Warm-up

Write the equation of the line in slope intercept form.

1. $m = -\frac{4}{7}$, and $(-21, -2)$ (x, y)

$y = mx + b$

$-2 = \left(\frac{-4}{7}\right)(-21) + b$

$-2 = 12 + b$

$-12 \quad -12$

$-14 = b$

$y = -\frac{4}{7}x - 14$

2. $(-8, -18)$ and $(-3, -3)$ (x, y)

$\frac{y_2 - y_1}{x_2 - x_1} \quad \frac{-3+18}{-3+8} = \frac{15}{5} = 3 = m$

$y = mx + b$

$-3 = (3)(-3) + b$

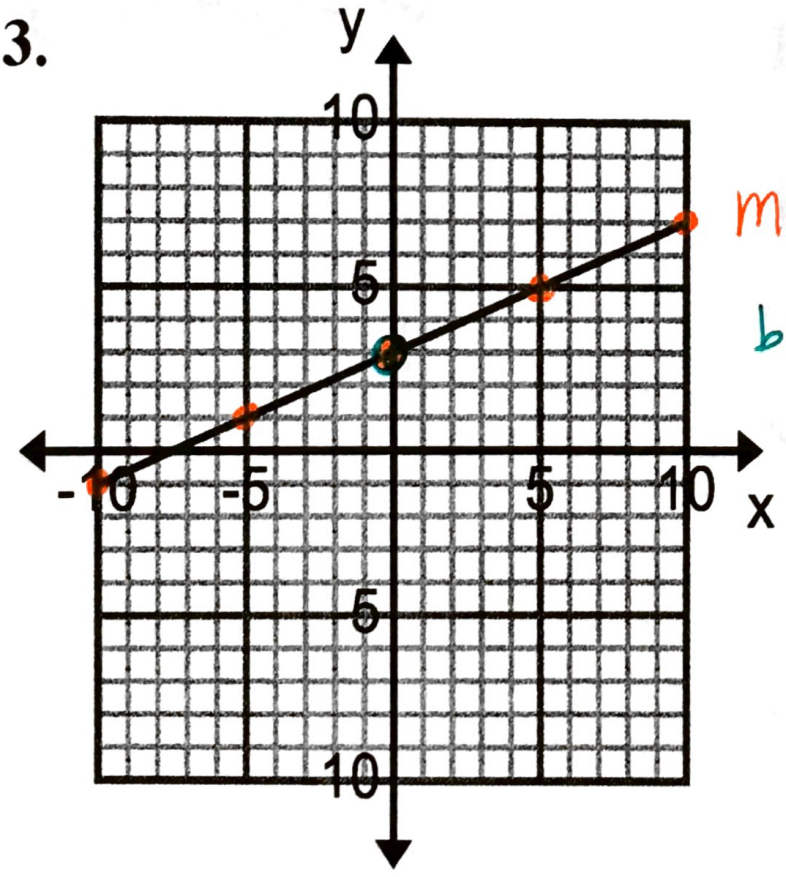
$-3 = -9 + b$

$+9 \quad +9$

$6 = b$

$y = 3x + 6$

3.



$m = \frac{2}{5}$

$b = 3$

$y = \frac{2}{5}x + 3$

- **Systems of Two Linear Equations:**

  2 straight lines

- **A Solution of a System:**

  where (if anywhere) the 2 lines intersect.

Example 1: Checking Solutions of Linear System

Check whether the two points listed are solutions of the following system.

$$\begin{cases} x - 3y = -5 \\ -2x + 3y = 10 \end{cases}$$

A. $(1, 4)$ (x, y)

B. $(-5, 0)$ (x, y)

CHECK POINT A

$1 - 3(4) = -5$

$1 - 12 = -5$

$-11 \neq -5$

Not a solution.

CHECK POINT B

$-5 - 3(0) = -5$

$-5 - 0 = -5$ ✓

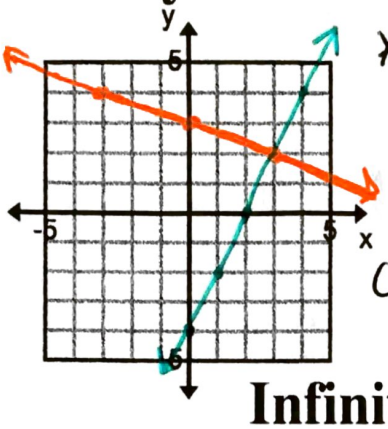
$-2(-5) + 3(0) = 10$

$10 + 0 = 10$ ✓

Yes! That's where the 2 lines cross.

Number of Solutions of a Linear System

Exactly one solution:



* Different slopes !*

$y = -\frac{1}{3}x + 3$

$y = 2x - 4$

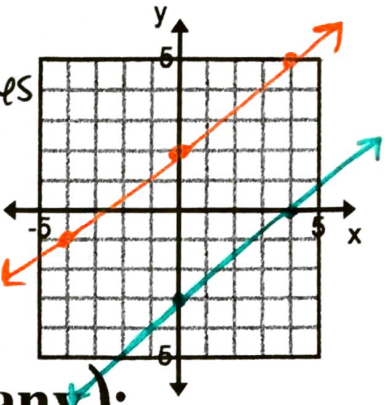
Cross @ (3, 2)

No Solution: (Never Cross)

* parallel lines

$y = \frac{3}{4}x + 2$

$y = \frac{3}{4}x - 3$

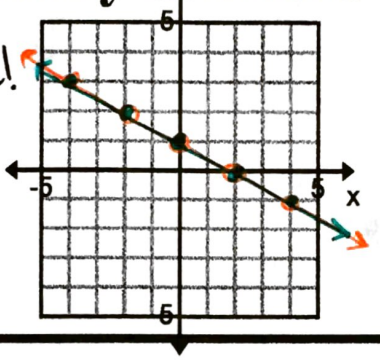


Infinitely many Solutions (∞ many):

* same exact line!

$y = -\frac{1}{2}x + 1$

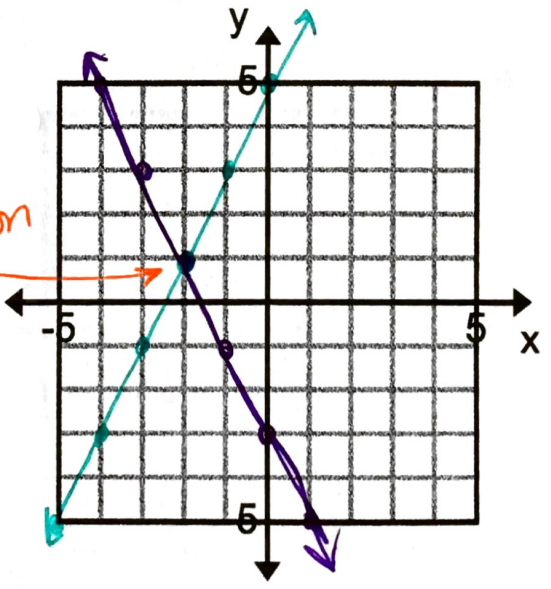
$y = -\frac{1}{2}x + 1$



(cross ∞ times or share ∞ points)

Ex. 2: Solve the system using a graph.

$$\begin{cases} y = -2x - 3 \\ y = 2x + 5 \end{cases}$$

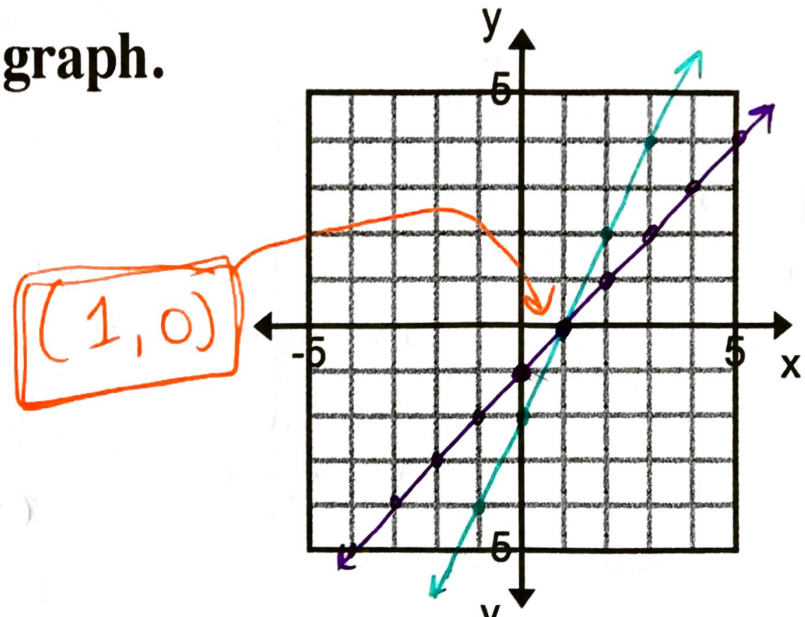


Solution

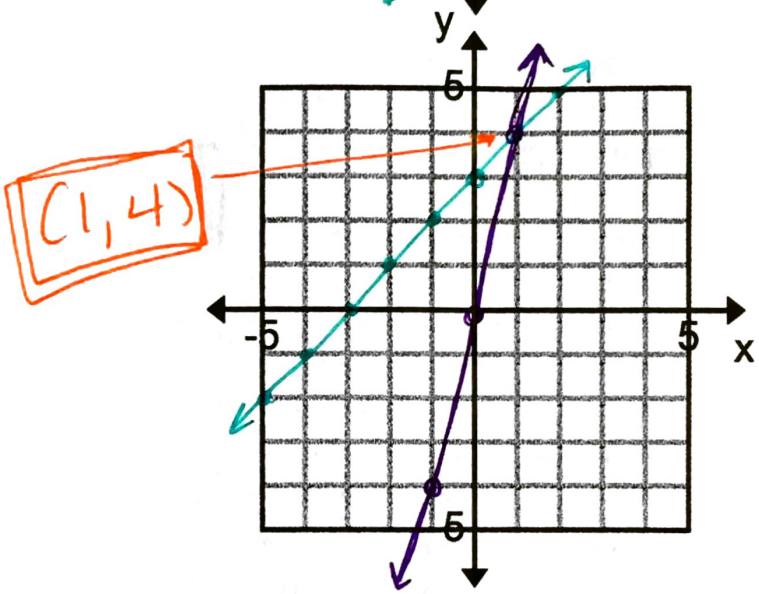
(-2, 1)

Solve the system using a graph.

Ex. 3: $\begin{cases} y = x - 1 \\ y = 2x - 2 \end{cases}$ $m = \frac{1}{1}$



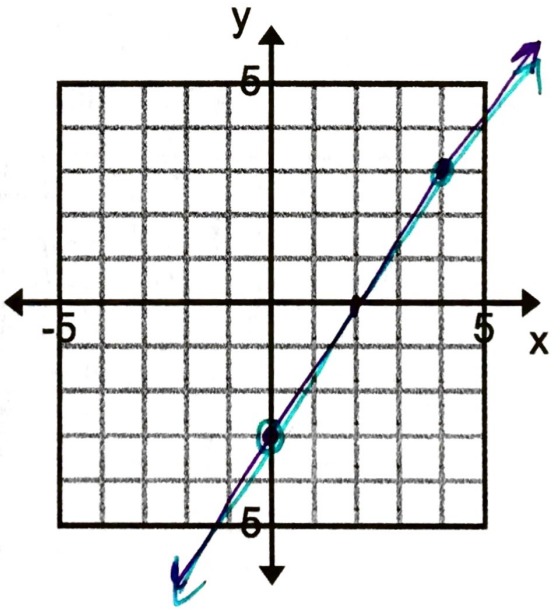
Ex. 4: $\begin{cases} y = 4x + 0 \\ y = x + 3 \end{cases}$ b



Ex. 5:

$$\begin{cases} y = \frac{3}{2}x - 3 \\ y = \frac{6}{4}x - 3 \end{cases}$$

∞ solutions



Solve the system using a graph.

Ex. 6:

$$\begin{cases} 2x - y = -1 \\ 4x - 2y = 6 \end{cases}$$

$-4x \quad -4x$

$-2y = -4x + 6$

$\frac{-2y}{-2} = \frac{-4x}{-2} + \frac{6}{-2}$

$y = 2x - 3$

$2x - y = -1$

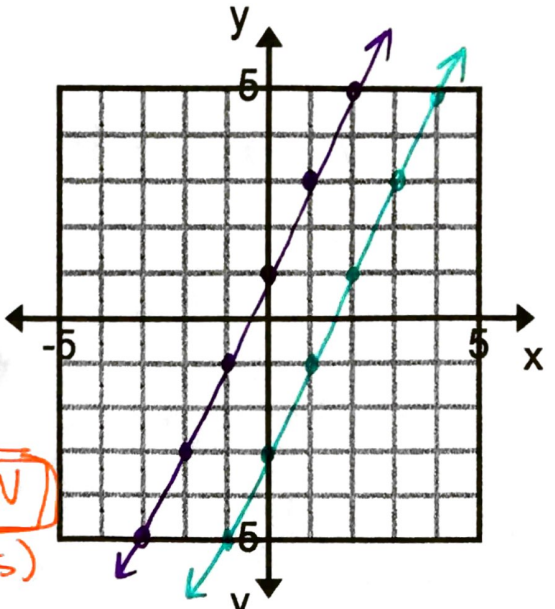
$-2x \quad -2x$

$-1y = -2x - 1$

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

$y = 2x + 1$

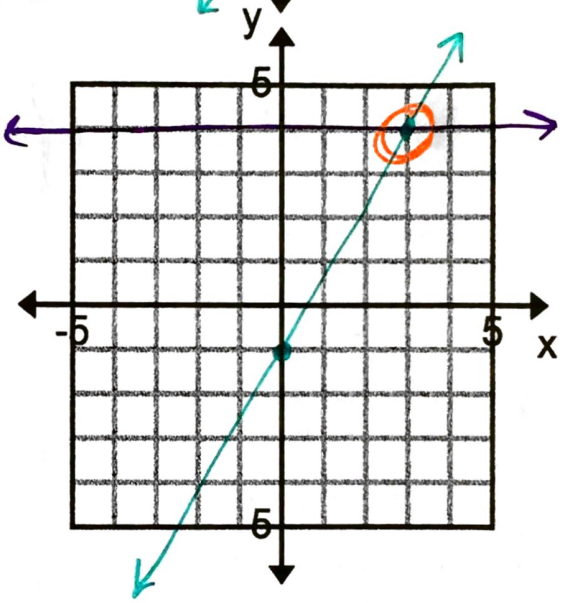
NO SOLUTION
(parallel lines)



Ex. 7:

$$\begin{cases} y = 4 \\ y = \frac{5}{3}x - 1 \end{cases}$$

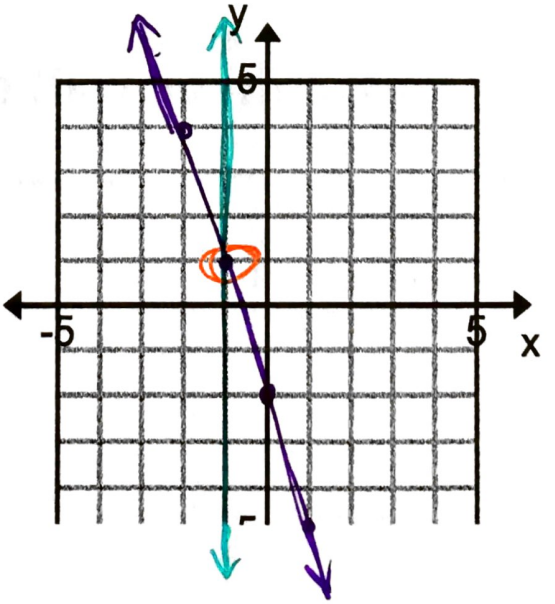
(3, 4)



Ex. 8:

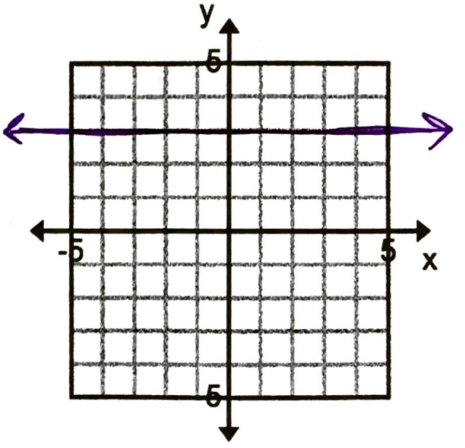
$$\begin{cases} y = -3x - 2 \\ x = -1 \end{cases}$$

(-1, 1)



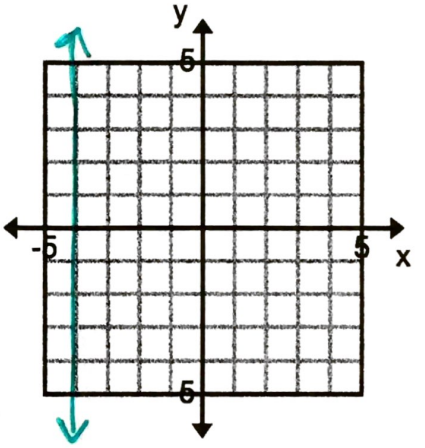
Review of Horizontal & Vertical Lines:

When there is ONLY a *y* in the equation, the graph of the line is Horizontal.



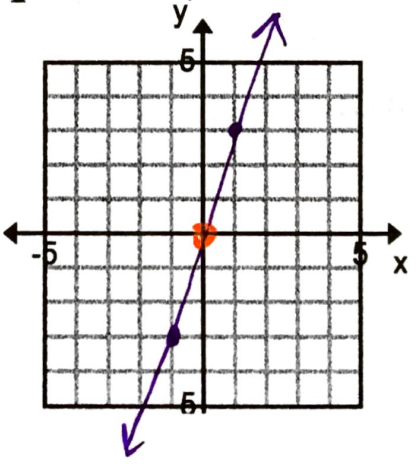
Ex. 9: $y = 3$ *crosses y axis*

When there is ONLY an *x* in the equation, the graph of the line is vertical.



Ex. 10: $x = -4$ *crosses x axis*

When there is both an *x* and a *y* in the equation, the graph of the line is SLANTED.



Ex. 11: $y = 3x + 0$

$y = mx + b$