

Quiz 7

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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.

The normal vector to the given line is,

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

The perpendicular distance to the line is,

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

Let the equation of the line be,

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

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

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

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

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

$$c = 5 \quad (1.0.7)$$

Hence, the equation of the line is,

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