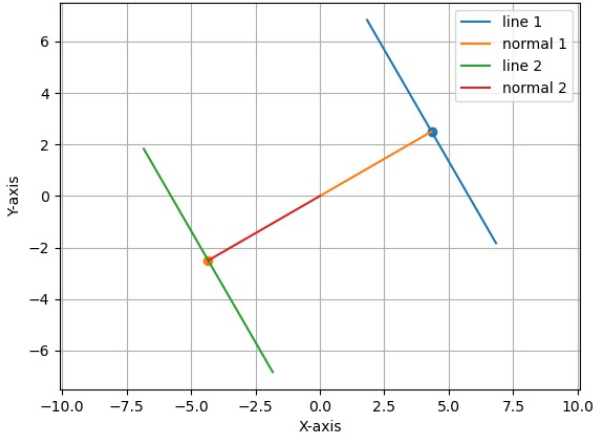


Fig. 1: Triangle ABC

The normal vector to the given lines are,

$$\mathbf{n}_1 = \begin{pmatrix} \cos(30) \\ \sin(30) \end{pmatrix} = \begin{pmatrix} \frac{\sqrt{3}}{2} \\ \frac{1}{2} \end{pmatrix} \quad (1.0.1)$$

The perpendicular distance to the line is,

$$d = 5 \quad (1.0.2)$$

Let the equation of the line be,

$$\mathbf{n}^T \mathbf{x} - c = 0 \quad (1.0.3)$$

Then, the perpendicular distance to the line from any point \mathbf{x} is,

$$d = \frac{|\mathbf{n}_1^T \mathbf{x} - c|}{\|\mathbf{n}_1\|} \quad (1.0.4)$$

$$5 = \frac{\left| \begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \end{pmatrix} \begin{pmatrix} 0 \\ 0 \end{pmatrix} - c \right|}{\left\| \begin{pmatrix} \frac{\sqrt{3}}{2} \\ \frac{1}{2} \end{pmatrix} \right\|} \quad (1.0.5)$$

$$5 = \frac{|c|}{1} \quad (1.0.6)$$

$$c = 5 \text{ or } c = -5 \quad (1.0.7)$$

Hence, the equation of the lines is,

$$\begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \end{pmatrix} \mathbf{x} - 5 = 0 \quad (1.0.8)$$

$$\begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{-1}{2} \end{pmatrix} \mathbf{x} + 5 = 0 \quad (1.0.9)$$