In each of the following systems of equation determine whether the system has a unique solution, no solution or infinite solutions. In case there is a unique solution, find it from 1 to 4:

(1) $x - 3y - 3 = 0$

$3x - 9y - 2 = 0$

Soln:

The given system may be written as

$x - 3y - 3 = 0 \quad 3x - 9y - 2 = 0$

The given system of equation is of the form

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

Where, $a_1 = 1, b_1 = -3, c_1 = -3$

$a_2 = 3, b_2 = -9, c_2 = -2$

We have,

$\frac{a_1}{a_2} = \frac{1}{3} \quad \frac{b_1}{b_2} = \frac{-3}{-9} = \frac{1}{3}$

And , $\frac{c_1}{c_2} = \frac{-3}{-2} = \frac{3}{2}$

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

Therefore, the given equation has no solution.

(2) $2x + y - 5 = 0$

$4x + 2y - 10 = 0$

Soln:

The given system may be written as

$2x + y - 5 = 0 \quad 4x + 2y - 10 = 0$

The given system of equation is of the form

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

Where, $a_1 = 2, b_1 = 1, c_1 = -5$

$a_2 = 4, b_2 = 2, c_2 = -10$

We have,

a_1a_2=24=12 $\frac{a_1}{a_2}=\frac{2}{4}=\frac{1}{2}$ b_1b_2=12 $\frac{b_1}{b_2}=\frac{1}{2}$

And , c_1c_2=-5-10=12 $\frac{c_1}{c_2}=\frac{-5}{-10}=\frac{1}{2}$

So, a_1a_2=b_1b_2=c_1c_2 $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

Therefore, the given equation has infinitely many solution.

(3) 3x−5y=20$3x-5y=20$

6x−10y=40$6x-10y=40$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

Where, $a_1=3,b_1=-5,c_1=-20$ $a_1=3, b_1=-5, c_1=-20$

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

We have,

a_1a_2=36=12 $\frac{a_1}{a_2}=\frac{3}{6}=\frac{1}{2}$ b_1b_2=-5-10=12 $\frac{b_1}{b_2}=\frac{-5}{-10}=\frac{1}{2}$

And , c_1c_2=-20-40=12 $\frac{c_1}{c_2}=\frac{-20}{-40}=\frac{1}{2}$

So, a_1a_2=b_1b_2=c_1c_2 $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

Therefore, the given equation has infinitely many solution.

(4) x−2y−8=0$x-2y-8=0$

5x−10y−10=0$5x-10y-10=0$

Soln:

The given system may be written as

x−2y−8=0$x-2y-8=0$ 5x−10y−10=0$5x-10y-10=0$

The given system of equation is of the form

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

Where, $a_1=1,b_1=-2,c_1=-8$ $a_1=1, b_1=-2, c_1=-8$

$a_2 = 5, b_2 = -10, c_2 = -10$

We have,

$\frac{a_1}{a_2} = \frac{1}{5}$ $\frac{b_1}{b_2} = \frac{-2}{-10} = \frac{1}{5}$

And , $\frac{c_1}{c_2} = \frac{-8}{-10} = \frac{4}{5}$

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

Therefore, the given equation has no solution.

Find the value of k for each of the following system of equations which have a unique solution (5-8)

(5) $kx + 2y - 5 = 0$

$3x + y - 1 = 0$

Soln:

The given system may be written as

$kx + 2y - 5 = 0$ $3x + y - 1 = 0$

The given system of equation is of the form

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

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

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

For unique solution,we have

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\frac{k}{3} \neq \frac{2}{1}$ $\Rightarrow k \neq 6$

Therefore, the given system will have unique solution for all real values of k other than 6.

(6) $4x + ky + 8 = 0$

$2x + 2y + 2 = 0$

Soln:

The given system may be written as

$4x + ky + 8 = 0$ $2x + 2y + 2 = 0$

The given system of equation is of the form

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

Where, $a_1=4, b_1=k, c_1=8$ $a_1 = 4, b_1 = k, c_1 = 8$

$a_2=2, b_2=2, c_2=2$ $a_2 = 2, b_2 = 2, c_2 = 2$

For unique solution,we have

$a_1 a_2 \neq b_1 b_2$ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $42 \neq k2$ $\frac{4}{2} \neq \frac{k}{2}$ $\Rightarrow k \neq 4 \Rightarrow$ $k \neq 4$

Therefore, the given system will have unique solution for all real values of k other than 4.

(7) **$4x-5y=k$** $4x - 5y = k$

$2x-3y=12$ $2x - 3y = 12$

Soln:

The given system may be written as

$4x-5y-k=0$ $4x - 5y - k = 0$ $2x-3y-12=0$ $2x - 3y - 12 = 0$

The given system of equation is of the form

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

Where, $a_1=4, b_1=-5, c_1=-k$ $a_1 = 4, b_1 = -5, c_1 = -k$

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

For unique solution,we have

$a_1 a_2 \neq b_1 b_2$ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $42 \neq -5-3$ $\frac{4}{2} \neq \frac{-5}{-3}$

$\Rightarrow k \Rightarrow$ k can have any real values.

Therefore, the given system will have unique solution for all real values of k.

(8) **$x+2y=3$** $x + 2y = 3$

$5x+ky+7=0$ $5x + ky + 7 = 0$

Soln:

The given system may be written as

$x+2y=3$ $x + 2y = 3$ $5x+ky+7=0$ $5x + ky + 7 = 0$

The given system of equation is of the form

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

Where, $a_1=1, b_1=2, c_1=-3$ $a_1 = 1, b_1 = 2, c_1 = -3$

$a_2=5, b_2=k, c_2=7$ $a_2 = 5, b_2 = k, c_2 = 7$

For unique solution,we have

$a_1a_2 \neq b_1b_2 \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $15 \neq 2k \frac{1}{5} \neq \frac{2}{k}$ $\Rightarrow k \neq 10 \Rightarrow k \neq 10$

Therefore, the given system will have unique solution for all real values of k other than 10.

Find the value of k for which each of the following system of equations having infinitely many solution: (9-19)

(9) $\mathbf{2x+3y-5=0} 2x + 3y - 5 = 0$

$\mathbf{6x-ky-15=0} 6x - ky - 15 = 0$

Soln:

The given system may be written as

$2x+3y-5=0 2x + 3y - 5 = 0$ $6x-ky-15=0 6x - ky - 15 = 0$

The given system of equation is of the form

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

Where, $a_1=2,b_1=3,c_1=-5 a_1 = 2, b_1 = 3, c_1 = -5$

$a_2=6,b_2=k,c_2=-15 a_2 = 6, b_2 = k, c_2 = -15$

For unique solution,we have

$a_1a_2 = b_1b_2 = c_1c_2 \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $26 \neq 3k \frac{2}{6} \neq \frac{3}{k}$ $\Rightarrow k=9 \Rightarrow k = 9$

Therefore, the given system of equation will have infinitely many solutions, if k=9.

(10) $\mathbf{4x+5y=3} 4x + 5y = 3$

$\mathbf{kx+15y=9} kx + 15y = 9$

Soln:

The given system may be written as

$4x+5y=3 4x + 5y = 3$ $kx+15y=9 kx + 15y = 9$

The given system of equation is of the form

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

Where, $a_1=4,b_1=5,c_1=3 a_1 = 4, b_1 = 5, c_1 = 3$

$a_2=k,b_2=15,c_2=9 a_2 = k, b_2 = 15, c_2 = 9$

For unique solution,we have

$a_1a_2 = b_1b_2 = c_1c_2 \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $4k = 515 = -3-9 \frac{4}{k} = \frac{5}{15} = \frac{-3}{-9}$ $4k = 13 \frac{4}{k} = \frac{1}{3}$ $\Rightarrow k \neq 12 \Rightarrow k \neq 12$

Therefore, the given system will have infinitely many solutions if k=12.

(11) $kx-2y+6=0$

$4x+3y+9=0$

Soln:

The given system may be written as

$kx-2y+6=0 \quad 4x+3y+9=0$

The given system of equation is of the form

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

Where, $a_1=k, b_1=-2, c_1=6$

$a_2=4, b_2=-3, c_2=9$

For unique solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2} \quad \frac{k}{4}=\frac{-2}{-3}=\frac{2}{3} \Rightarrow k=\frac{8}{3}$

Therefore, the given system of equations will have infinitely many solutions, if $k=\frac{8}{3}$.

(12) $8x+5y=9$

$kx+10y=19$

Soln:

The given system may be written as

$8x+5y=9 \quad kx+10y=19$

The given system of equation is of the form

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

Where, $a_1=8, b_1=5, c_1=-9$

$a_2=k, b_2=10, c_2=-18$

For unique solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2} \quad \frac{8}{k}=\frac{5}{10}=\frac{-9}{-18}=\frac{1}{2} \Rightarrow k=16$

Therefore, the given system of equations will have infinitely many solutions, if $k=16$.

(13) $2x-3y=7$

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

Soln:

The given system may be written as

$2x-3y=7$ $2x-3y=7$ $(k+2)x-(2k+1)y=3(2k-1)$ $(k+2)x-(2k+1)y=3(2k-1)$

The given system of equation is of the form

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

Where, $a_1=2,b_1=-3,c_1=-7$ $a_1=2,b_1=-3,c_1=-7$

$a_2=k,b_2=-(2k+1),c_2=-3(2k-1)$ $a_2=k,b_2=-(2k+1),c_2=-3(2k-1)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $2k+2=-3-(2k+1)=-7-3(2k-1$ $\frac{2}{k+2}=\frac{-3}{-(2k+1)}=\frac{-7}{-3(2k-1}$ $2k+2=-3-(2k+1)$ and $-3-(2k+1)=-7-3(2k-1$ $\frac{2}{k+2}=\frac{-3}{-(2k+1)}$ and $\frac{-3}{-(2k+1)}=\frac{-7}{-3(2k-1}$ $\Rightarrow 2(2k+1)=3(k+2) \text{and} 3\times3(2k-1)=7(2k+1)$

$\Rightarrow 2(2k+1)=3(k+2)$ and $3\times3(2k-1)=7(2k+1)$ $\Rightarrow 4k+2=3k+6 \text{and} 18k-9=14k+7$

$\Rightarrow 4k+2=3k+6$ and $18k-9=14k+7$ $\Rightarrow k=4 \text{and} 4k=16 \Rightarrow k=4$ $\Rightarrow k=4$ and $4k=16 \Rightarrow k=4$

Therefore, the given system of equations will have infinitely many solutions, if $k=4$ $k=4$.

(14) **$2x+3y=2$**$2x+3y=2$

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

Where, $a_1=2,b_1=3,c_1=-2$ $a_1=2,b_1=3,c_1=-2$

$a_2=(k+2),b_2=(2k+1),c_2=-2(k-1)$ $a_2=(k+2),b_2=(2k+1),c_2=-2(k-1)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $2k+2=3(2k+1)=-2-2(k-1$

$\frac{2}{k+2}=\frac{3}{(2k+1)}=\frac{-2}{-2(k-1}$ $2k+2=3(2k+1)$ and $3(2k+1)=22(k-1$

$\frac{2}{k+2}=\frac{3}{(2k+1)}$ and $\frac{3}{(2k+1)}=\frac{2}{2(k-1}$ $\Rightarrow 2(2k+1)=3(k+2) \text{and} 3(k-1)=(2k+1)$

$\Rightarrow 2(2k+1)=3(k+2)$ and $3(k-1)=(2k+1)$ $\Rightarrow 4k+2=3k+6 \text{and} 3k-3=2k+1$

$\Rightarrow 4k+2=3k+6$ and $3k-3=2k+1$ $\Rightarrow k=4 \text{and} k=4$ $\Rightarrow k=4$ and $k=4$

Therefore, the given system of equations will have infinitely many solutions, if k=4$k = 4$.

(15) x+(k+1)y=4$x + (k + 1)y = 4$

(k+1)x+9y=(5k+2)$(k + 1)x + 9y = (5k + 2)$

Soln:

The given system may be written as

x+(k+1)y=4$x + (k + 1)y = 4$ (k+1)x+9y=(5k+2)$(k + 1)x + 9y = (5k + 2)$

The given system of equation is of the form

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

Where, $a_1=1, b_1=(k+1), c_1=-4$ $a_1 = 1, b_1 = (k + 1), c_1 = -4$

$a_2=(k+1), b_2=9, c_2=-(5k+2)$ $a_2 = (k + 1), b_2 = 9, c_2 = -(5k + 2)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ 1k+1=(k+1)9=−4−(5k+2 $\frac{1}{k+1} = \frac{(k+1)}{9} = \frac{-4}{-(5k+2}$ 1k+1=k+19 and k+19=45k+2

$\frac{1}{k+1} = \frac{k+1}{9}$ and $\frac{k+1}{9} = \frac{4}{5k+2}$ ⇒9=(k+1)^{2}and(k+1)(5k+2)=36

$\Rightarrow 9 = (k + 1)^2$ and $(k + 1)(5k + 2) = 36$ ⇒9=k^2+2k+1and5k^2+2k+5k+2=36

$\Rightarrow 9 = k^2 + 2k + 1$ and $5k^2 + 2k + 5k + 2 = 36$ ⇒k^2+2k−8=0and5k^2+7k−34=0

$\Rightarrow k^2 + 2k - 8 = 0$ and $5k^2 + 7k - 34 = 0$ ⇒k^2+4k−2k−8=0and5k^2+17k−10k−34=0

$\Rightarrow k^2 + 4k - 2k - 8 = 0$ and $5k^2 + 17k - 10k - 34 = 0$ ⇒k(k+4)−2(k+4)=0and(5k+17)−2(5k+17)=0

$\Rightarrow k(k + 4) - 2(k + 4) = 0$ and $(5k + 17) - 2(5k + 17) = 0$ ⇒(k+4)(k−2)=0and(5k+17)(k−2)=0

$\Rightarrow (k + 4)(k - 2) = 0$ and $(5k + 17)(k - 2) = 0$ ⇒k=−4ork=2andk=−175ork=2

$\Rightarrow k = -4$ or $k = 2$ and $k = \frac{-17}{5}$ or $k = 2$

thus, k=2 satisfies both the condition.

Therefore, the given system of equations will have infinitely many solutions, if k=2$k = 2$.

(16) kx+3y=2k+1$kx + 3y = 2k + 1$

2(k+1)x+9y=(7k+1)$2(k + 1)x + 9y = (7k + 1)$

Soln:

The given system may be written as

kx+3y=2k+1$kx + 3y = 2k + 1$ 2(k+1)x+9y=(7k+1)$2(k + 1)x + 9y = (7k + 1)$

The given system of equation is of the form

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

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

$a_2=2(k+1), b_2=9, c_2=-(7k+1)$ $a_2=2(k+1), b_2=9, c_2=-(7k+1)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $12(k+2)=39=-(2k+1)-(7k+1$ $\frac{1}{2(k+2)}=\frac{3}{9}=\frac{-(2k+1)}{-(7k+1}$ $12(k+2)=39$ and $39=(2k+1)(7k+1$ $\frac{1}{2(k+2)}=\frac{3}{9}$ and $\frac{3}{9}=\frac{(2k+1)}{(7k+1}$ $\Rightarrow 9k=3\times 2(k+1)$ and $3(7k+1)=9(2k+1)$

$\Rightarrow 9k=3\times 2(k+1)$ and $3(7k+1)=9(2k+1)$ $\Rightarrow 9k-6k=6$ and $21k-18k=9-3$

$\Rightarrow 9k-6k=6$ and $21k-18k=9-3$ $\Rightarrow 3k=6$ and $3k=6$ $\Rightarrow 3k=6$ and $3k=6$ $\Rightarrow k=2$ and $k=2$

$\Rightarrow k=2$ and $k=2$

Therefore, the given system of equations will have infinitely many solutions, if $k=2$ $k=2$.

(17) $2x+(k-2)y=k$ $2x+(k-2)y=k$

$6x+(2k-1)y=(2k+5)$ $6x+(2k-1)y=(2k+5)$

Soln:

The given system may be written as

$2x+(k-2)y=k$ $2x+(k-2)y=k$ $6x+(2k-1)y=(2k+5)$ $6x+(2k-1)y=(2k+5)$

The given system of equation is of the form

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

Where, $a_1=2, b_1=(k-2), c_1=-k$ $a_1=2, b_1=(k-2), c_1=-k$

$a_2=6, b_2=(2k-1), c_2=-(2k+5)$ $a_2=6, b_2=(2k-1), c_2=-(2k+5)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $26=k-22k-1=-k-2(2k+5)$ $\frac{2}{6}=\frac{k-2}{2k-1}=\frac{-k}{-2(2k+5)}$ $26=k-22k-1$ and $k-22k-1=k(2k+5$ $\frac{2}{6}=\frac{k-2}{2k-1}$ and $\frac{k-2}{2k-1}=\frac{k}{(2k+5}$ $13=k-22k-1$ and $2k^2+5k-4k-10=2k^2-k$

$\frac{1}{3}=\frac{k-2}{2k-1}$ and $2k^2+5k-4k-10=2k^2-k$ $\Rightarrow 2k-3k=-6+1$ and $k+k=10$

$\Rightarrow 2k-3k=-6+1$ and $k+k=10$ $\Rightarrow -k=-5$ and $2k=10$ $\Rightarrow -k=-5$ and $2k=10$ $\Rightarrow k=5$ and $k=5$

$\Rightarrow k=5$ and $k=5$

Therefore, the given system of equations will have infinitely many solutions, if $k=5$ $k=5$.

(18) $2x+3y=7$ $2x+3y=7$

$(k+1)x+(2k-1)y=(4k+1)$ $(k+1)x+(2k-1)y=(4k+1)$

Soln:

The given system may be written as

$2x+3y=7$ $2x+3y=7$ $(k+1)x+(2k-1)y=(4k+1)$ $(k+1)x+(2k-1)y=(4k+1)$

The given system of equation is of the form

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

Where, $a_1=2, b_1=3, c_1=-7 \; a_1=2, b_1=3, c_1=-7$

$a_2=k+1, b_2=2k-1, c_2=-(4k+1) \; a_2=k+1, b_2=2k-1, c_2=-(4k+1)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2 \; \frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $\quad 2k+1=32k-1=-7-(4k+1) \; \frac{2}{k+1}=\frac{3}{2k-1}=\frac{-7}{-(4k+1)}$ $\quad 2k+1=32k-1 \text{ and } 32k-1=7(4k+1)$
$\frac{2}{k+1}=\frac{3}{2k-1} \text{ and } \frac{3}{2k-1}=\frac{7}{(4k+1)}$ Extra close brace or missing open brace

$\Rightarrow 4k-2=3k+3 \text{and} 12k+3=14k-7$

$\Rightarrow 4k-2=3k+3 \text{ and } 12k+3=14k-7$ $\quad \Rightarrow k=5 \text{and} 2k=10 \Rightarrow k=5 \text{ and } 2k=10$ $\quad \Rightarrow k=5 \text{and} k=5$
$\Rightarrow k=5 \text{ and } k=5$

Therefore, the given system of equations will have infinitely many solutions, if $k=5 \; k=5$.

(19) $2x+3y=k \; 2x+3y=k$

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

Soln:

The given system may be written as

$2x+3y=k \; 2x+3y=k$ $\quad (k-1)x+(k+2)y=3k \; (k-1)x+(k+2)y=3k$

The given system of equation is of the form

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

Where, $a_1=2, b_1=3, c_1=-k \; a_1=2, b_1=3, c_1=-k$

$a_2=k-1, b_2=k+2, c_2=-3k \; a_2=k-1, b_2=k+2, c_2=-3k$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2 \; \frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $\quad 2k-1=3k+2=-k-3k \; \frac{2}{k-1}=\frac{3}{k+2}=\frac{-k}{-3k}$ $\quad 2k-1=3k+2 \text{ and } 3k+1=-k-3k$
$\frac{2}{k-1}=\frac{3}{k+2} \text{ and } \frac{3}{k+1}=\frac{-k}{-3k}$ Extra close brace or missing open brace

$2k+4=3k-3 \text{and} 9=k+2$

$\Rightarrow$ $\quad \Rightarrow k=7 \text{and} k=7 \Rightarrow k=7 \text{ and } k=7$

Therefore, the given system of equations will have infinitely many solutions, if $k=7 \; k=7$.

Find the value of k for which the following system of equation has no solution : (20-25)

(20) $kx-5y=2 \; kx-5y=2$

$6x + 2y = 7$

Soln:

The given system may be written as

$kx - 5y = 2$ $6x + 2y = 7$

The given system of equation is of the form

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

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

$a_2 = 6, b_2 = 2, c_2 = -7$

For no solution,we have

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $\frac{k}{6} = \frac{-5}{2} \neq \frac{2}{7}$ $\Rightarrow 2k = -30$ $\Rightarrow k = -15$

Therefore, the given system of equations will have no solutions, if $k = -15$.

(21) $x + 2y = 0$

$2x + ky = 5$

Soln:

The given system may be written as

$x2y = 0$ $2x + ky = 5$

The given system of equation is of the form

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

Where, $a_1 = 1, b_1 = 2, c_1 = 0$

$a_2 = 2, b_2 = k, c_2 = -5$

For no solution,we have

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $\frac{1}{2} = \frac{2}{k} \neq \frac{2}{7}$ $\Rightarrow k = 4$

Therefore, the given system of equations will have no solutions, if $k = 4$.

(22) $3x - 4y + 7 = 0$

$kx + 3y - 5 = 0$

Soln:

The given system may be written as

$3x - 4y + 7 = 0$ $kx + 3y - 5 = 0$

The given system of equation is of the form

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

Where, $a_1=3, b_1=-4, c_1=7$

$a_2=k, b_2=3, c_2=-5$

For no solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$ $\frac{3}{k}=\frac{-4}{3}$ $\Rightarrow k=\frac{-9}{4}$

Therefore, the given system of equations will have no solutions, if $k=\frac{-9}{4}$.

(23) $2x-ky+3=0$

$3x+2y-1=0$

Soln:

The given system may be written as

$2x-ky+3=0$ $3x+2y-1=0$

The given system of equation is of the form

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

Where, $a_1=2, b_1=-k, c_1=3$

$a_2=3, b_2=2, c_2=-1$

For no solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$ $\frac{2}{3}=\frac{-k}{2}$ $\Rightarrow k=\frac{-4}{3}$

Therefore, the given system of equations will have no solutions, if $k=\frac{-4}{3}$.

(24) $2x+ky-11=0$

$5x-7y-5=0$

Soln:

The given system may be written as

$2x+ky-11=0$ $5x-7y-5=0$

The given system of equation is of the form

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

Where, $a_1=2,b_1=k,c_1=-11$ $a_1 = 2, b_1 = k, c_1 = -11$

$a_2=5,b_2=-7,c_2=-5$ $a_2 = 5, b_2 = -7, c_2 = -5$

For no solution,we have

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $25=-k-7$ $\frac{2}{5} = \frac{-k}{-7}$ $\Rightarrow k=-145 \Rightarrow k = \frac{-14}{5}$

Therefore, the given system of equations will have no solutions, if $k=-145$ $k = \frac{-14}{5}$.

(25) **$kx+3y=3$** $kx + 3y = 3$

$12x+ky=6$ $12x + ky = 6$

Soln:

The given system may be written as

$kx+3y=3$ $kx + 3y = 3$ $12x+ky=6$ $12x + ky = 6$

The given system of equation is of the form

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

Where, $a_1=k,b_1=3,c_1=-3$ $a_1 = k, b_1 = 3, c_1 = -3$

$a_2=12,b_2=k,c_2=-6$ $a_2 = 12, b_2 = k, c_2 = -6$

For no solution,we have

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$k12=3k\neq 36$ $\frac{k}{12} = \frac{3}{k} \neq \frac{3}{6}$ ……(i)

$\Rightarrow k^2=36 \Rightarrow k^2 = 36$ $\Rightarrow k=+6 or -6 \Rightarrow k = +6 \text{ or } -6$

From (i)

$k12\neq 36$ $\frac{k}{12} \neq \frac{3}{6}$ $\Rightarrow k\neq 6 \Rightarrow k \neq 6$

Therefore, the given system of equations will have no solutions, if $k=-6$ $k = -6$.

(26) For what value of a, the following system of equation will be inconsistent?

$4x+6y-11=0$ $4x + 6y - 11 = 0$

$2x+ay-7=0$ $2x + ay - 7 = 0$

Soln:

The given system may be written as

$4x+6y-11=0 \quad 2x+ay-7=0$

The given system of equation is of the form

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

Where, $a_1=4, b_1=6, c_1=-11$

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

For unique solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2} \quad \frac{a_1}{a_2}=\frac{b_1}{b_2} \quad \frac{4}{2}=\frac{6}{a} \Rightarrow a=3$

Therefore, the given system of equations will be inconsistent, if $a=3$.

(27) For what value of a, the following system of equation have no solution?

$\mathbf{ax+3y=a-3}$

$\mathbf{12x+ay=a}$

Soln:

The given system may be written as

$ax+3y=a-3 \quad 12x+ay=a$

The given system of equation is of the form

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

Where, $a_1=a, b_1=3, c_1=-(a-3)$

$a_2=12, b_2=a, c_2=-a$

For unique solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2} \quad \frac{a}{12}=\frac{3}{a}\neq\frac{-(a-3)}{-a} \quad$ 3a≠frac−(a−3)−a

$\frac{3}{a}\neq$ frac−(a−3)−a $\quad \Rightarrow a-3\neq 3 \quad \Rightarrow a\neq 6$

And,

$\frac{a}{12}=\frac{3}{a} \quad \Rightarrow a^2=36 \quad \Rightarrow a=+6 \text{ or } -6$

$\because a\neq 6$

$\Rightarrow a=-6$

Therefore, the given system of equations will have no solution, if $a=-6$.

(28) Find the value of a,for which the following system of equation have

(i) Unique solution

(ii) No solution

$kx + 2y = 5$

$3x + y = 1$

Soln:

The given system may be written as

$kx + 2y - 5 = 0$ $3x + y - 1 = 0$

The given system of equation is of the form

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

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

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

(i) For unique solution, we have

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\frac{k}{3} \neq \frac{2}{1}$ $k \neq 6$

Therefore, the given system of equations will have unique solution, if $k \neq 6$.

(ii) For no solution, we have

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $\frac{k}{3} = \frac{2}{1} \neq \frac{-5}{-1}$ $\frac{k}{3} = \frac{2}{1}$ $\Rightarrow k = 6$

Therefore, the given system of equations will have no solution, if $a = 6$.

(29) For what value of c, the following system of equation have infinitely many solution (where $c \neq 0$)?

$6x + 3y = c - 3$

$12x + cy = c$

Soln:

The given system may be written as

$6x + 3y - (c - 3) = 0$ $12x + cy - c = 0$

The given system of equation is of the form

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

Where, $a_1=6, b_1=3, c_1=-(c-3)$ $a_1 = 6, b_1 = 3, c_1 = -(c-3)$

$a_2=12, b_2=c, c_2=-c$ $a_2 = 12, b_2 = c, c_2 = -c$

For infinitely many solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $612=3c=-(c-3)-c$ $\frac{6}{12} = \frac{3}{c} = \frac{-(c-3)}{-c}$ $12=3c$ and $3c=-(c-3)-c$

$\frac{1}{2} = \frac{3}{c}$ and $\frac{3}{c} = \frac{-(c-3)}{-c}$ $\Rightarrow c=6$ and $c-3=3$ $\Rightarrow c = 6$ and $c - 3 = 3$ $\Rightarrow c=6$ and $c=6$ $\Rightarrow c = 6$ and $c = 6$

Therefore, the given system of equations will have infinitely many solution, if $c=6$ $c = 6$.

(30) Find the value of k,for which the following system of equation have

(i) Unique solution

(ii) No solution

(iii) Infinitely many solution

$2x+ky=1$ $2x + ky = 1$

$3x-5y=7$ $3x - 5y = 7$

Soln:

The given system may be written as

$2x+ky=1$ $2x + ky = 1$ $3x-5y=7$ $3x - 5y = 7$

The given system of equation is of the form

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

Where, $a_1=2, b_1=k, c_1=-1$ $a_1 = 2, b_1 = k, c_1 = -1$

$a_2=3, b_2=-5, c_2=-7$ $a_2 = 3, b_2 = -5, c_2 = -7$

(i) For unique solution, we have

$a_1a_2 \neq b_1b_2$ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $23 \neq -k-5$ $\frac{2}{3} \neq \frac{-k}{-5}$ $k \neq -103$ $k \neq \frac{-10}{3}$

Therefore, the given system of equations will have unique solution, if $k \neq -103$ $k \neq \frac{-10}{3}$.

(ii) For no solution, we have

$a_1a_2=b_1b_2 \neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $23=k-5$ neq $-1-7$ $\frac{2}{3} = \frac{k}{-5}$ neq $\frac{-1}{-7}$ $23=k-5$ and $k-5$ neq 17

$\frac{2}{3} = \frac{k}{-5}$ and $\frac{k}{-5}$ neq $\frac{1}{7}$ $\Rightarrow k=-103$ and kneq -57 $\Rightarrow k = \frac{-10}{3}$ and kneq $\frac{-5}{7}$ $\Rightarrow k=-103$ $\Rightarrow k = \frac{-10}{3}$

Therefore, the given system of equations will have no solution, if $k=-103$ $k = \frac{-10}{3}$.

(iii) For the given system to have infinitely many solution,we have

$a_1a_2=b_1b_2=c_1c_2 \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $23=k-5=-1-7 \frac{2}{3} = \frac{k}{-5} = \frac{-1}{-7}$

Clearly $a_1a_2 \neq c_1c_2 \frac{a_1}{a_2} \neq \frac{c_1}{c_2}$,

So there is no value of k for which the given system of equation has infinitely many solution.

(31) For what value of k, the following system of equation will represent the coincident lines?

x+2y+7=0$x+2y+7=0$

2x+ky+14=0$2x+ky+14=0$

Soln:

The given system may be written as

x+2y+7=0$x+2y+7=0$ 2x+ky+14=0$2x+ky+14=0$

The given system of equation is of the form

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

Where, $a_1=1,b_1=2,c_1=7 a_1=1, b_1=2, c_1=7$

$a_2=2,b_2=k,c_2=14 a_2=2, b_2=k, c_2=14$

The given system of equation will represent the coincident lines if they have infinitely many solution.

$a_1a_2=b_1b_2=c_1c_2 \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $12=2k=714 \frac{1}{2} = \frac{2}{k} = \frac{7}{14}$ $12=2k=12 \frac{1}{2} = \frac{2}{k} = \frac{1}{2}$ $\Rightarrow k=4 \Rightarrow k=4$

Therefore, the given system of equations will have infinitely many solution, if k=4$k=4$.

(32) (30) Find the value of k,for which the following system of equation have unique solution.

ax+by=c$ax+by=c$

lx+my=n$lx+my=n$

Soln:

The given system may be written as

ax+by−c=0$ax+by-c=0$ lx+my−n=0$lx+my-n=0$

The given system of equation is of the form

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

Where, $a_1=a,b_1=b,c_1=-c a_1=a, b_1=b, c_1=-c$

$a_2 = l, b_2 = m, c_2 = -n$

For unique solution, we have

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow al \neq bm \Rightarrow \frac{a}{l} \neq \frac{b}{m} \Rightarrow am \neq bl$

Therefore, the given system of equations will have unique solution, if $am \neq bl$.

(33) Find the value of a and b such that the following system of linear equation have infinitely many solution:

$(2a-1)x+3y-5=0$

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

Soln:

The given system of equation may be written as,

$(2a-1)x+3y-5=0$ $3x+(b-1)y-2=0$

The given system of equation is of the form

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

Where, $a_1=(2a-1), b_1=3, c_1=-5$

$a_2=3, b_2=b-1, c_2=-2$

The given system of equation will have infinitely many solution, if

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $\frac{(2a-1)}{3} = \frac{3}{b-1} = \frac{-5}{-2}$ $\frac{(2a-1)}{3} = \frac{5}{2}$ and $\frac{3}{b-1} = \frac{5}{2}$

$\Rightarrow 2(2a-1) = 15$ and $6 = 5(b-1)$

$\Rightarrow 4a-2 = 15$ and $6 = 5b-5$

$\Rightarrow 4a = 17$ and $5b = 11$

$\Rightarrow a = \frac{17}{4}$ and $b = \frac{11}{5}$

(34) Find the value of a and b such that the following system of linear equation have infinitely many solution:

$2x-3y=7$

$(a+b)x-(a+b-3)y=4a+b$

Soln:

The given system of equation may be written as,

$2x-3y-7=0$ $(a+b)x-(a+b-3)y-(4a+b)=0$

The given system of equation is of the form

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

Where, $a_1=2, b_1=-3, c_1=-7$

$a_2=(a+b), b_2=-(a+b-3), c_2=-(4a+b)$

The given system of equation will have infinitely many solution, if

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

$$\frac{2}{(a+b)}=\frac{-3}{-(a+b-3)}=\frac{-7}{-(4a+b)}$$

$$\frac{2}{(a+b)}=\frac{3}{(a+b-3)} \text{ and } \frac{3}{(a+b-3)}=\frac{7}{(4a+b)}$$

$$\Rightarrow 2(a+b-3)=3(a+b) \text{ and } 3(4a+b)=7(a+b-3)$$

$$\Rightarrow 2a+2b-6=3a+3b \text{ and } 12a+3b=7a+7b-21$$

$$\Rightarrow a+b=-6 \text{ and } 5a-4b=-21$$

a+b= -6

$\Rightarrow a=-6-b$

Substituting the value of a in $5a-4b=-21$ we have

5(-b-6)-4b=-21

$\Rightarrow -5b-30-4b=-21$ $\Rightarrow 9b=-9$ $\Rightarrow b=-1$

As a=-6-b

$\Rightarrow a=-6+1=-5$

Hence the given system of equation will have infinitely many solution if

a=-5 and b=-1.

(35) Find the value of p and q such that the following system of linear equation have infinitely many solution:

$\mathbf{2x-3y=9}$

$\mathbf{(p+q)x+(2p-q)y=3(p+q+1)}$

Soln:

The given system of equation may be written as,

$2x-3y-9=0$ $(p+q)x+(2p-q)y-3(p+q+1)=0$

The given system of equation is of the form

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

Where, $a_1=2, b_1=3, c_1=-9$

$a_2=(p+q), b_2=(2p-q), c_2=-3(p+q+1)$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2 \frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ 2(p+q)=3(2p−q)=−9−3(p+q+1)

$\frac{2}{(p+q)}=\frac{3}{(2p-q)}=\frac{-9}{-3(p+q+1)}$ 2(p+q)=3(2p−q) and 3(2p−q)=3(p+q+1)

$\frac{2}{(p+q)}=\frac{3}{(2p-q)}$ and $\frac{3}{(2p-q)}=\frac{3}{(p+q+1)}$ 2(2p−q)=3(p+q)and(p+q+1)=2p−q

$2(2p-q)=3(p+q)$ and $(p+q+1)=2p-q$ ⇒4p−2q=3p+3qand−p+2q=−1

$\Rightarrow 4p-2q=3p+3q$ and $-p+2q=-1$ ⇒p=5qandp−2q=1⇒ $p=5q$ and $p-2q=1$

Substituting the value of p in p-2q=1, we have

3q=1

⇒q=13⇒ $q=\frac{1}{3}$

Substituting the value of p in p=5q $p=5q$ we have

p=53 $p=\frac{5}{3}$

Hence the given system of equation will have infinitely many solution if

p=53 $p=\frac{5}{3}$ and q=13 $q=\frac{1}{3}$.

(36) Find the values of a and b for which the following system of equation has infinitely many solution:

(i) (2a−1)x+3y=5 $(2a-1)x+3y=5$

3x+(b−2)y=3 $3x+(b-2)y=3$

Soln:

The given system of equation may be written as,

(2a−1)x+3y−5=0 $(2a-1)x+3y-5=0$ 3x+(b−2)y−3=0 $3x+(b-2)y-3=0$

The given system of equation is of the form

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

Where, $a_1=2a-1, b_1=3, c_1=-5$ $a_1=2a-1, b_1=3, c_1=-5$

$a_2=3, b_2=b-2, c_2=-3(p+q+1)$ $a_2=3, b_2=b-2, c_2=-3(p+q+1)$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2 \frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ 2a−13=−3b−2=−5−3 $\frac{2a-1}{3}=\frac{-3}{b-2}=\frac{-5}{-3}$ 2a−13=53 and −3b−2=53

$\frac{2a-1}{3}=\frac{5}{3}$ and $\frac{-3}{b-2}=\frac{5}{3}$ 2a−1=5and−9=5(b−2) $2a-1=5$ and $-9=5(b-2)$ ⇒a=3and−9=5b−10

$\Rightarrow a=3$ and $-9=5b-10$ ⇒a=3andb=15⇒ $a=3$ and $b=\frac{1}{5}$

Hence the given system of equation will have infinitely many solution if

a=3 $a=3$ and b=15 $b=\frac{1}{5}$.

(ii) 2x−(2a+5)y=5$2x-(2a+5)y=5$

(2b+1)x−9y=15$(2b+1)x-9y=15$

Soln:

The given system of equation may be written as,

2x−(2a+5)y=5$2x-(2a+5)y=5$ (2b+1)x−9y=15$(2b+1)x-9y=15$

The given system of equation is of the form

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

Where, $a_1=2,b_1=-(2a+5),c_1=-5$$a_1=2, b_1=-(2a+5), c_1=-5$

$a_2=(2b+1),b_2=-9,c_2=-15$$a_2=(2b+1), b_2=-9, c_2=-15$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ 22b+1=−(2a+5)−9=−5−15 $\frac{2}{2b+1}=\frac{-(2a+5)}{-9}=\frac{-5}{-15}$ 22b+1=13and(2a+5)9=13 $\frac{2}{2b+1}=\frac{1}{3}$ and $\frac{(2a+5)}{9}=\frac{1}{3}$ ⇒6=2b+1and2a+5=3$\Rightarrow 6=2b+1$ and $2a+5=3$ ⇒b=52anda=−1 $\Rightarrow b=\frac{5}{2}$ and $a=-1$

Hence the given system of equation will have infinitely many solution if

a=−1$a=-1$ and b=52$b=\frac{5}{2}$.

(iii) (a−1)x+3y=2$(a-1)x+3y=2$

6x+(1−2b)y=6$6x+(1-2b)y=6$

Soln:

The given system of equation may be written as,

(a−1)x+3y=2$(a-1)x+3y=2$ 6x+(1−2b)y=6$6x+(1-2b)y=6$

The given system of equation is of the form

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

Where, $a_1=a-1,b_1=3,c_1=-2$$a_1=a-1, b_1=3, c_1=-2$

$a_2=6,b_2=1-2b,c_2=-6$$a_2=6, b_2=1-2b, c_2=-6$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ a−16=31−2b=26 $\frac{a-1}{6}=\frac{3}{1-2b}=\frac{2}{6}$ a−16=13and31−2b=13 $\frac{a-1}{6}=\frac{1}{3}$ and $\frac{3}{1-2b}=\frac{1}{3}$ ⇒a−1=2and1−2b=9$\Rightarrow a-1=2$ and $1-2b=9$ ⇒a=3andb=−4 $\Rightarrow a=3$ and $b=-4$

Hence the given system of equation will have infinitely many solution if

a=3$a = 3$ and b=−4$b = -4$.

(iv) **3x+4y=12**$3x + 4y = 12$

(a+b)x+2(a−b)y=5a−1$(a + b)x + 2(a - b)y = 5a - 1$

Soln:

The given system of equation may be written as,

3x+4y−12=0$3x + 4y - 12 = 0$ (a+b)x+2(a−b)y−(5a−1)=0$(a + b)x + 2(a - b)y - (5a - 1) = 0$

The given system of equation is of the form

a1x+b1y−c1=0$a_1 x + b_1 y - c_1 = 0$ a2x+b2y−c2=0$a_2 x + b_2 y - c_2 = 0$

Where, a1=3,b1=4,c1=−12$a_1 = 3, b_1 = 4, c_1 = -12$

a2=(a+b),b2=2(a−b),c2=−(5a−1)$a_2 = (a + b), b_2 = 2(a - b), c_2 = -(5a - 1)$

The given system of equation will have infinitely many solution, if

a1a2=b1b2=c1c2 $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ 3a+b=42(a−b)=125a−1 $\frac{3}{a+b} = \frac{4}{2(a-b)} = \frac{12}{5a-1}$ 3a+b=2a+b and 2a+b=125a−1
$\frac{3}{a+b} = \frac{2}{a+b}$ and $\frac{2}{a+b} = \frac{12}{5a-1}$ ⇒3(a−b)=2a+2band2(5a−1)=12(a−b)
$\Rightarrow 3(a - b) = 2a + 2b \text{ and } 2(5a - 1) = 12(a - b)$ ⇒a=5band−2a=−12b+2
$\Rightarrow a = 5b \text{ and } -2a = -12b + 2$

Substituting a=5b in -2a=-12b+2 , we have

-2(5b)=-12b+2

⇒−10b=−12b+2$\Rightarrow -10b = -12b + 2$ ⇒b=1$\Rightarrow b = 1$

Thus a=5

Hence the given system of equation will have infinitely many solution if

a=5$a = 5$ and b=1$b = 1$.

(v) **2x+3y=7**$2x + 3y = 7$

(a−1)x+(a+1)y=3a−1$(a - 1)x + (a + 1)y = 3a - 1$

Soln:

The given system of equation may be written as,

2x+3y−7=0$2x + 3y - 7 = 0$ (a−1)x+(a+1)y−(3a−1)=0$(a - 1)x + (a + 1)y - (3a - 1) = 0$

The given system of equation is of the form

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

Where, $a_1=2, b_1=3, c_1=-7$

$a_2=(a-1), b_2=(a+1), c_2=-(3a-1)$

The given system of equation will have infinitely many solution, if

$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $\frac{2}{a-b}=\frac{3}{a+1)}=\frac{-7}{3a-1}$

$\frac{2}{a-b}=\frac{3}{a+1)}$ and $\frac{3}{a+1)}=\frac{-7}{3a-1}$

$\Rightarrow 2(a+1)=3(a-1) \text{ and } 3(3a-1)=7(a+1)$

$\Rightarrow 2a-3a=-3-2 \text{ and } 9a-3=7a+7$

$\Rightarrow a=5 \text{ and } a=5$

Hence the given system of equation will have infinitely many solution if

$a=5$ and $b=1$.

(vi) $2x+3y=7$

$(a-1)x+(a+2)y=3a$

Soln:

The given system of equation may be written as,

$2x+3y-7=0$ $(a-1)x+(a+2)y-3a=0$

The given system of equation is of the form

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

Where, $a_1=2, b_1=3, c_1=-7$

$a_2=(a-1), b_2=(a+2), c_2=-3a$

The given system of equation will have infinitely many solution, if

$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $\frac{2}{a-b}=\frac{3}{a+2)}=\frac{-7}{-3a}$

$\frac{2}{a-b}=\frac{3}{a+2)}$ and $\frac{3}{a+2)}=\frac{7}{3a}$

$\Rightarrow 2(a+2)=3(a-1) \text{ and } 3(3a)=7(a+2)$

$\Rightarrow 2a+4=3a-3 \text{ and } 9a=7a+14$

$\Rightarrow a=7 \text{ and } a=7$

Hence the given system of equation will have infinitely many solution if

$a=7$ and $b=1$.