

Quiz 7

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Abstract—This document contains the solution of the question from NCERT 11th standard chapter 10 exercise 10.4 problem 21

1 EXERCISE 10.4

- 1) Find the equation of line which is equidistant from parallel lines $9x + 6y - 7 = 0$ and $3x + 2y + 6 = 0$.

Equation of line 1 is,

$$(9 \ 6)\mathbf{x} = 7 \quad (1.0.1)$$

$$(3 \ 2)\mathbf{x} = \frac{7}{3} \quad (1.0.2)$$

Equation of line 2 is,

$$(3 \ 2)\mathbf{x} = -6 \quad (1.0.3)$$

The equation of the equidistant line will be of the form,

$$(3 \ 2)\mathbf{x} = c \quad (1.0.4)$$

If,

$$\mathbf{n}^\top \mathbf{x} = c_1 \quad (1.0.5)$$

$$\mathbf{n}^\top \mathbf{x} = c_2 \quad (1.0.6)$$

are two parallel lines then the distance between these two lines is,

$$d = \frac{|c_1 - c_2|}{\|\mathbf{n}\|} \quad (1.0.7)$$

We need to find c such that,

$$\frac{|c - c_1|}{\|\mathbf{n}\|} = \frac{|c - c_2|}{\|\mathbf{n}\|} \quad (1.0.8)$$

where,

$$\mathbf{n} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad (1.0.9)$$

$$\frac{|c - c_1|}{\|\mathbf{n}\|} = \frac{|c - c_2|}{\|\mathbf{n}\|} \quad (1.0.10)$$

$$\left| c - \frac{7}{3} \right| = |c - (-6)| \quad (1.0.11)$$

$$\frac{7}{3} - c = c + 6 \quad (1.0.12)$$

$$2c = \frac{7}{3} - 6 = \frac{-11}{3} \quad (1.0.13)$$

$$c = \frac{-11}{6} \quad (1.0.14)$$

Hence, the equation of the line that is equidistant to parallel lines,

$$(9 \ 6)\mathbf{x} = 7 \quad (1.0.15)$$

$$(3 \ 2)\mathbf{x} = -6 \quad (1.0.16)$$

is,

$$(3 \ 2)\mathbf{x} = -\frac{11}{6} \quad (1.0.17)$$