No. 10

Elimination Method

Elimination Method

Q. x - y - 7 = 0,   x + y - 11 = 0

Sol. 1x - 1y = 7 ..... (i)

1x + 1y = 11 ..... (ii)

Adding (i) and (ii)

$$x - \cancel{y} = 7$$

$$x + \cancel{y} = 11$$

$$2x = 18$$

$$\boxed{x = 9}$$

Substituti

As Signs

We have to substitute x = 9

How to eliminate ?

Either by adding or subtracting

Either equation (i) or equation (ii)

Whichever variable's coefficient is same

No. 11

Q. Solve the following pair of linear equations by the elimination method (and the substitution method)

(ii) $3x + 4y - 10 = 0$ and $2x - 2y - 2 = 0$

Soln. Elimination method

$3x + 4y = 10$ ... (i)

$2x - 2y = 2$ ... (ii)

Multiplying (ii) by 2, we get

$4x - 4y = 4$ ... (iii)

$3x + 4y = 10$ ... (i)

Ad

First in

th

7x

x =

x

Substituting x = 2 in (i)

$3(2) + 4y = 10$

$6 + 4y = 10$

$4y = 10 - 6$

To ... have to

Which variable can be

Number

equation as e

... of Y

To remove y, we need to add

... have to

... by 3

As Signs are different

We have to substitute x = 2

Either equation (i),(ii) or equation (iii)

Here coefficent of y is same

No. 12

Q. Solve the following pair of linear equations by the elimination method (and the substitution method)

(i) $x + y - 5 = 0$ and $2x - 3y - 4 = 0$

Soln. Elimination method

$x + y = 5$ ... (i)

$2x - 3y = 4$ ... (ii)

Multiplying eq^n (i) by 2, we get

$+2x + 2y = 10$ ... (iii)

$+2x - 3y = 4$ ... (ii)

Subtracting eq^n (ii) from eq^n (iii)

$\cancel{2x} + 2y = 10$ ... (iii)

$\cancel{2x} - 3y = 4$ ... (ii)

$-\quad +\quad -$

$5y = 6$

$$y = \frac{6}{5}$$

Substituting $y = \frac{6}{5}$ in (i)

$x + \frac{6}{}$ ...

To make th... mult...

We can eliminate x by subtracting

As Signs are same

OR

...ble on L.H.S and constant on R.H.S

$\frac{6}{5}$

To make the coefficient of y same we will have to multiplying equation (i) by 3

throughout by 5

No. 13

(iv) $\frac{x}{2} + \frac{2y}{3} + 1 = 0$ and $x - \frac{y}{3} - 3 = 0$

Soln. Elimination method

$\frac{x}{2} + \frac{2y}{3} = -1$ ... (i)

x −

Multiplying

3x

Multiplying thr

$3x \; -1y$

$3x + 4y = -6$

Subtracting eqⁿ (iv) fr

$\cancel{3x} + 4y = -6$

$\cancel{3x} - y = 9$

$- \quad + \quad -$

$5y = -15$

We need to eith

x or rem

Number the equation as equation (iv)

Which variable can be

To remove x, we need to subtract

es !!

L.C.M. of 3 is 3

n eqⁿ (iii), we get

coefficient

As Signs are same

x + 4(-3) = -6

Are coefficient

6

12

Either equa

equati

Number the equation as equation (iii)

x = 2

Solution is x = 2, y = – 3

No. 14

Q.] Solve the following pair of linear equations by the elimination method

$3x - 5y - 4 = 0$ and $9x = 2y + 7$

Soln. Elimination method

$$3x - 5y = 4 \quad \text{... (i)}$$
$$9x - 2y = 7 \quad \text{... (ii)}$$

Multiplying (i) by 3, we get

$$9x - 15y = 12 \quad \text{... (iii)}$$
$$9x - 2y = 7 \quad \text{... (i)}$$

Subtracting (i) from (iii)

$$\cancel{9x} - 15y = 12$$
$$\underset{-}{\cancel{9x}} \underset{+}{-} 2y = \underset{-}{7}$$

$$-13y = 5$$

$$y = -\frac{5}{13}$$

Substituting $y = -\frac{5}{13}$

$$3x - 5\left(-\frac{5}{13}\right) = 4$$

$$3x + \frac{25}{13} = 4$$

$$3x = 4 - \frac{25}{13}$$

$$3x = \frac{52 - 25}{13}$$

$$3x = \frac{27}{13}$$

$$x = \frac{27}{39}$$

$$x = \frac{9}{13}$$

$$\boxed{\text{Solution is } x = \frac{9}{13}, \; y = -\frac{5}{13}}$$

To remove x, we need to Subtract

No. 15

Cross Multiplication Method

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

$$\begin{array}{ccccccc} & x & & y & & 1 & \\ b_1 & & c_1 & & a_1 & & b_1 \\ b_2 & & c_2 & & a_2 & & b_2 \end{array}$$

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{y}{c_1a_2 - c_2a_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Q. Solve the following pair of linear equations by the substitution method and cross multiplication.

(i) $8x + 5y = 9$

$3x + 2y = 4$

(ii) By Cross Multiplication Method

Soln. $8x + 5y - 9 = 0$ … (i)

$3x + 2y - 4 = 0$ … (ii)

Comparing equation (i) with $a_1x + b_1y + c_1 = 0$

and equation (ii) with $a_2x + b_2y + c_2 = 0$

We get $a_1 = 8$ $\quad b_1 = 5$ $\quad c_1 = -9$

$a_2 = 3$ $\quad b_2 = 2$ $\quad c_2 = -4$

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{y}{c_1a_2 - c_2a_1} = \frac{1}{a_1b_2 - a_2b_1}$$

$$\frac{x}{-20 - (-18)} = \frac{y}{-27 - (-32)} = \frac{1}{16 - 15}$$

$$\therefore \frac{x}{-2} = \frac{y}{5} = \frac{1}{1}$$

By Cross Multiplication Method

Solution is x = -2, y = 5

8 x 2 = 16

3 x 5 = 15

No. 16

Q. Which of the following pairs of linear equations has unique solution, no solution, or infinitely many solutions. In case there is a unique solution, find it by using cross multiplication method : $2x + y = 5$, $3x + 2y = 8$

Sol : $2x + y - 5 = 0$ ... (i)

$3x + 2y - 8 = 0$ ... (ii)

Comparing equation (i) with $a_1x + b_1y + c_1 = 0$

and equation (ii) with $a_2x + b_2y + c_2 = 0$

We get $a_1 = 2$, $b_1 = 1$, $c_1 = -5$

$a_2 = 3$, $b_2 = 2$, $c_2 = -8$

$$\frac{a_1}{a_2} = \frac{2}{3} \quad \text{... (iii)}$$

$$\frac{b_1}{b_2} = \frac{1}{2} \quad \text{... (iv)}$$

$$\frac{c_1}{c_2} = \frac{-5}{-8} = \frac{5}{8} \quad \text{... (v)}$$

From (iii), (iv) and (v)

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

$\therefore$ The given pair of linear equations has a unique solution.

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{y}{c_1a_2 - c_2a_1} = \frac{1}{a_1b_2 - a_2b_1}$$

$$\therefore \frac{x}{-8 - (-10)} = \frac{y}{-15 - (-16)} = \frac{1}{4 - 3}$$

$$\therefore \frac{x}{2} = \frac{y}{1} = \frac{1}{1}$$

$\therefore$

$\therefore$

So

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ Equations has unique solution (Consistent)

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ Equations has no solution (Inconsistent)

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ Equations has infinite solutions (Consistent)

No. 17

Q. Which of the following pairs of linear equations has unique solution, no solution, or infinitely many solutions. In case there is a unique solution, find it by using cross multiplication method :

$3x - 5y = 20$; $6x - 10y = 40$

Sol :

$3x - 5y - 20 = 0$ ... (i)

$6x - 10y - 40 = 0$ ... (ii)

Comparing equation (i) with $a_1x + b_1y + c_1 = 0$

and equation (ii) with $a_2x + b_2y + c_2 = 0$

We get $a_1 = 3$, $b_1 = -5$, $c_1 = -20$

$a_2 = 6$, $b_2 = -10$, $c_2 = -40$

$$\frac{a_1}{a_2} = \frac{3}{6} = \frac{1}{2} \quad \text{... (iii)}$$

$$\frac{b_1}{b_2} = \frac{-5}{-10} = \frac{1}{2} \quad \text{... (iv)}$$

$$\frac{c_1}{c_2} = \frac{-20}{-40} = \frac{1}{2} \quad \text{... (v)}$$

From (iii), (iv) and (v)

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$\therefore$ The two lines are coincident, so they have infinitely many solutions.

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ Equations has unique solution (Consistent)

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ Equations has no solution (Inconsistent)

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ Equations has infinite solutions (Consistent)

Thank You