UDAAN

2026

Pair of Linear Equation in Two Variables

MATHS LECTURE-1

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Topics *to be covered*

A. Basics

B. Linear Equation in one variable

C. Linear Equation in two variable

D. Pair of linear equation in two variable

E. Graphical Representation

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Linear Equation in One Variable

$x - 1 = 0$

$2x + 1 = 0$

$3x + 5 = 0$

$-2x + 0 = 0$

General form

$ax + b = 0$

$a, b \in R$

$a \neq 0$

Solution → Variable ki value

↓

eqn satisfy

↓

L.H.S = R.H.S

(i) $x + 1 = 0$

$x = -1$

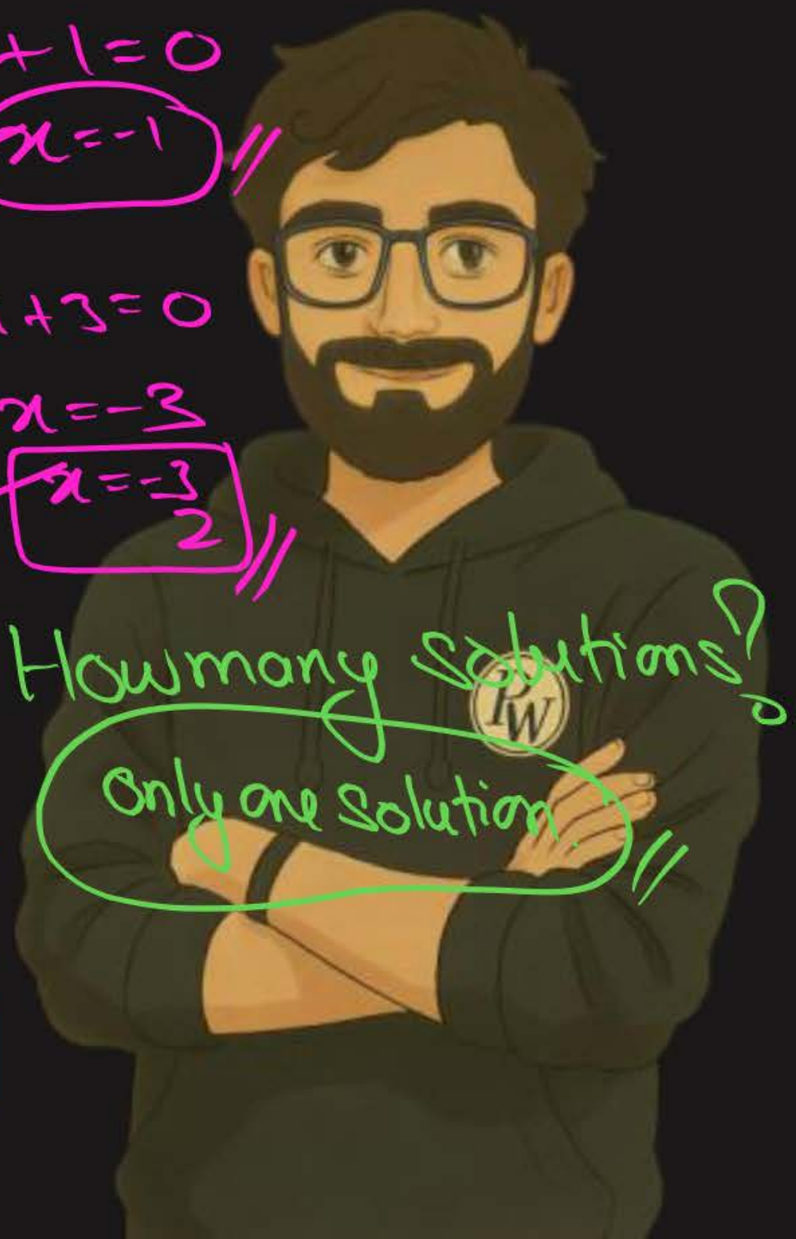
(ii) $2x + 3 = 0$

$2x = -3$

$x = \frac{-3}{2}$

How many solutions?

Only one solution



Linear Equation in Two Variable

$x + y = 1$

$2x - 3y + 2 = 0$

$5x + 4y + 3 = 0$

$9x - 9y + 2 = 0$

General form

$$ax + by + c = 0$$

$a, b, c \in R$

'a' and 'b' both cannot be zero at the same time.

Solution:

$x+y=2$

- (1, 1)
- (2, 0)
- (0, 2)
- (100, -98)
- (5, -3)
- (900, -198)

→ How many solutions?

Infinite

Q: $2x-3y=2$ → I

x	0	1	2	$7/2$
y	$-2/3$	0	$2/3$	$5/3$

$y=5/3$ → $x=?$

$2x-3(5/3)=2$

$2x-5=2$

$2x=2+5$

$2x=7$

$x=7/2$

→ System.

Pair of Linear Equation in Two Variable

Solution

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

General form

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

How many solutions?

#Q. Show that x = 2, y = 1 is a solution of the system of simultaneous linear equation:

$3x - 2y = 4$

$2x + 4y = 5$

$a_1x + b_1y + c_1 = 0$

$a_2x + b_2y + c_2 = 0$

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

$a_2 = 2$, $b_2 = 4$, $c_2 = -5$

$3(2) - 2(1) = 4$

$6 - 2 = 4$

$4 = 4$

$2(2) + 4(1) = 5$

$4 + 4 = 5$

$8 \neq 5$ ✗

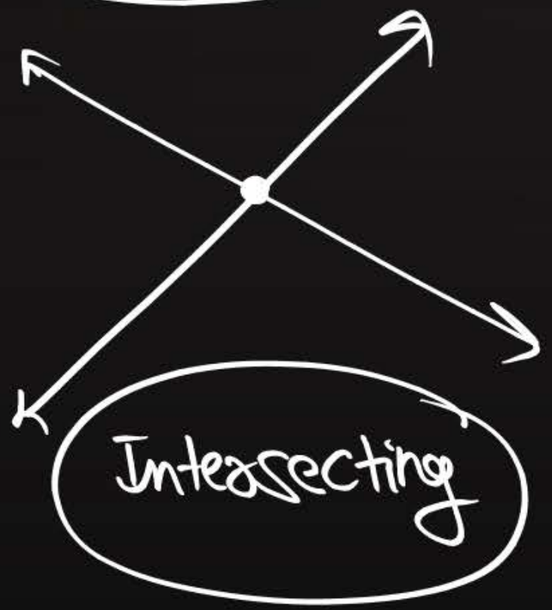
Not a solution

I

Consistent system

Unique solution

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



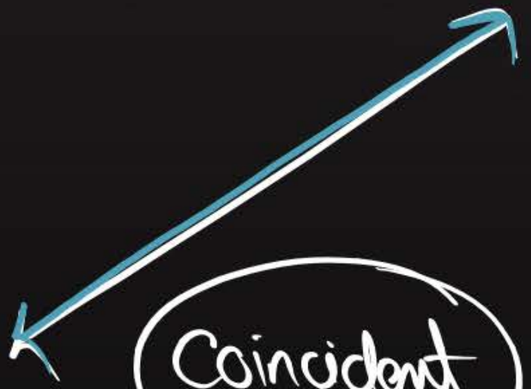
Intersecting

II

Infinite many solution

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

dependent



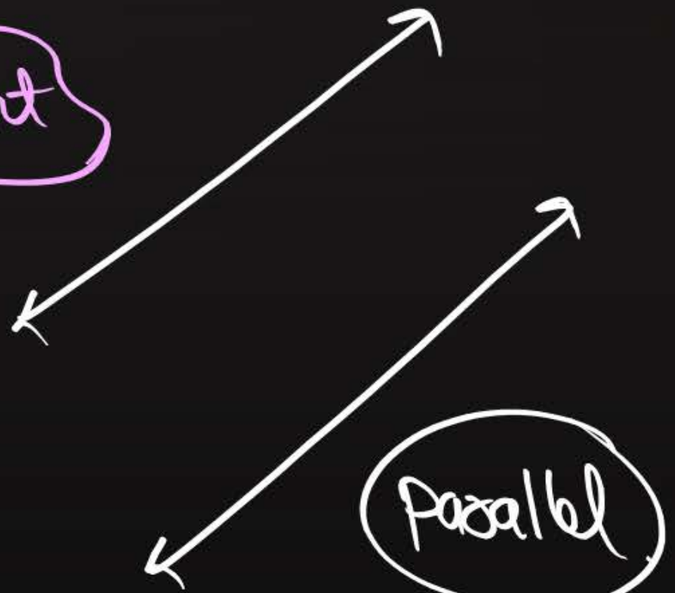
Coincident

Inconsistent system

III

No solution

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



Parallel

Q1 $2x - 3y + 4 = 0$

$5x + 4y - 2 = 0$

$a_1 = 2 \quad a_2 = 5$

$b_1 = -3 \quad b_2 = 4$

$c_1 = 4 \quad c_2 = -2$

$\frac{2}{5} \neq \frac{-3}{4}$ $\quad \frac{4}{-2}$

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

Unique solution (Intersecting) (consistent)

Q1 $2x + 4y + 3 = 0$

$6x + 12y + 9 = 0$

$\frac{2}{6} \quad \frac{4}{12} \quad \frac{3}{9}$

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

Coincident.
Infinite solution.
Consistent.
dependent.

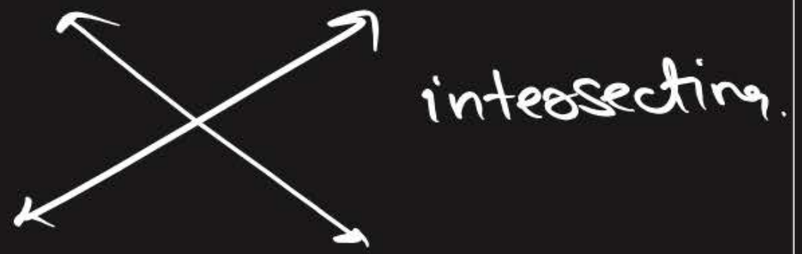
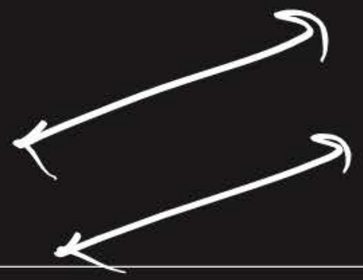
Q. $2x - 4y - 9 = 0$

$12x - 24y - 3 = 0$

$\frac{1}{6}$ $\frac{1}{6}$ $\frac{3}{1}$

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

No solution.
Inconsistent.
Parallel lines.

S. No.	Pair of Lines	$\frac{a_1}{a_2}$	$\frac{b_1}{b_2}$	$\frac{c_1}{c_2}$	Compare the Ratios	Graphical representation	Algebraic Interpretation
1.	$x - 2y = 0$ $3x + 4y - 20 = 0$	$\frac{1}{3}$	$\frac{-2}{4}$	$\frac{0}{-20}$	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$		Exactly one solution consistent (Unique)
2.	$2x + 3y - 9 = 0$ $4x + 6y - 18 = 0$	$\frac{2}{4}$	$\frac{3}{6}$	$\frac{-9}{-18}$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$		Infinitely many solutions consistent (Dependent)
3.	$x + 2y - 4 = 0$ $2x + 4y - 12 = 0$	$\frac{1}{2}$	$\frac{2}{4}$	$\frac{-4}{-12}$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$		No solutions Inconsistent

How to Solve?? (Solving System of Equations)

- Graphical method
- Algebraic method
  - Substitution method
  - Elimination method

#Q. Graphically, the pair of equations $\begin{matrix} 6x - 3y + 10 = 0 \\ 2x - y + 9 = 0 \end{matrix}$ represents two lines which are

$\frac{6}{2} \quad \frac{-3}{-1} \quad \frac{10}{9}$

$\frac{3}{1} = \frac{3}{1} \neq \frac{10}{9}$

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

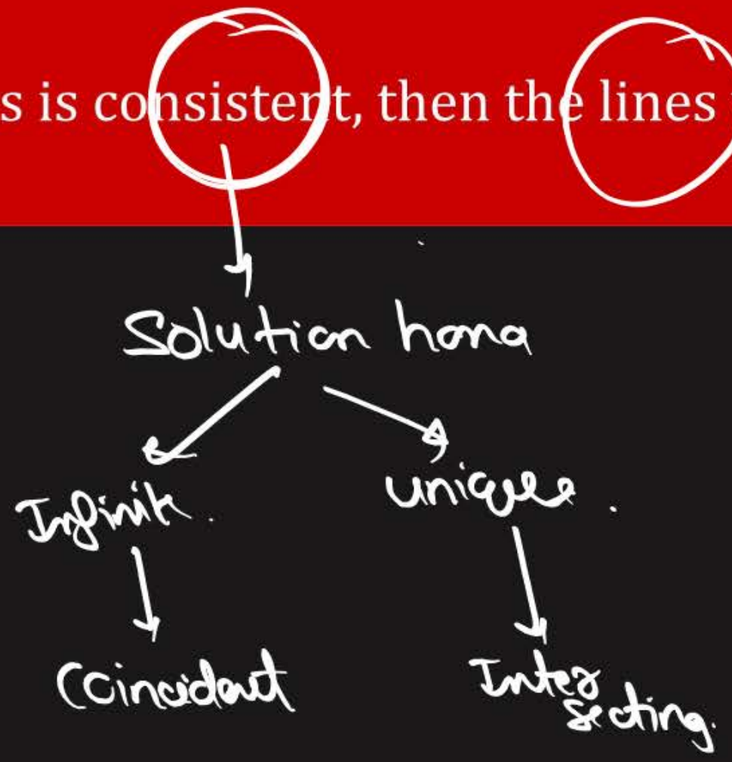
A Intersecting at exactly one point

B Intersecting at exactly two point

C Coincident

D Parallel

#Q. If a pair of linear equations is consistent, then the lines will be



A Parallel

B Always coincident

C Intersecting or coincident

D Always intersecting

#Q. Show graphically that the system of equations $\begin{matrix} 2x + 4y = 10 \\ 3x + 6y = 12 \end{matrix}$ has no solution.

$2x + 4y = 10$

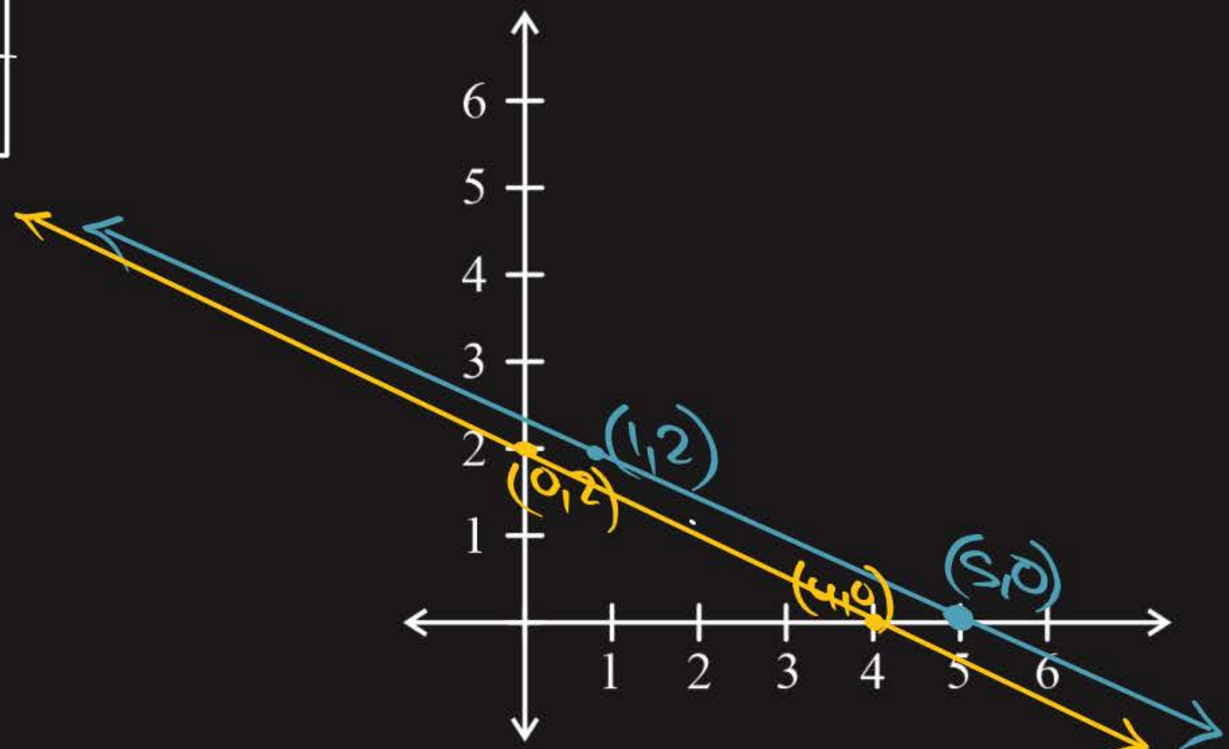
x	5	1
y	0	2

(5, 0)
(1, 2)

$3x + 6y = 12$

x	0	4
y	2	0

(0, 2)
(4, 0)



Since, lines are parallel.
∴ the system will no solution.

#Q. Solve graphically the system of equations: $x + y = 3$, $3x - 2y = 4$

$x+y=3$

x	0	3
y	3	0

(0,3)
(3,0)

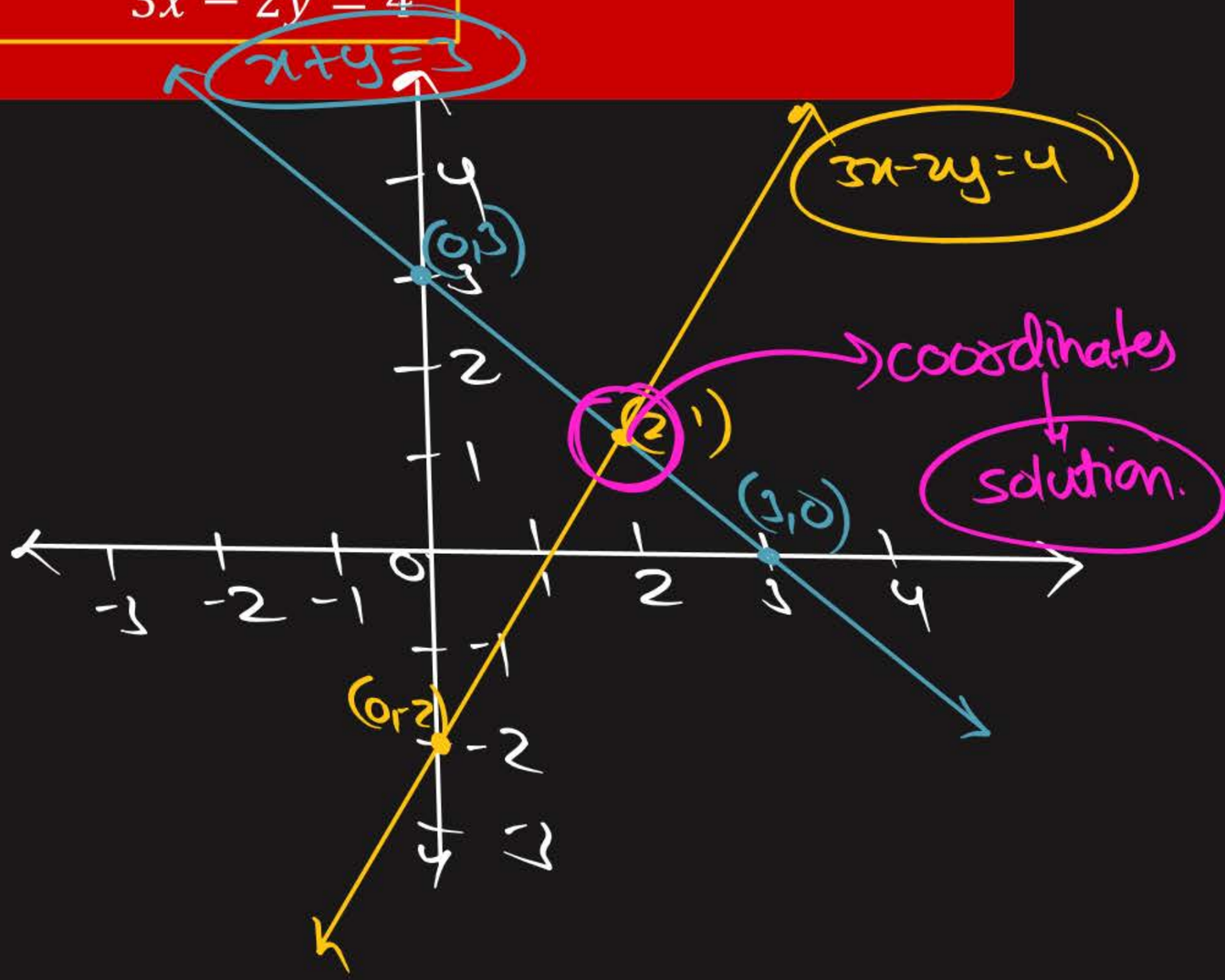
$3x-2y=4$

x	0	2
y	-2	1

(0,-2)
(2,1)

→ ∵ lines are intersecting.
∴ unique solution.

Ans: (2,1)



CONSISTENT SYSTEM : A system of simultaneous linear equations is said to be consistent, if it has at least one solution.

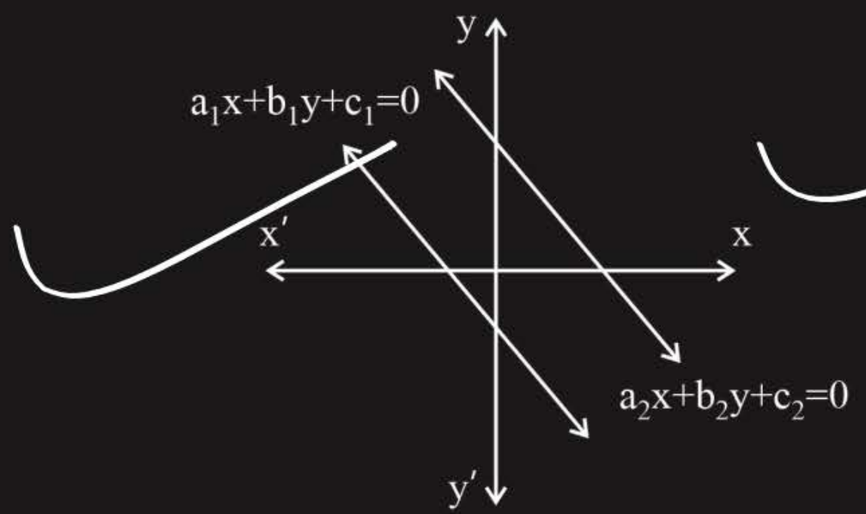
IN-CONSISTENT SYSTEM : A system of simultaneous linear equations is said to be in–consistent, if it has no solution.

Graphical Representation of Linear Equations

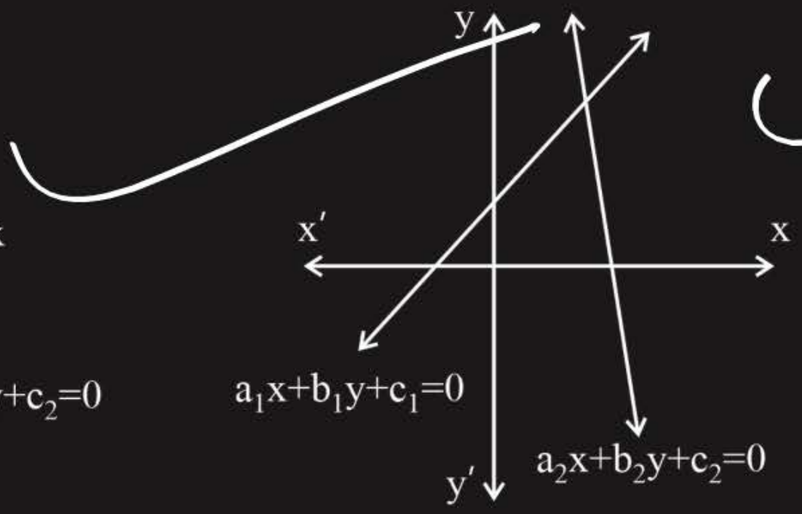
(i) The two lines intersect at one point.

(ii) The two lines are parallel i.e. they do not intersect however far they are extended.

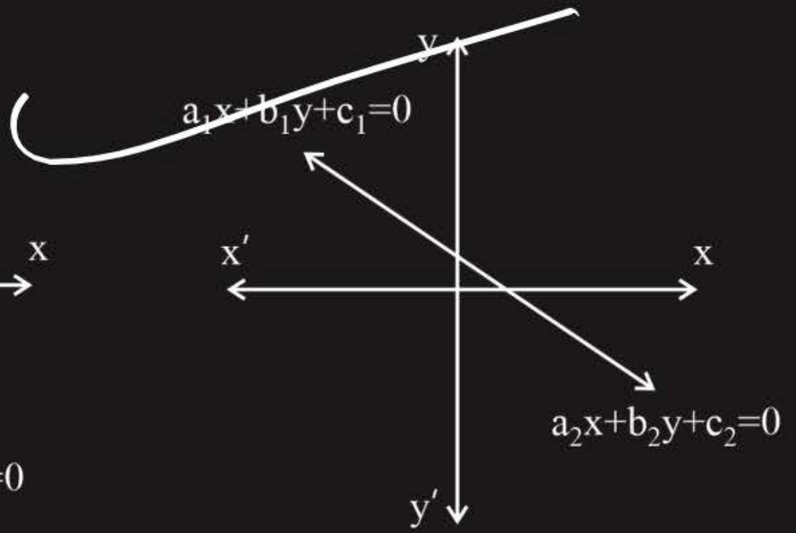
(iii) The two lines are coincident lines i.e. one line overlaps the other line.



Parallel lines



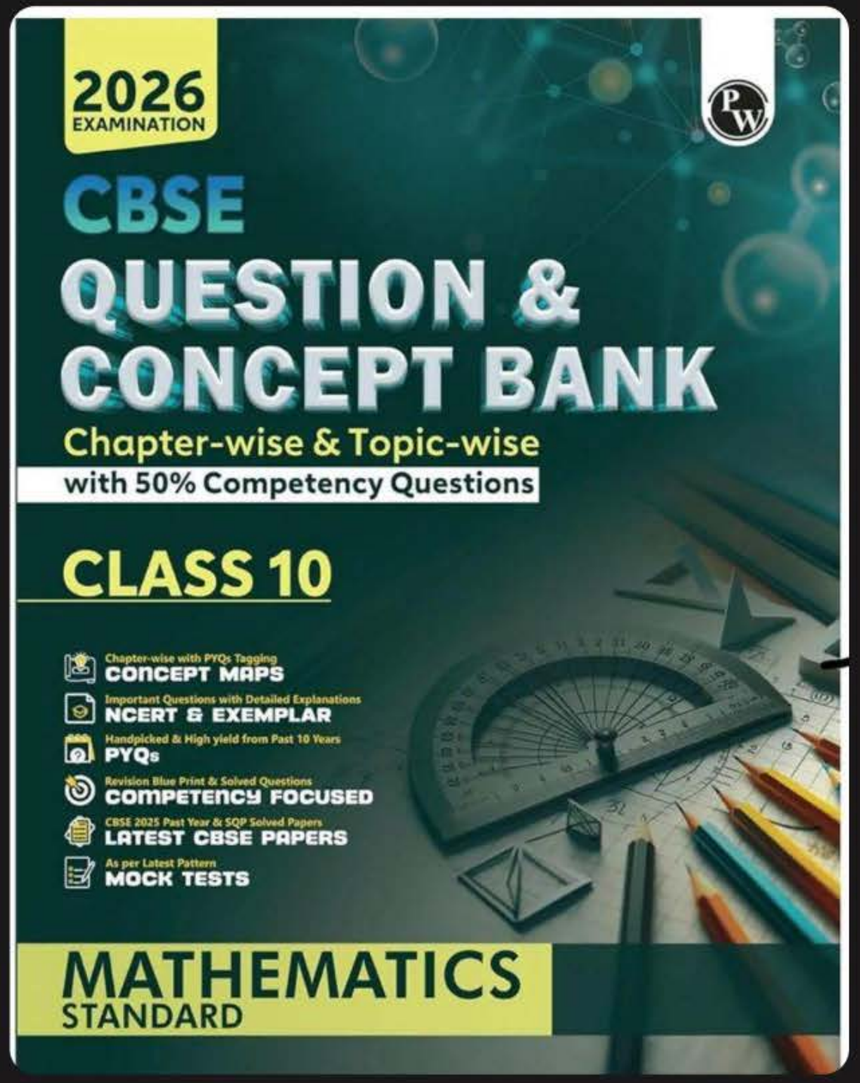
Intersecting lines



Coincident lines

#Q. Show graphically that the system of equations $\begin{matrix} 3x - y = 2 \\ 9x - 3y = 6 \end{matrix}$ has infinitely many solutions.

#Gapu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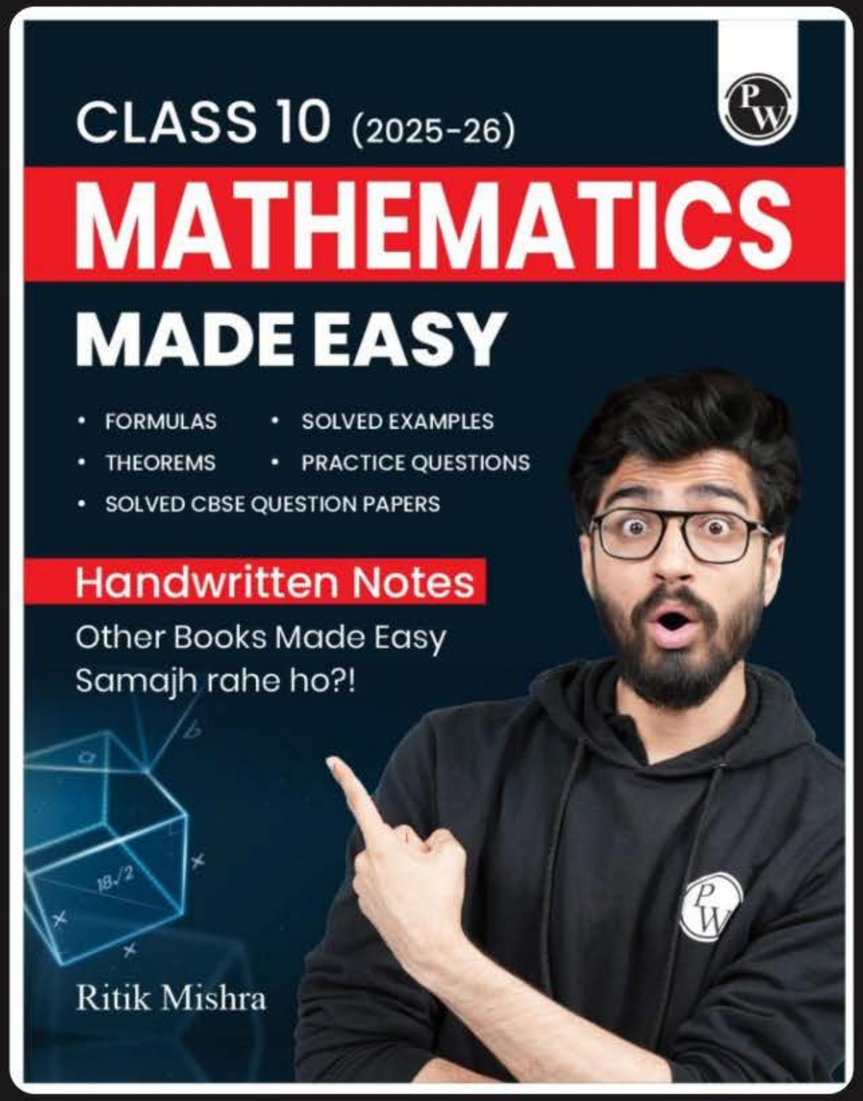
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