Mathematics

Chapter 3 –Pair of Linear Equations in Two Variables

Exercise 3.1

(….Contd)

2) Soln: (ii) Given expressions;

$9x + 3y + 12 = 0$

$18x + 6y + 24 = 0$

Comparing these equations with $a_1x + b_1y + c_1 = 0$

And $a_2x + b_2y + c_2 = 0$

We get,

$a_1 = 9, b_1 = 3, c_1 = 12$

$a_2 = 18, b_2 = 6, c_2 = 24$

$(a_1 / a_2) = 9 / 18 = 1 / 2$

$(b_1 / b_2) = 3 / 6 = 1 / 2$

$(c_1/c_2) = 12 / 24 = 1 / 2$

Since $(a_1 / a_2) = (b_1 / b_2) = (c_1 / c_2)$

So, the pairs of equations given in the question have infinite possible solutions and the lines are coincident.

2) (iii) Given Expressions;

$6x – 3y + 10 = 0$

$2x – y + 9 = 0$

Comparing these equations with $a_1x+b_1y+c_1 = 0$

And $a_2x+b_2y+c_2 = 0$

We get, $a_1 = 6, b_1 = -3, c_1 = 10$

$a_2 = 2, b_2 = -1, c_2 = 9$

$(a_1/a_2) = 6/2 = 3/1$

$(b_1/b_2) = -3/-1 = 3/1$

$(c_1/c_2) = 10/9$

Since $(a_1/a_2) = (b_1/b_2) \neq (c_1/c_A)$

So, the pairs of equations given in the question are parallel to each other and the lines never intersect each other at any point and there is no possible solution for the given pair of equations.

3. On comparing the ratio, $\frac{a_1}{a_2}, \frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, find out whether the following pair of linear equations are consistent, or inconsistent.

(i) $3x + 2y = 5 ; \quad 2x - 3y = 7$ (ii) $2x - 3y = 8 ; \quad 4x - 6y = 9$

iii) $\frac{3}{2}x + \frac{5}{3}y = 7 ; 9x - 10y = 14$ (iv) $5x - 3y = 11 ; -10x + 6y = -22$

(v) $\frac{4}{3}x + 2y = 8 ; 2x + 3y = 12$

Soln:

(i) Given : $3x + 2y = 5$ or $3x + 2y -5 = 0$ and $2x – 3y = 7$ or $2x – 3y -7 = 0$

Comparing these equations with $a_1x+b_1y+c_1 = 0$

And $a_2x+b_2y+c_2 = 0$

We get, $a_1 = 3, b_1 = 2, c_1 = -5$

$a_2 = 2, b_2 = -3, c_2 = -7$

$(a_1/a_2) = 3/2$

$(b_1/b_2) = 2/-3$

$(c_1/c_2) = -5/-7 = 5/7$

Since, $(a_1/a_2) \neq (b_1/b_2)$

So, the given equations intersect each other at one point and they have only one possible solution. The equations are consistent.

(ii) Given $2x – 3y = 8$ and $4x – 6y = 9$

Therefore, $a_1 = 2, b_1 = -3, c_1 = -8$

$a_2 = 4, b_2 = -6, c_2 = -9$

$(a_1/a_2) = 2/4 = 1/2$

$(b_1/b_2) = -3/-6 = 1/2$

$(c_1/c_2) = -8/-9 = 8/9$

Since , $(a_1/a_2) = (b_1/b_2) \neq (c_1/c_2)$

So, the equations are parallel to each other and they have no possible solution. Hence, the equations are inconsistent.

(iii)Given

$\frac{3}{2}x + \frac{5}{3}y = 7 ; 9x - 10y = 14$

Therefore,

$a_1 = 3/2, b_1 = 5/3, c_1 = -7$

$a_2 = 9, b_2 = -10, c_2 = -14$

$(a_1/a_2) = 3/(2\times9) = 1/6$

$(b_1/b_2) = 5/(3\times -10)= -1/6$

$(c_1/c_2) = -7/-14 = 1/2$

Since, $(a_1/a_2) \neq (b_1/b_2)$

So, the equations are intersecting each other at one point and they have only one possible solution. Hence, the equations are consistent.

(iv) Given, $5x – 3y = 11$ and $– 10x + 6y = –22$

Therefore,

$a_1 = 5, b_1 = -3, c_1 = -11$

$a_2 = -10, b_2 = 6, c_2 = 22$

$(a_1/a_2) = 5/(-10) = -5/10 = -1/2$

$(b_1/b_2) = -3/6 = -1/2$

$(c_1/c_2) = -11/22 = -1/2$

Since $(a_1/a_2) = (b_1/b_2) = (c_1/c_2)$

These linear equations are coincident lines and have infinite number of possible solutions. Hence, the equations are consistent.

(v) Given,

$\frac{4}{3}x + 2y = 8 ; 2x + 3y = 12$

$a_1 = 4/3, b_1= 2 , c_1 = -8$

$a_2 = 2, b_2 = 3 , c_2 = -12$

$(a_1/a_2) = 4/(3\times2)= 4/6 = 2/3$

$(b_1/b_2) = 2/3$

$(c_1/c_2) = -8/-12 = 2/3$

Since $(a_1/a_2) = (b_1/b_2) = (c_1/c_2)$

These linear equations are coincident lines and have infinite number of possible solutions. Hence, the equations are consistent.

4. Which of the following pairs of linear equations are consistent/ inconsistent? If consistent, obtain the solution graphically:

(i) $x + y = 5, \quad 2x + 2y = 10$

(ii) $x – y = 8, \quad 3x – 3y = 16$

(iii) $2x + y – 6 = 0, \quad 4x – 2y – 4 = 0$

(iv) $2x – 2y – 2 = 0, \quad 4x – 4y – 5 = 0$

Solutions:

(i) Given, $x + y = 5$ and $2x + 2y = 10$

$(a_1/a_2) = 1/2$

$(b_1/b_2) = 1/2$

$(c_1/c_2) = 1/2$

Since $(a_1/a_2) = (b_1/b_2) = (c_1/c_2)$

∴The equations are coincident and they have infinite number of possible solutions.