Exercise 3D

Question 11:

$(3k + 1)x + 3y - 2 = 0$

$\left(k^2 + 1\right)x + (k - 2)y - 5 = 0$

these equations are of the form

$a_1x + b_1y + c_1 = 0,\ a_2x + b_2y + c_2 = 0$

$a_1 = (3k + 1),\ b_1 = 3,\ c_1 = -2$ and

$a_2 = \left(k^2 + 1\right),\ b_2 = (k - 2),\ c_2 = -5$

for no solution, we must have $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$

now, $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$

$\dfrac{3k + 1}{k^2 + 1} = \dfrac{3}{k - 2} \neq \dfrac{-2}{-5}$

$\Rightarrow \dfrac{3k + 1}{k^2 + 1} = \dfrac{3}{k - 2}$ and $\dfrac{3}{k - 2} \neq \dfrac{2}{5}$

$(3k + 1)(k - 2) = 3\left(k^2 + 1\right)$ and $2(k - 2) \neq 15$

$\Rightarrow 3k^2 + k - 6k - 2 = 3k^2 + 3$ and $2k - 4 \neq 15$

$\Rightarrow k = -1$ and $k \neq \dfrac{19}{2}$

Thus, $k = -1$ also satisfy the condition

$k \neq \dfrac{19}{2}$

Hence, the given system will have no solution when k = -1

Question 12:

The given equations are

$3x - y - 5 = 0$ —(1)

$6x - 2y + k = 0$ —(2)

Here, $a_1 = 3, b_1 = -1, c_1 = -5$

$a_2 = 6, b_2 = -2, c_2 = k$

$\therefore \dfrac{a_1}{a_2} = \dfrac{3}{6} = \dfrac{1}{2}, \dfrac{b_1}{b_2} = \dfrac{-1}{-2} = \dfrac{1}{2}, \dfrac{c_1}{c_2} = \dfrac{-5}{k}$

Equations (1) and (2) have no solution, if

$\dfrac{-5}{k} \neq \dfrac{1}{2}$ or $k \neq -10$

Question 13:

$kx + 2y - 5 = 0$

$3x + y - 1 = 0$

These equations are of the form

$a_1x + b_1y + c_1 = 0, \quad a_2x + b_2y + c_2 = 0$

Where, $a_1 = k, b_1 = 2, c_1 = -5$

$a_2 = 3, b_2 = 1, c_2 = -1$

For unique solution, we must have $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$

Now, $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$ i.e., $\dfrac{k}{3} \neq \dfrac{2}{1}$

$k \neq 6$

Thus, for all real values of k other than 6, the given system of equations will have a unique solution

********** END *********