

UPDAAN



2025

Pair of linear equation in two variable

Mathematics

Lecture - 02

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Topics

to be covered



1 Questions on Graphical Method

2 Substitution Method





WORK HARD
DREAM BIG
NEVER GIVE UP !!



Recap:

$$a_1x + b_1y + c_1 = 0$$

$$a_2x + b_2y + c_2 = 0$$

Coordinates

Solution
 ↑
 variable x or y
 value to do
 or no satisfy both

Intersecting

→ Unique Solution
 → Consistent

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

Parallel

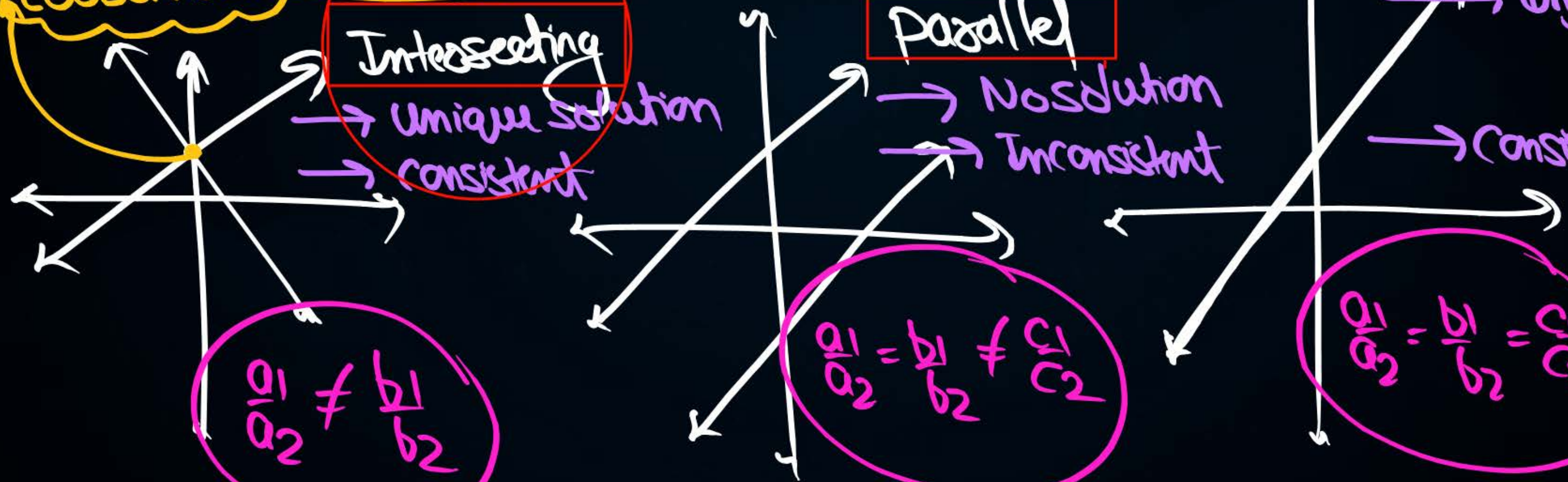
→ No Solution
 → Inconsistent

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

Coincident

→ Infinite many Solutions
 → Consistent

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



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

Topic : Graphical Method of Solving Simultaneous Linear Equation

#Q. Write the number of solutions of the following pair of linear equations:

$$x + 2y - 8 = 0; 2x + 4y = 16$$

[NCERT]

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

$$a_1 = 1$$

$$a_2 = 2$$

$$b_1 = 2$$

$$b_2 = 4$$

$$c_1 = -8$$

$$c_2 = -16$$

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

→ Infinite.

$$\frac{1}{2} \quad \frac{2}{4} \quad \frac{-8}{-16}$$

$$\frac{1}{2} = \frac{1}{2} = \frac{1}{2}$$

Topic : Graphical Method of Solving Simultaneous Linear Equation



#Q. Are the following pair of linear equation consistent? Justify your answer.

$$2ax + by = a \text{ and } 4ax + 2by - 2a = 0; a, b \neq 0$$

$$\begin{array}{l|l} a_1 = 2a & a_2 = 4a \\ b_1 = b & b_2 = 2b \\ c_1 = -a & c_2 = -2a \end{array}$$

$$\frac{2a}{2} = \frac{b}{2} = \frac{-a}{-2a}$$

$$\frac{1}{2} = \frac{1}{2} = \frac{1}{2}$$

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

True (I)

Consistent

Topic : Graphical Method of Solving Simultaneous Linear Equation

#Q. Graphically, the pair of equations

$$6x - 3y + 10 = 0$$

$$2x - y + 9 = 0$$

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

Represents two lines which are

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

A Intersecting at exactly one point

B Intersecting at exactly two point

C Coincident

D Parallel

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

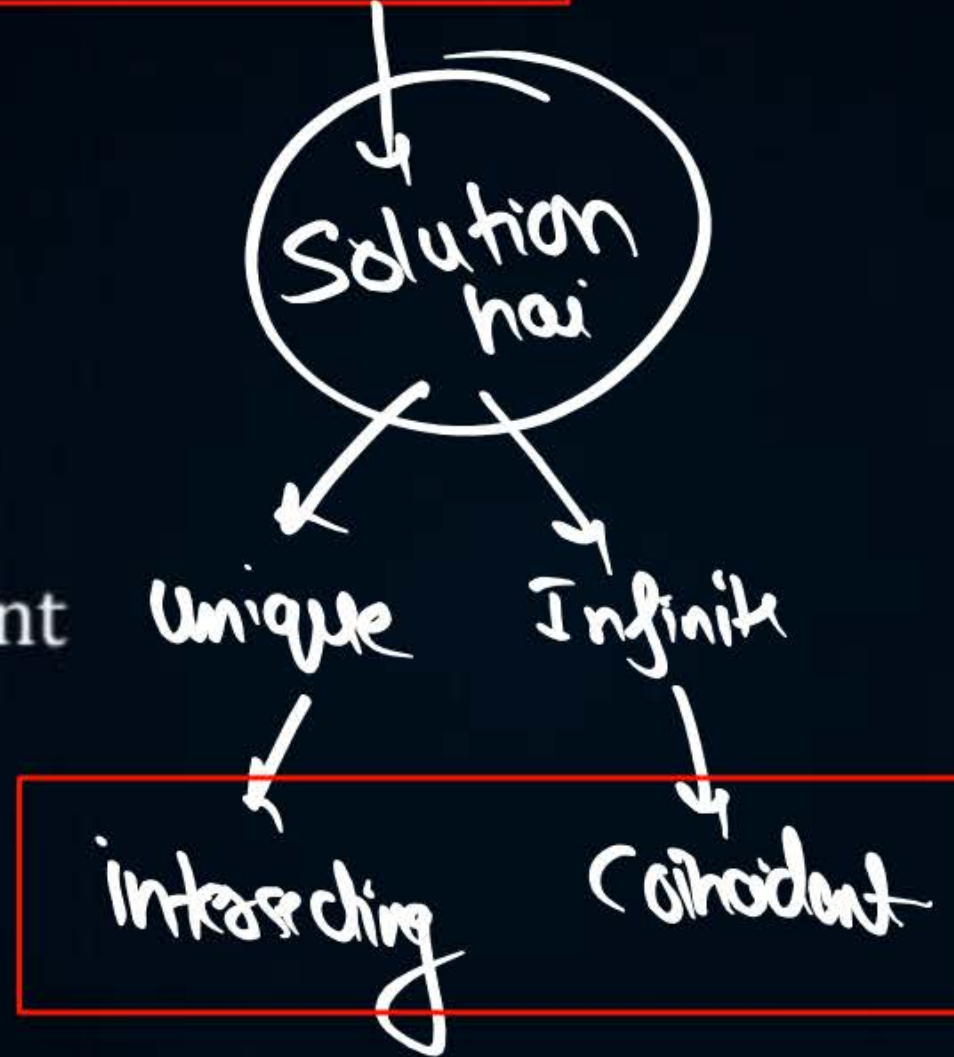
No solution

Parallel lines.

Topic : Graphical Method of Solving Simultaneous Linear Equation

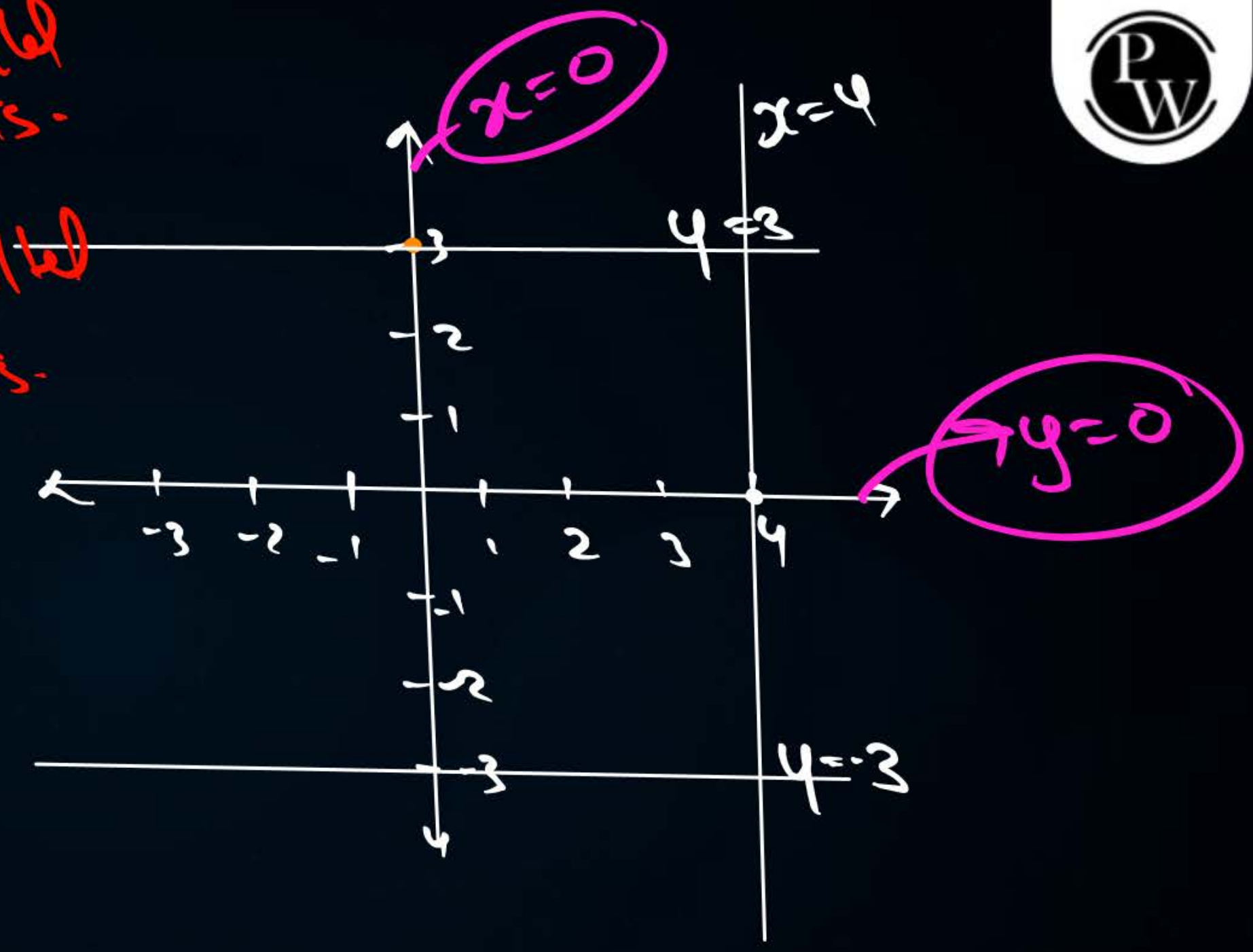
#Q. If a pair of linear equations is consistent, then the lines will be :

- A** Parallel
- B** Always coincident
- C** Intersecting or coincident
- D** Always intersecting



$y=3$ → line parallel to x-axis.

$x=4$ → line parallel to y-axis.

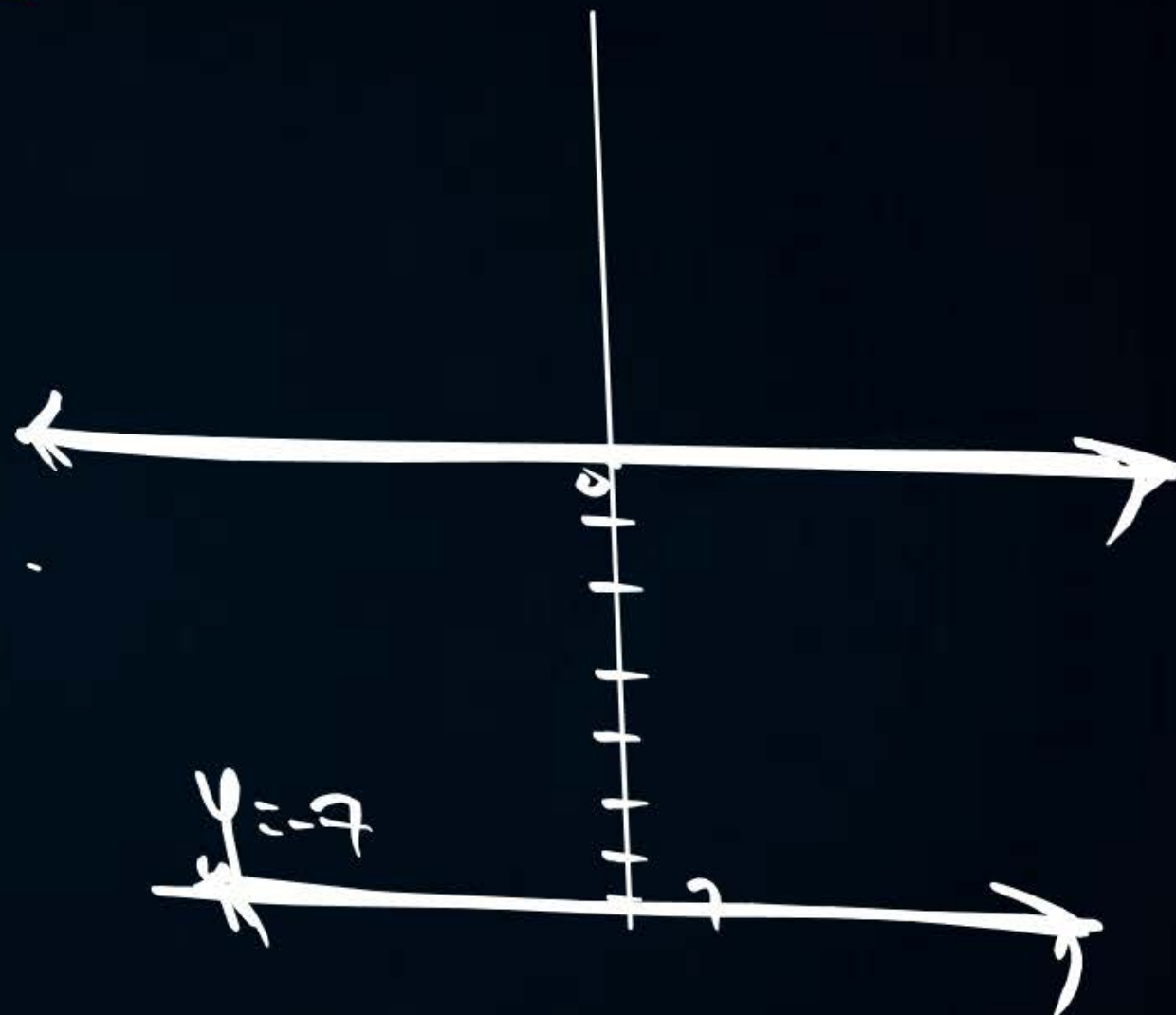


Topic : Graphical Method of Solving Simultaneous Linear Equation



#Q. The pair of equations $y = 0$ and $y = -7$ has:

- A** One solutions
- B** Two solutions
- C** Infinitely many solutions
- D** No solution



Topic : Graphical Method of Solving Simultaneous Linear Equation



#Q. A pair of linear equations which has a unique solution $x = 2, y = -3$, is

A $x + y = -1; 2x - 3y = -5$ ✗

B ✗ $2x + 5y = -11; 4x + 10y = -22$

C $2x - y = 1; 3x + 2y = 0$

D ✓ $x - 4y - 14 = 0; x - y - 10 = 0$

$\frac{2}{4} \quad \frac{5}{10} \quad \frac{11}{22}$

$\frac{1}{2} = \frac{1}{2} = \frac{1}{2}$

Flu

ghar par
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Topic : Graphical Method of Solving Simultaneous Linear Equation



#Q. Find whether the following pair of linear equations is consistent or inconsistent: $3x + 2y = 8$ and $6x - 4y = 9$ [Board Term - 1, 2016]

Ans

Topic : Graphical Method of Solving Simultaneous Linear Equation

#Q. Draw the graphs of the pair of linear equations :

$$x + 2y = 5 \text{ and } 2x - 3y = -4$$

Also, find the points where the lines meet the X-axis.

[Board Term - 1, 2014, 2015]

$$x + 2y = 5$$

x	1	5
y	2	0

(5, 0)

$$2x - 3y = -4$$

x	-2	1
y	0	2

(-2, 0)

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

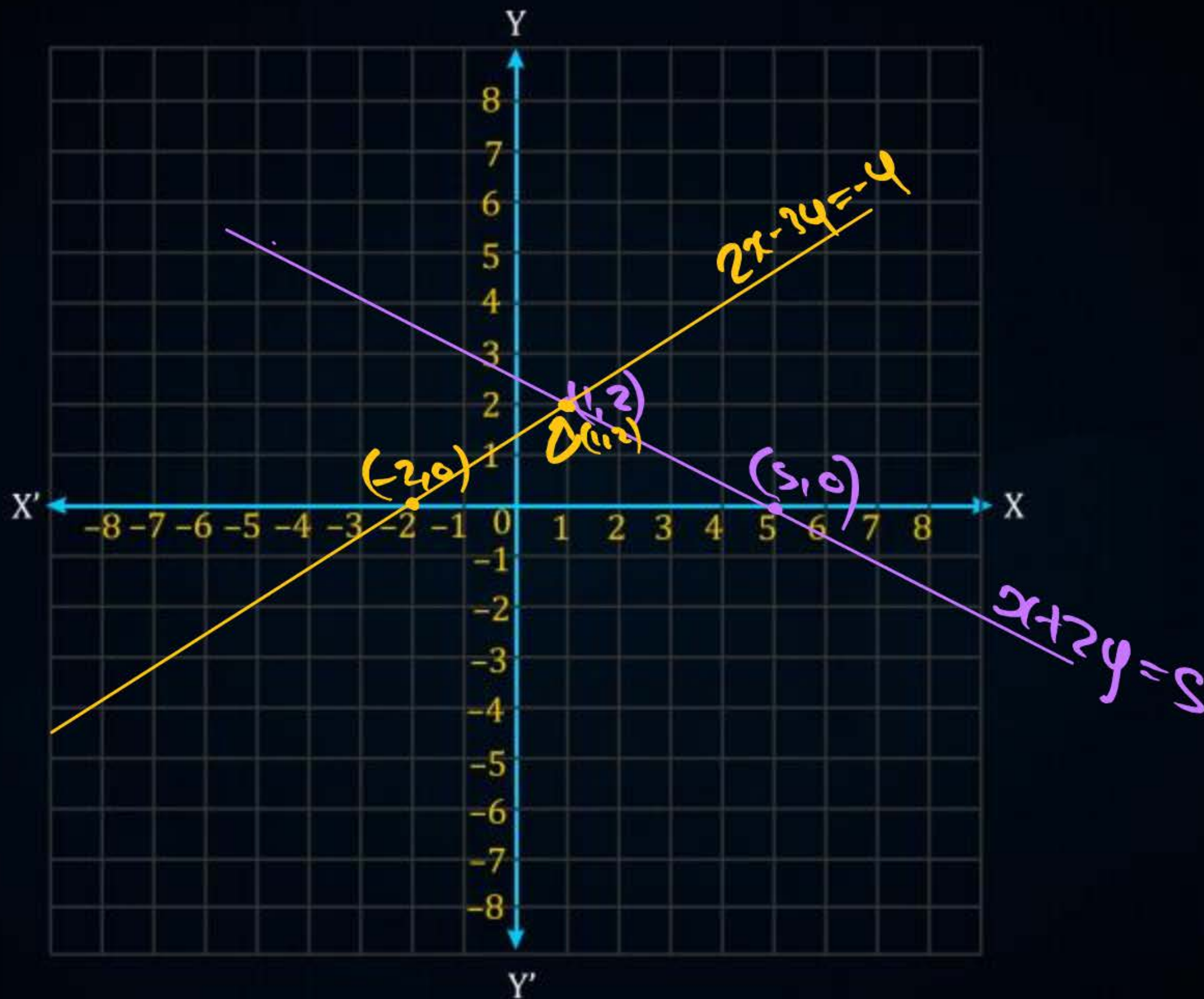
$$2x - 6 = -4$$

$$2x = -4 + 6$$

$$2x = 2$$

$$x = 1$$

$(-2, 0)$
 $(5, 0)$



#Q. A pair of linear equation which has a unique solution $x = 2$ and $y = -3$ is

- A** $x + y = 1$ and $2x - 3y = -5$
- B** $2x + 5y = -11$ and $4x + 10y = -22$
- C** $2x - y = 1$ and $3x + 2y = 0$
- D** $x - 4y - 14 = 0$ and $5x - y - 13 = 0$

H.w

Topic : Graphical Method of Solving Simultaneous Linear Equation



#Q. Two straight paths are represented by the equations $x - 3y = 2$ and $-2x + 6y = 5$. Check whether the paths cross each other or not.

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

$$a_2 = -2$$

$$b_2 = 6$$

$$c_2 = -5$$

$$\frac{1}{-2} \quad \frac{-3}{6} \quad \frac{-2}{-5}$$

$$\frac{1}{-2} \neq \frac{-3}{6} \neq \frac{-2}{-5}$$

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

No solution (parallel lines)

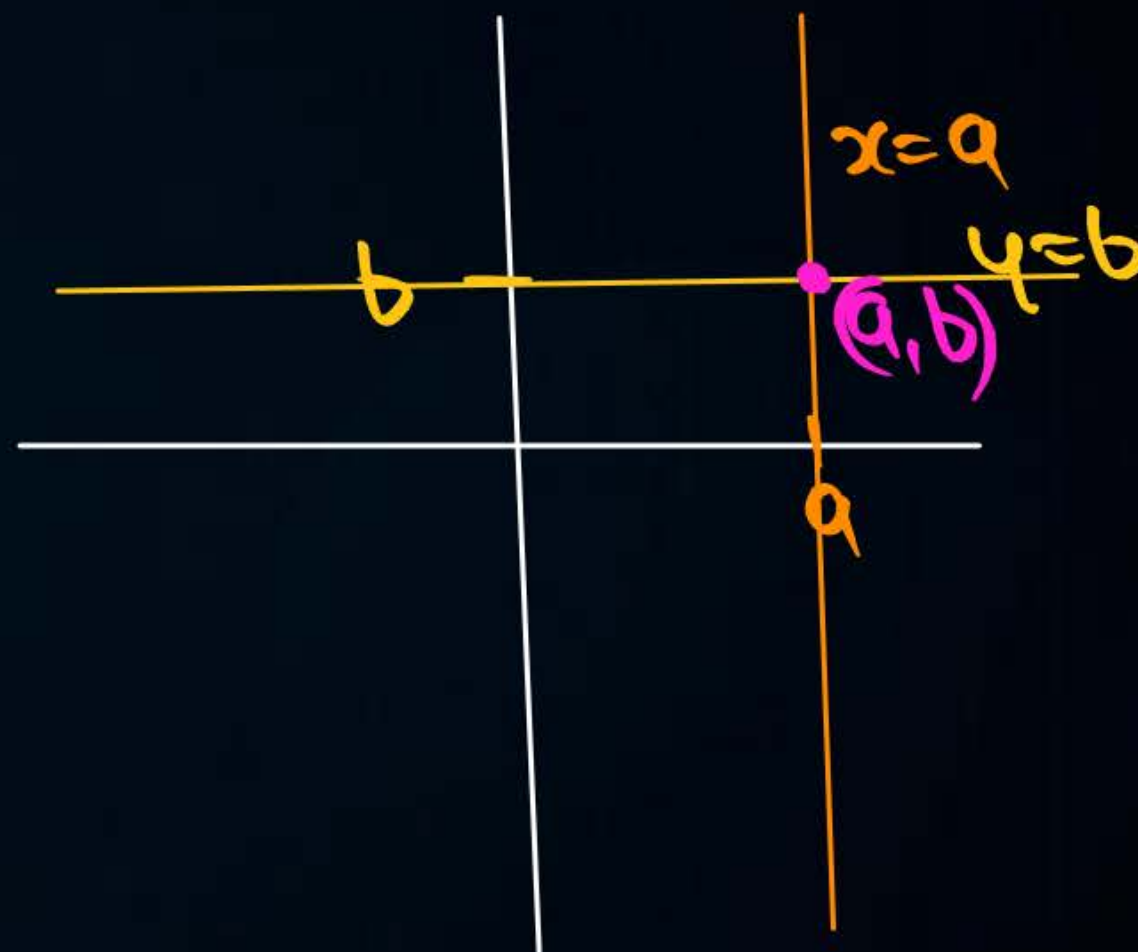
Ans: NO

Topic : Graphical Method of Solving Simultaneous Linear Equation



#Q. The pair of equations $x = a$ and $y = b$ graphically represents lines which are:

- A** parallel
- B** Intersecting at (b, a)
- C** Coincident
- D** Intersecting at (a, b)



Topic : Graphical Method of Solving Simultaneous Linear Equation



#Q. The pair of linear equations $\frac{3x}{2} + \frac{5y}{3} = 1$ and $9x + 10y = 14$ is

[CBSE, Delhi & OD, 2020]

A Consistent

B Inconsistent

C Consistent with one solution

D Consistent with many solution

$$a_1 = \frac{3}{2}$$

$$a_2 = 9$$

$$b_1 = \frac{5}{3}$$

$$b_2 = 10$$

$$c_1 = -1$$

$$c_2 = -14$$

$$\left[\begin{array}{c} \frac{3}{2} \\ \frac{5}{3} \\ -1 \end{array} \right]$$

$$\left[\begin{array}{c} 9 \\ 10 \\ -14 \end{array} \right]$$

$$\frac{-1}{-14}$$

$$\frac{3}{18}$$

$$\frac{5}{30}$$

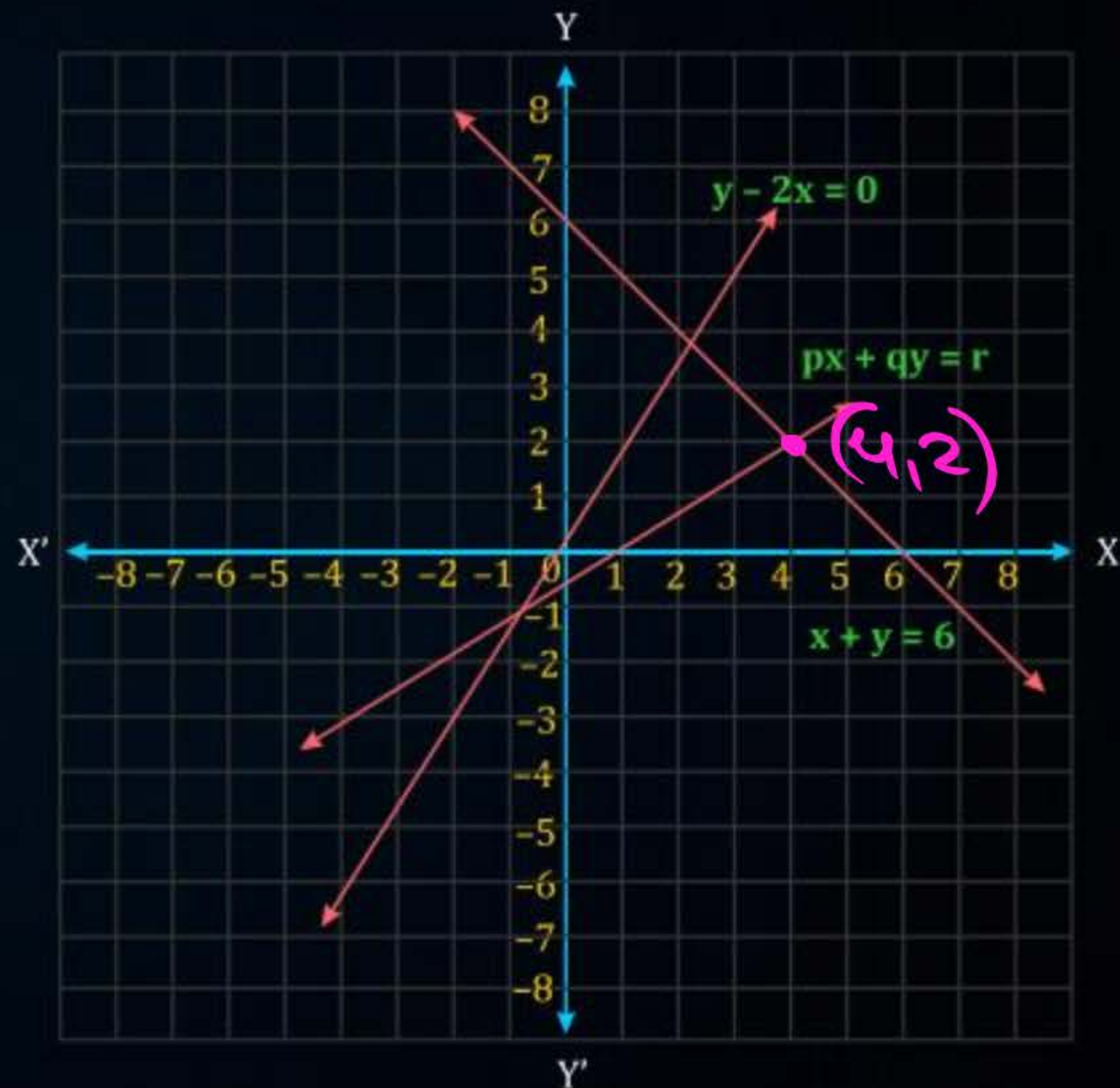
$$\frac{-1}{14}$$

$$\frac{1}{6} = \frac{1}{6} \neq \frac{1}{14}$$

Topic : Graphical Method of Solving Simultaneous Linear Equation



#Q. Show below are the graphs of the lines $y - 2x = 0$, $x + y = 6$ and $px + qy = r$.



Topic : Graphical Method of Solving Simultaneous Linear Equation



#Q. Which of these is the solution for the pair of equation $x + y = 6$ and $px + qy = r$.

[CBSE Q.B., 2021-22]

- A** $x = 2, y = 4$
- B** $x = 4, y = 2$
- C** $x = 3, y = 2$
- D** We cannot say for sure as the values of p and q are not known.

Topic : Graphical Method of Solving Simultaneous Linear Equation



[CBSE 2008]

#Q. Solving the following system of equations graphically

$$x + 3y = 16$$

$$2x - 3y = 12$$

and hence find the value of a , if $4x + 3y = a$

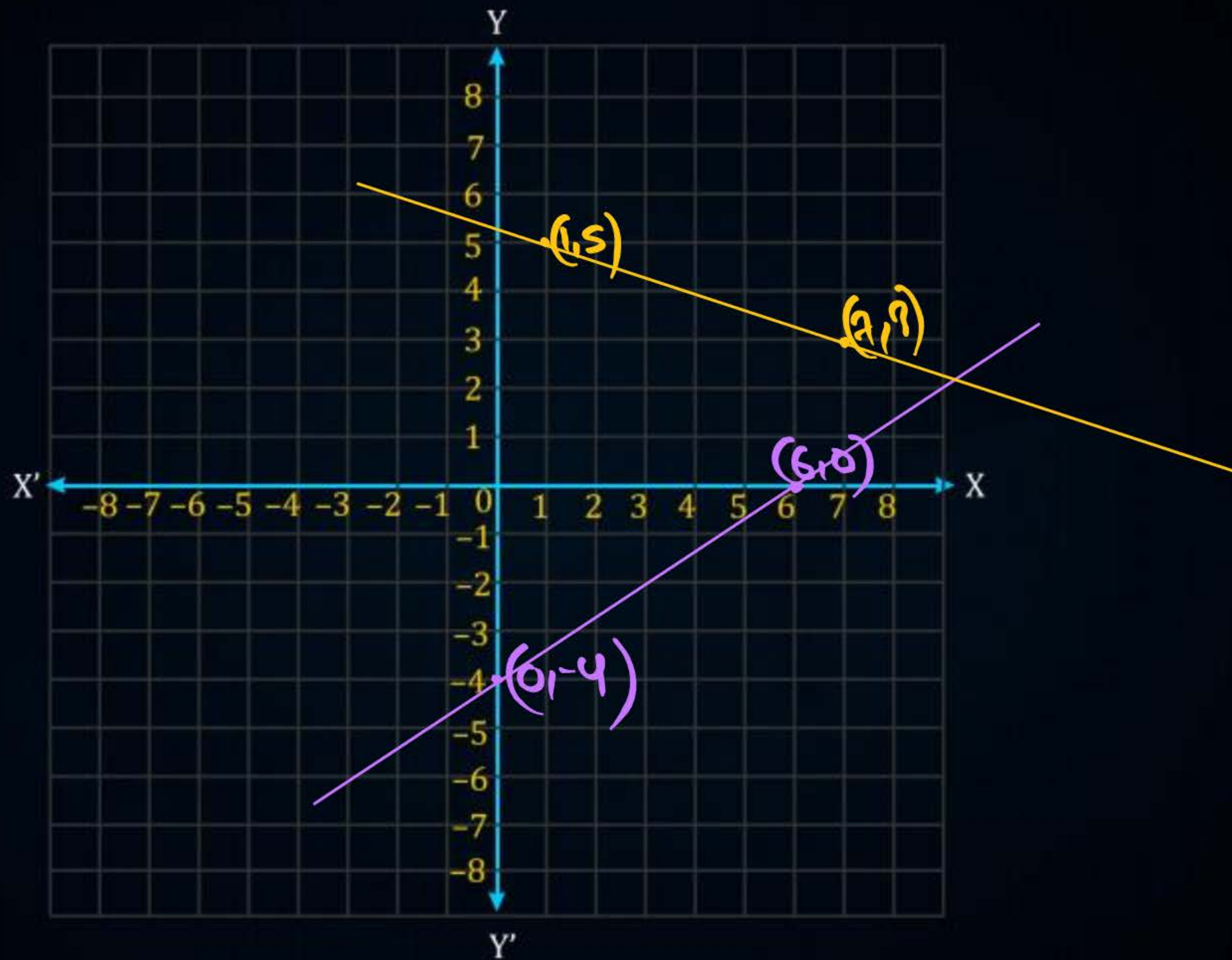
next class

$$x + 3y = 16$$

x	16	0
y	5	3

$$2x - 3y = 12$$

x	6	0
y	-4	0



Topic : Graphical Method of Solving Simultaneous Linear Equation



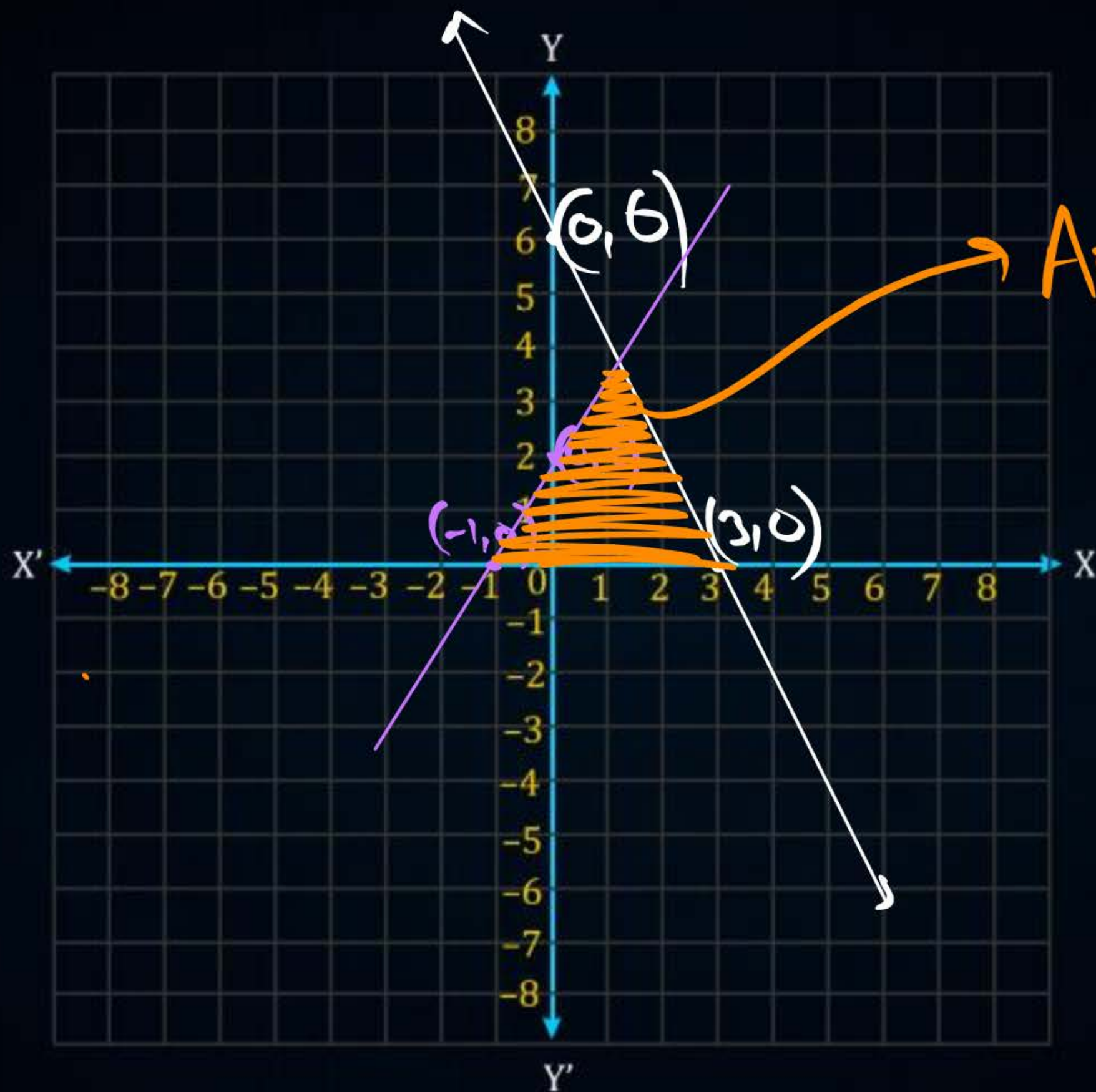
#Q. Draw the graphs of $2x + y = 6$ and $2x - y + 2 = 0$. Shade the region bounded by these lines and x-axis. Find the area of the shaded region. [CBSE 2002]

$$2x + y = 6$$

x	0	3
y	6	0

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

x	0	-1
y	2	0



$$\text{Area} = \frac{1}{2} \times b \times h$$

$$= \frac{1}{2} \times 4 \times 4$$

8 sq. units



Topic : Algebraic Methods of Solving Simultaneous Linear Equations in two variables

The most commonly used algebraic methods of solving simultaneous linear equation in two variables are:

- (i) Method of elimination by substitution
- (ii) Method of elimination by equation the coefficients.
- (iii) Method of cross-multiplication.

not in CBSE

#Q. Solving the following systems of equations by using the method of substitution:

(i) $3x - 5y = -1$; $x - y = -1$

(ii) $x + 2y = -1$; $2x - 3y = 12$

$$\begin{array}{l} 3x - 5y = -1 \quad \text{--- (1)} \\ x - y = -1 \quad \text{--- (2)} \\ \boxed{x = -1 + y} \quad \text{--- (3)} \end{array}$$

Put (3) in (1)

$$3x - 5y = -1$$

$$3(-1 + y) - 5y = -1$$

$$\begin{array}{l} -3 + 3y - 5y = -1 \\ -3 - 2y = -1 \\ -2y = -1 + 3 \\ -2y = 2 \end{array}$$

$$y = \frac{2}{-2}$$

$$y = -1$$

Put $y = -1$ in eqⁿ (2)

$$x = -1 + (-1)$$

$$x = -2$$

$$(ii) \quad x + 2y = -1 \quad \text{--- (1)}$$

$$2x - 3y = 12 \quad \text{--- (2)}$$

$$x + 2y = -1$$

$$x = -1 - 2y \quad \text{--- (3)}$$

→ put (3) in (2)

$$2x - 3y = 12$$

$$2(-1 - 2y) - 3y = 12$$

$$-2 - 4y - 3y = 12$$

$$-7y = 14$$

$$y = -2$$

$$x = -1 - 2(-2)$$

$$x = -1 + 4$$

$$x = 3$$

Ans (3, -2)

#Q. Solving the following systems of equations by using the method of substitution:

(i) $2x + 3y = 9; 3x + 4y = 5$

$2x + 3y = 9$ ①

$3x + 4y = 5$ ②

$2x + 3y = 9$

$3y = 9 - 2x$

$y = \frac{9 - 2x}{3}$ ③

$3x + 4y = 5$

$3x + 4\left(\frac{9 - 2x}{3}\right) = 5$

$\frac{3x + 36 - 8x}{3} = 5$

$\frac{9x + 36 - 8x}{3} = 5$

$x + 36 = 15$

$x = -21$

$y = \frac{9 - 2(-21)}{3}$

$y = \frac{51}{3}$

$y = 17$

(ii) $\frac{2x}{a} + \frac{y}{b} = 2; \frac{x}{a} - \frac{y}{b} = 4$

will discuss in next class.

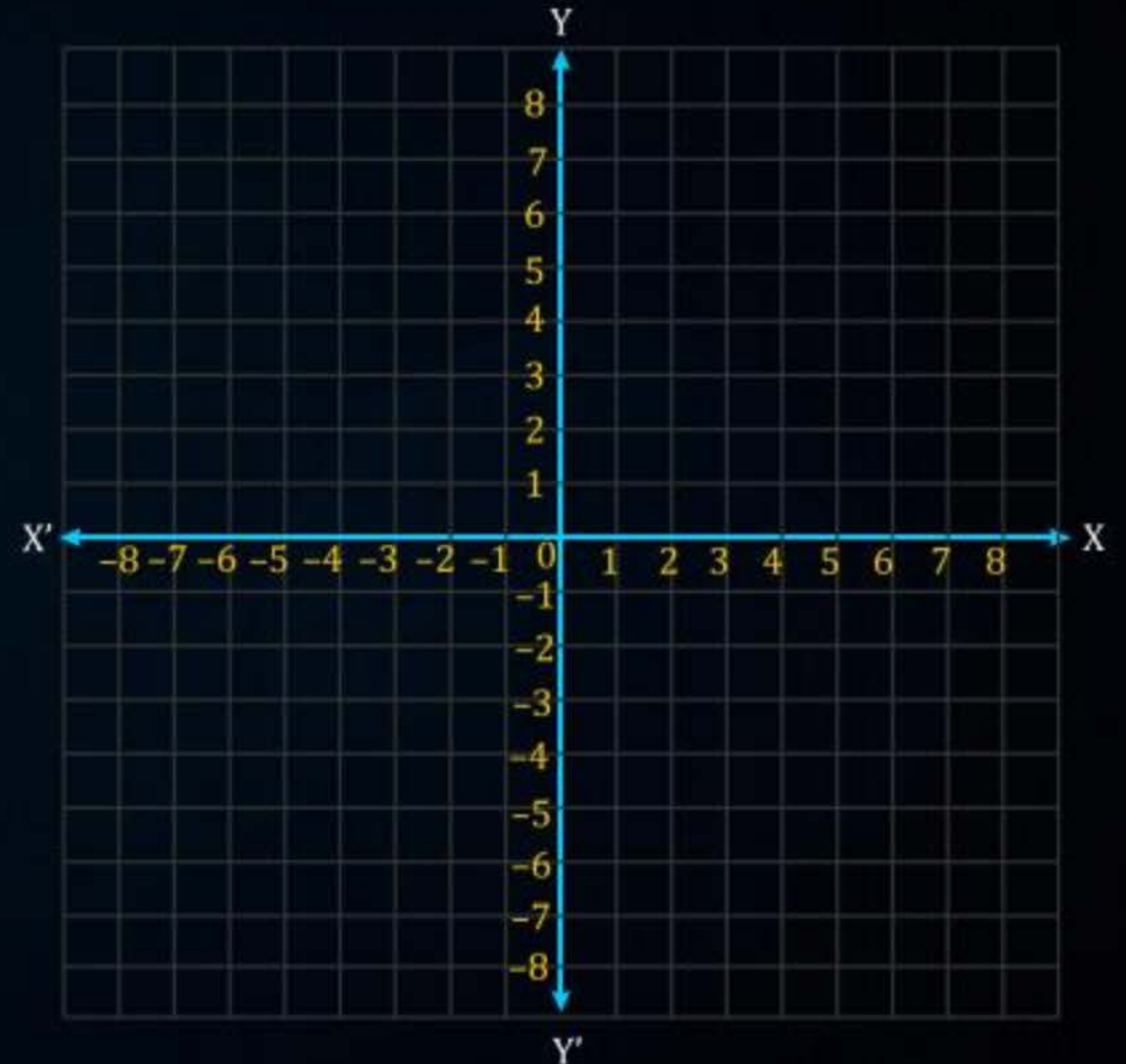
Topic : Graphical Method of Solving Simultaneous Linear Equations



#Q. The area of the triangle formed by the lines $y = x$, $x = 6$ and $y = 0$ is

- A** 36 sq. units
- B** 18 sq. units
- C** 9 sq. units
- D** 72 sq. units

H.w





Homework



DPP

+ 2 inclass
Questions



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THANK
YOU

