UDAAN

2025

Pair of linear equation in two variable

Mathematics | **Lecture - 01**

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Topics *to be covered*

1. Basics
2. Linear Equation in one variable
3. Linear Equation in two variable
4. Pair of linear equation in two variable
5. Graphical Representation

WORK HARD
DREAM BIG
NEVER GIVE UP !!

Topic : Linear Equation in One Variable

$P(x) = x+1$

$x+1=0$

General Form.

$ax+b=0$

$a, b \in R$

$a \neq 0$

Q! How many solutions?

Ans only 1

Solution

↑

Variable ki value

↑

Equation satisfy

↑

LHS = RHS.

Topic : Linear Equation in Two Variable

General Form.

$x+y=2$

$ax+by+c=0$

$2x-3y-3=0$

$-4x+5y-2=0$

$a, b, c \in R$

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

How many solutions?

$x + y = 2$

$(1) + (1) = 2$

$(4) + (-2) = 2$

$(100) + (-98) = 2$

$(0) + (2) = 2$

$(2) + (0) = 2$

Solutions:

(1, 1)

(4, -2)

(100, -98)

(0, 2)

(2, 0)

Infinite many solutions!

System

Topic : Pair of Linear Equation in Two Variable

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

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

A pair of values of the variables x and y satisfying each one of the equations in a given system of two simultaneous linear equations in x and y is called a solution of the system.

Topic : Solution

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

$3x - 2y = 4$

$2x + y = 5$

$3x-2y=4$

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

$6-2=4$

$4=4$

$2x+y=5$

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

$4+1=5$

$5=5$

Topic : Solution

#Q. Show that x = 2, y = 1 is not a solution of the system of simultaneous linear equations

$2x + 7y = 11$

$x - 3y = 5$

$2x+7y=11$

$2(2)+7(1)=11$

$4+7=11$

$11=11$

$x-3y=5$

$(2)-3(1)=5$

$2-3=5$

$-1 \neq 5$

- **Consistent System :**

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

  → unique
  → Infinite.

- **In-consistent System :**

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

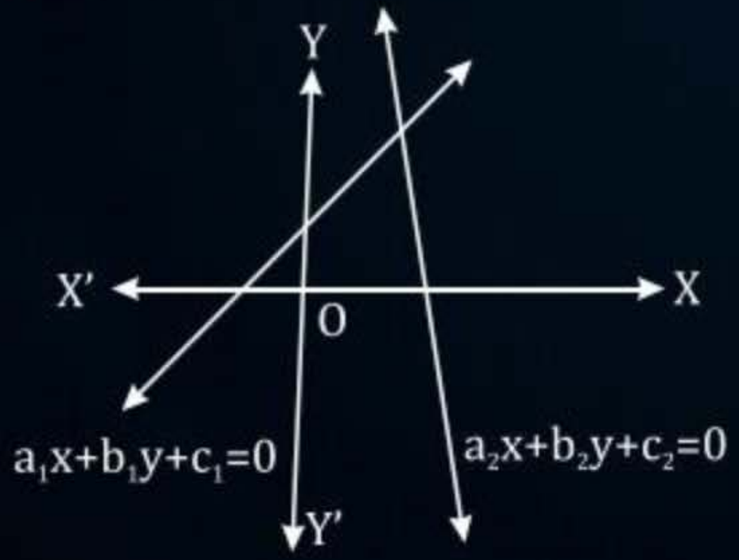
  → No solution.

Topic : Graphical Representation of Linear Equations

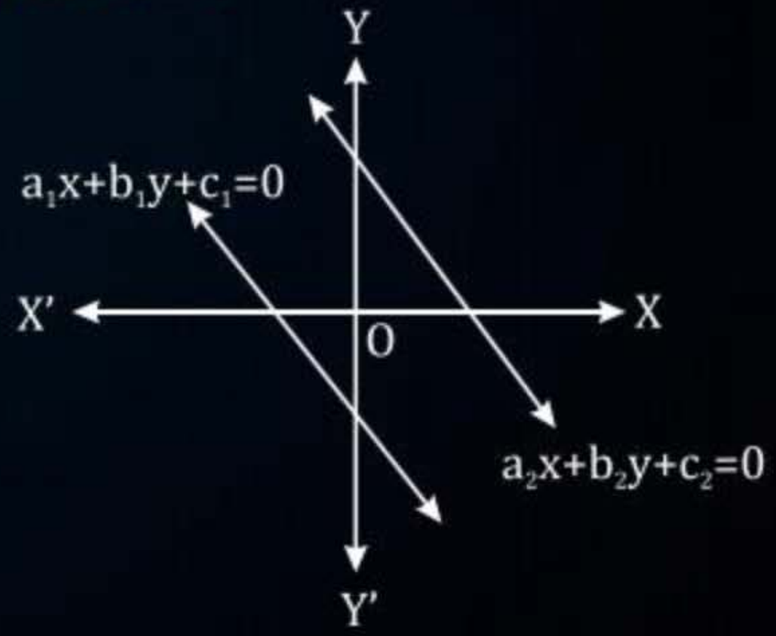
(i) The two lines intersect at one point.

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

Intersecting lines



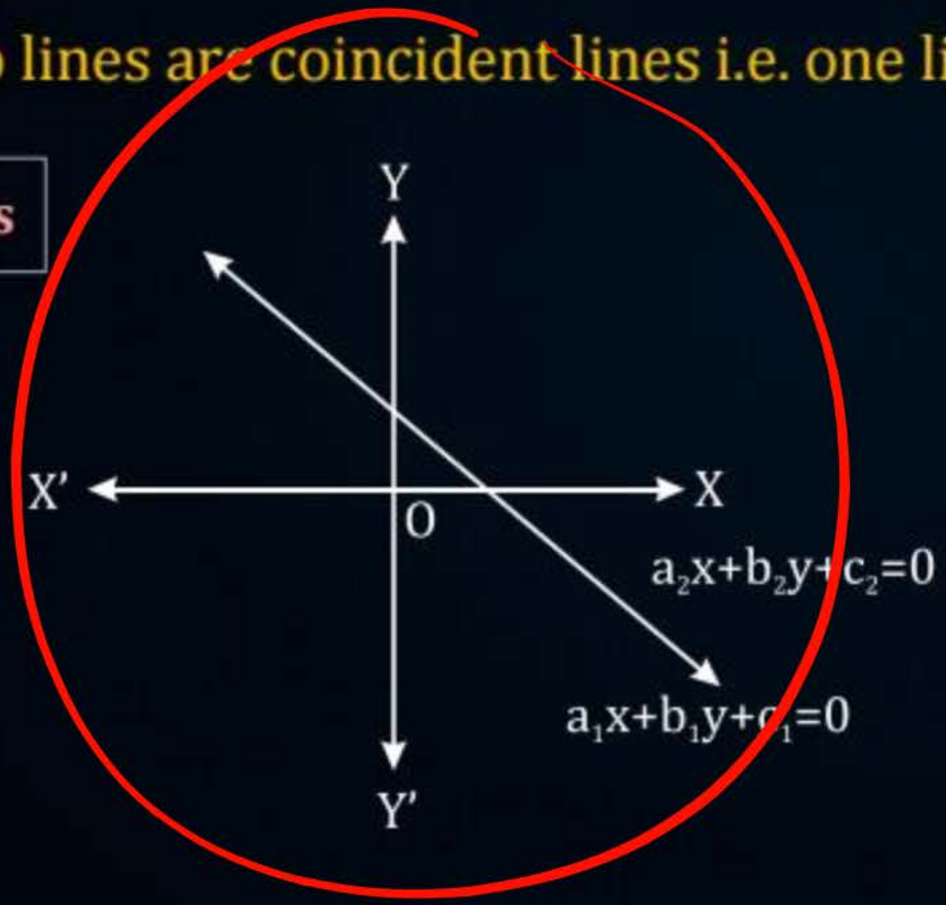
Parallel lines



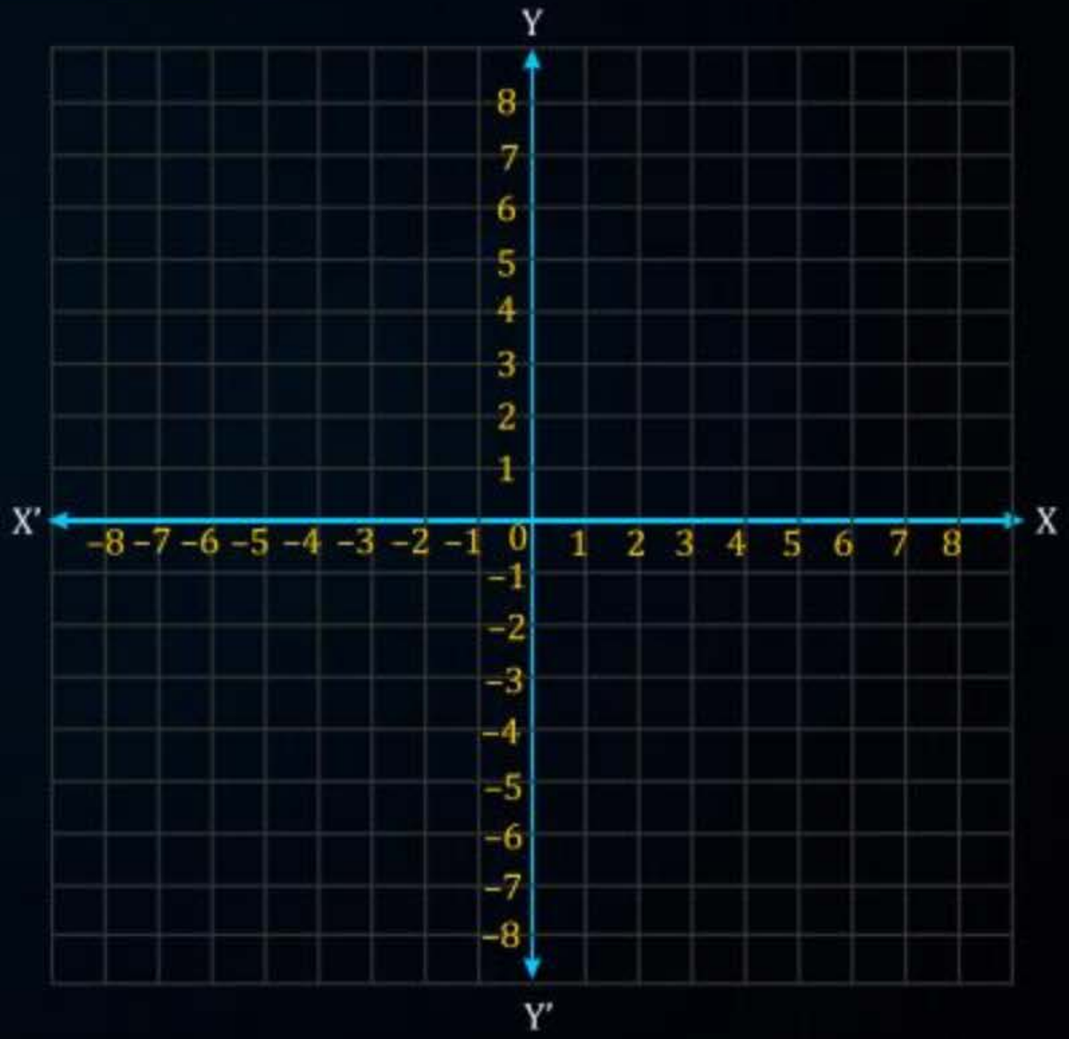
Topic : Graphical Representation of Linear Equations

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

Coincident lines



Topic : Graphical Method of Solving Simultaneous Linear Equations



Topic : Graphical Method of Solving Simultaneous Linear Equation

#Q. Solve graphically the system of equations:

$x + y = 3$

$3x - 2y = 4$

(2, 1)

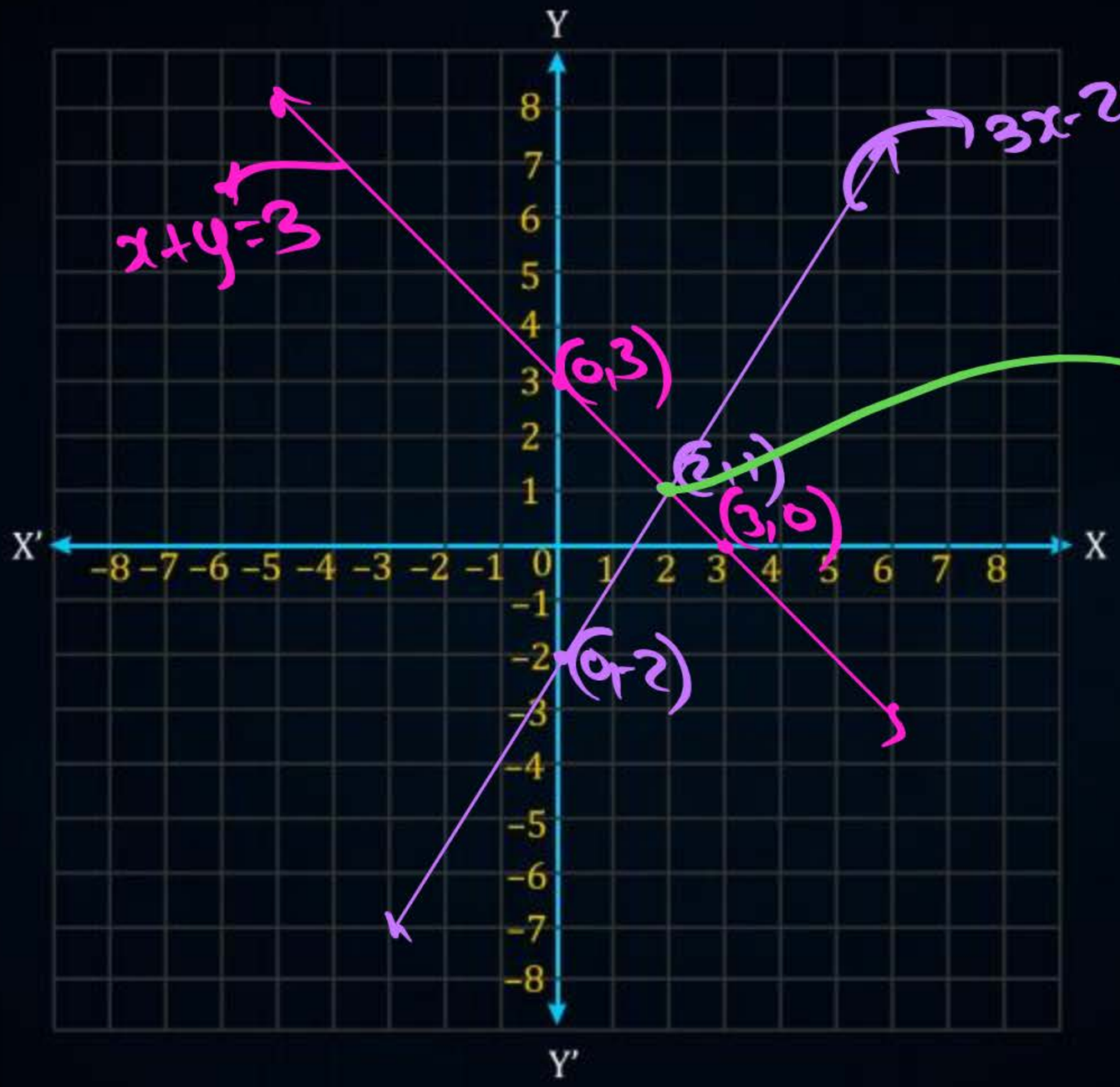
$y = 0$

$x + y = 3$

x	0	3
y	3	0

$3x - 2y = 4$

x	0	4/3	2
y	-2	0	1

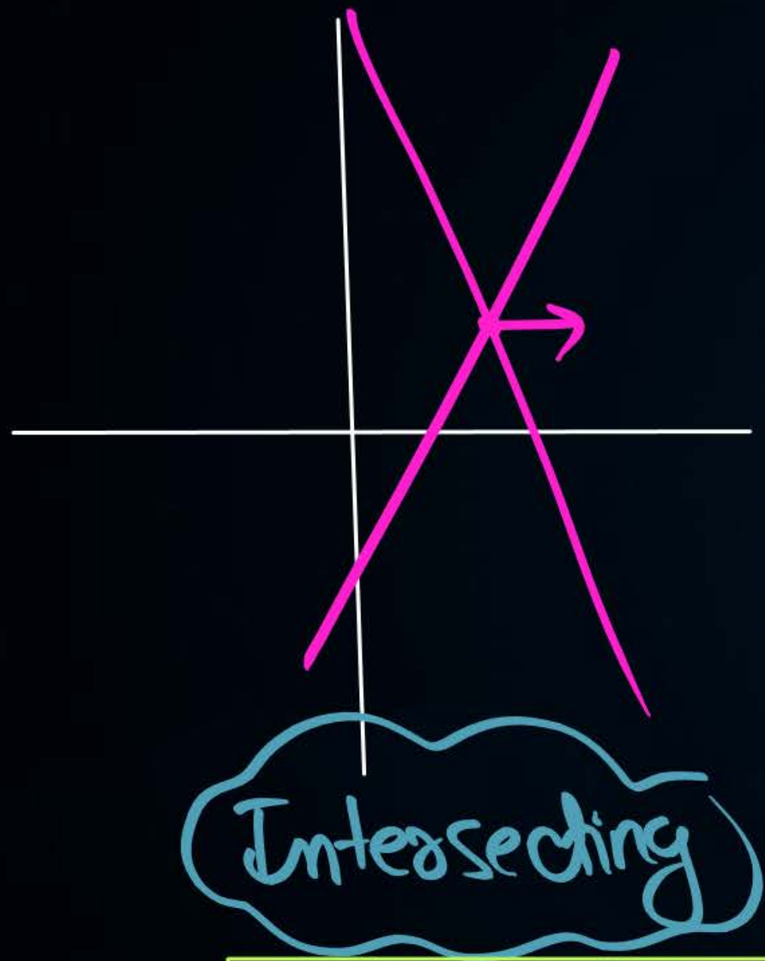


Coordinates

Solution.

(2,1)

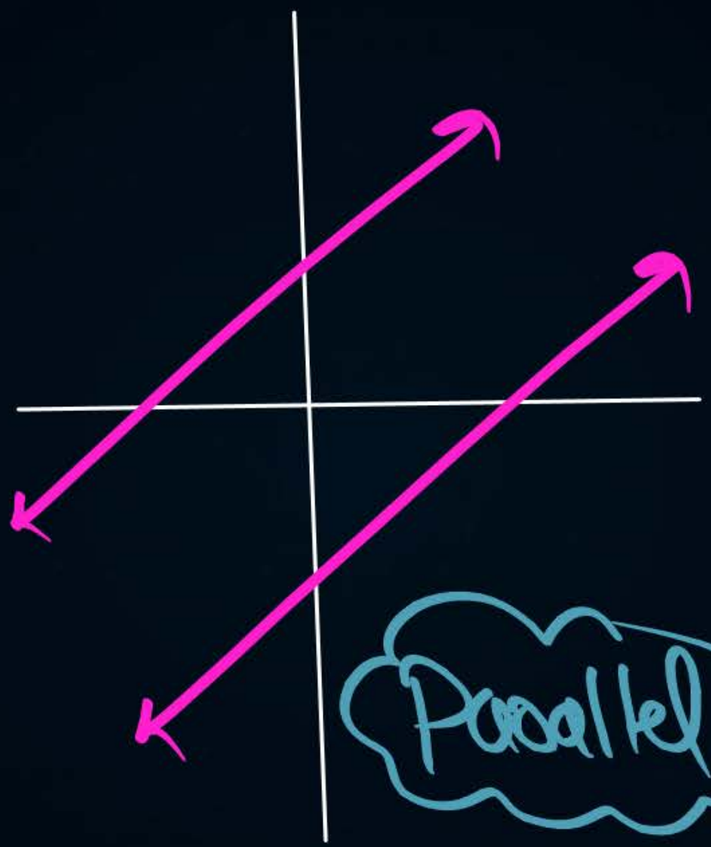
Case-I



Intersecting

→ Unique solution.

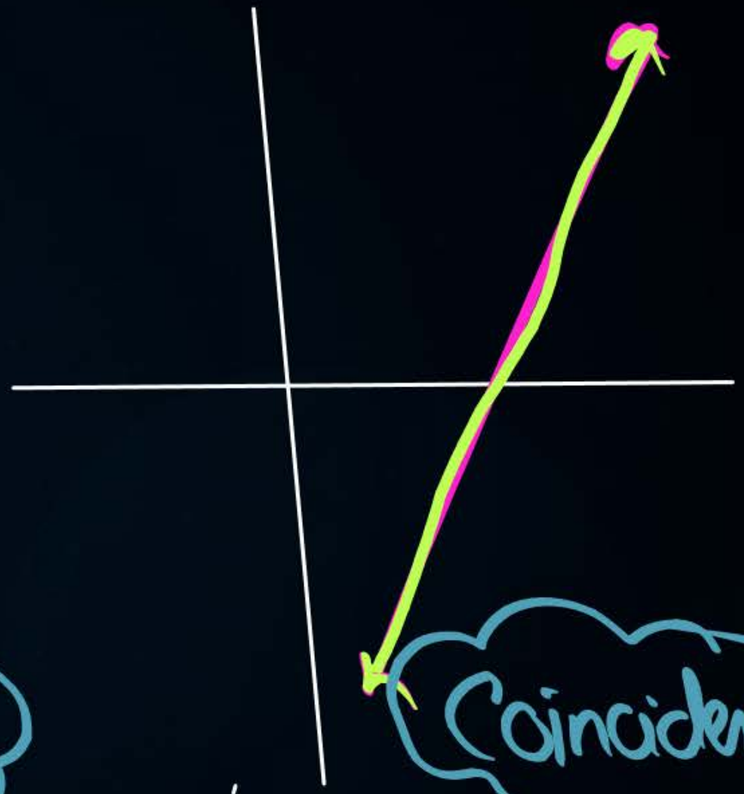
Case-II



Parallel

→ No solution.

Case-III



Coincident

→ Infinite many solutions.

Topic : Graphical Method of Solving Simultaneous Linear Equation

#Q. Show graphically that the system of equations

$2x + 4y = 10$

$3x + 6y = 12$

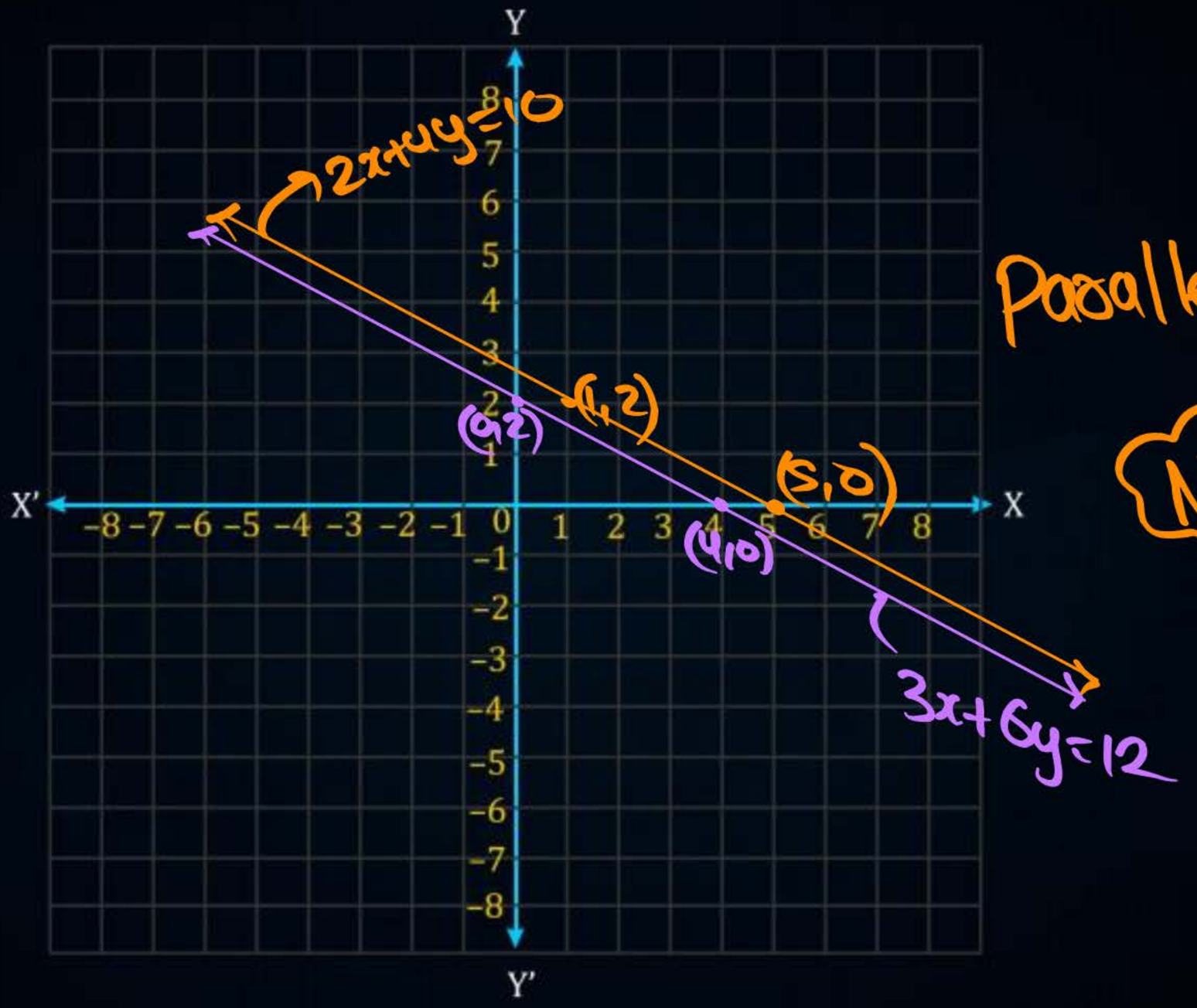
has no solution.

$2x+4y=10$

x	5	1
y	0	2

$3x+6y=12$

x	0	4
y	2	0


Y
Y'
X
X'
2x+4y=10
(0,2)
(1,2)
(5,0)
(4,0)
3x+6y=12
Parallel lines
No solution

Topic : Graphical Method of Solving Simultaneous Linear Equation

#Q. Show graphically that the system of equations [CBSE 2008]

$3x - y = 2$

$9x - 3y = 6$

has infinitely many solutions.

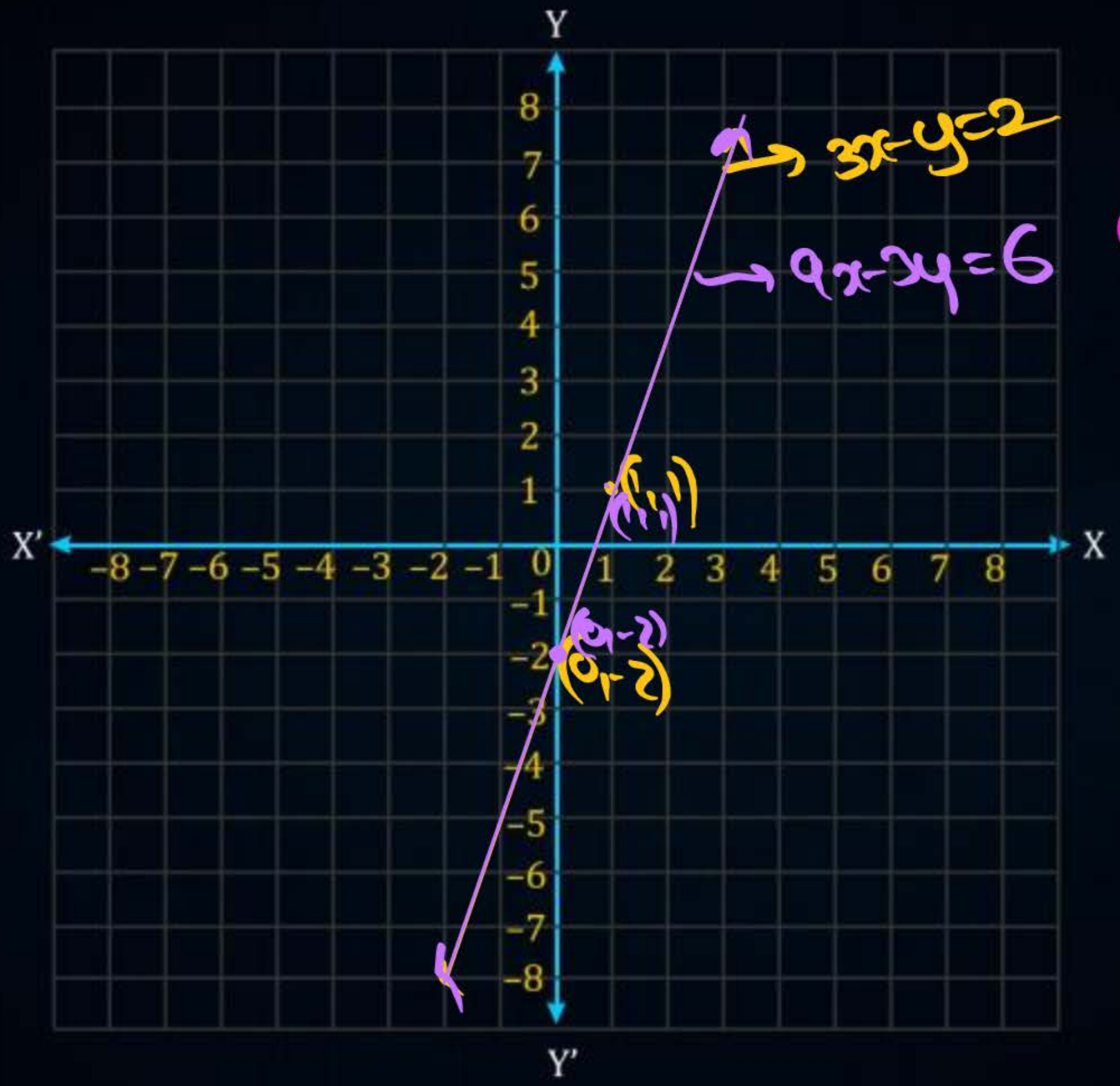
↳ Consistent.

$3x - y = 2$

x	0	2/3	1
y	-2	0	1

$9x - 3y = 6$

x	0	2/3	1
y	-2	0	1



Coincident lines.

Infinite many solutions

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

Case-I $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\longrightarrow$ unique Solution.

Case-II $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $\longrightarrow$ Infinite many solutions.

Case-III $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $\longrightarrow$ No solution.

$2x-3y+4=0$ $\quad a_1x+b_1y+c_1=0$

$-3x+2y+2=0$ $\quad a_2x+b_2y+c_2=0$

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

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

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

$\frac{-2}{3} \neq \frac{-3}{2}$

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

- → unique solution.
- → Intersecting lines
- → Consistent system.

Pair of lines	$\frac{a_1}{a_2}$	$\frac{b_1}{b_2}$	$\frac{c_1}{c_2}$	Compare the ratios	Graphical Representation	Algebraic Representation	Condition for solvability
$x - 2y = 0$ $3x - 4y - 20 = 0$	$\frac{1}{3}$	$\frac{-2}{-4}$	$\frac{0}{-20}$	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines	Exactly one solution or Unique Solution	System is consistent
$2x + 3y - 9 = 0$ $4x + 6y - 18 = 0$	$\frac{2}{4}$	$\frac{3}{6}$	$\frac{-9}{-18}$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coincident Lines	Infinitely many solutions	System is consistent
$x + 32y - 4 = 0$ $2x + 4y - 12 = 0$	$\frac{1}{2}$	$\frac{2}{4}$	$\frac{-4}{-12}$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Parallel Lines	No Solutions	System is inconsistent

#Q. Find whether the following pair of linear equations is consistent or inconsistent: $3x + 2y = 8$ and $6x - 4y = 9$

[Board Term – 1, 2016]

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

$a_1 = 3$ $a_2 = 6$

$b_1 = 2$ $b_2 = -4$

$c_1 = -8$ $c_2 = -9$

$\frac{3}{6}$ $\frac{2}{-4}$ $\frac{-8}{-9}$

$\frac{1}{2} \neq \frac{-1}{2}$

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

unique solution.

consistent system.

Homework

DPP-01

THANK YOU