2.6 Solving System of Equations Graphing

Standard:

A.REI.6

$\boxed{\text{Old}}$ Graphing Linear Equations

Let's recall 2 forms for linear equations:

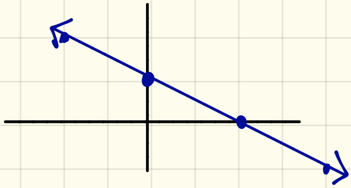
- slope-intercept form : $y = mx + b$ → best for graphing
- standard form : $ax + by = c$

$y = mx + b$

$m =$ slope, $b =$ y-intercept.

Graph Lines.

① $y = \frac{-1}{2}x + 1$



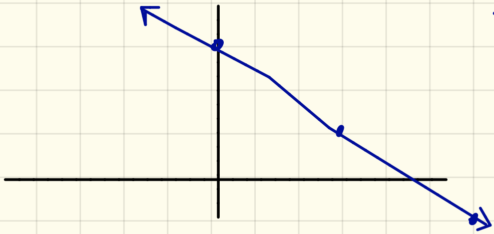
② $-3x - 6y = 18$

$-4x - 6y = 18$

$\cancel{-4x + 4x} - 6y = 4x + 18$

$\frac{-6y}{-6} = \frac{4x + 18}{-6}$

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

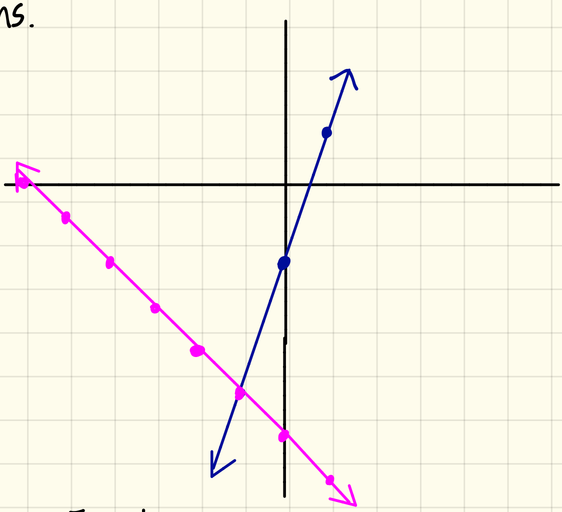


$\boxed{\text{new}}$ Solving Systems of Equations (Graphically)

A system of equations is a set or collection of equations that one deals with at one time (simultaneously).

Let's consider the 2 following equations.

- $y=3x-2$
- $y=-x-6$



[1] Graph the 2 equations.
[2] Do they intersect? If so, where?

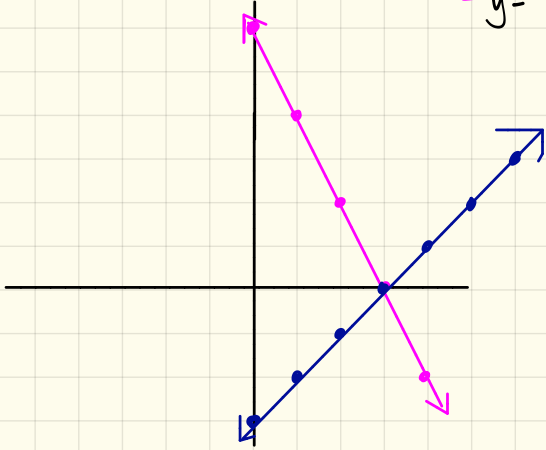
$(-1,-5)$.

Basic Idea of Solving System of Linear Equations

The goal is to find the point that marks the intersection of the 2 lines. The point that intersects on the graph is the solution to the system of linear equations.

[Example 1] Find the solution to the system.

- $y=x-3$
- $y=-2x+6$

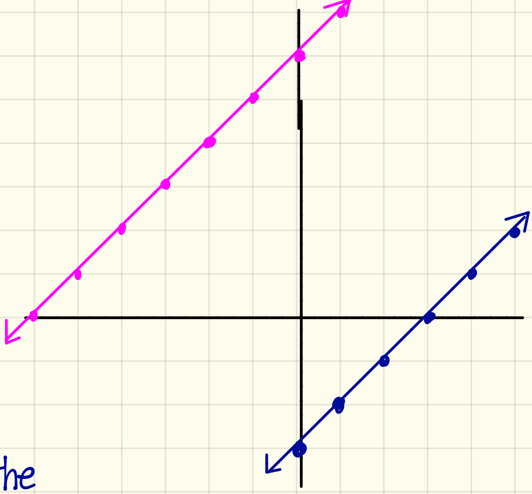


Solution: $(3,0)$

Let's consider the 2 equations:

$y = x - 3$

$y = x + 6$



$\boxed{1}$ Graph the 2 equations.

$\boxed{2}$ Do they intersect? If so, where?

They do not intersect.

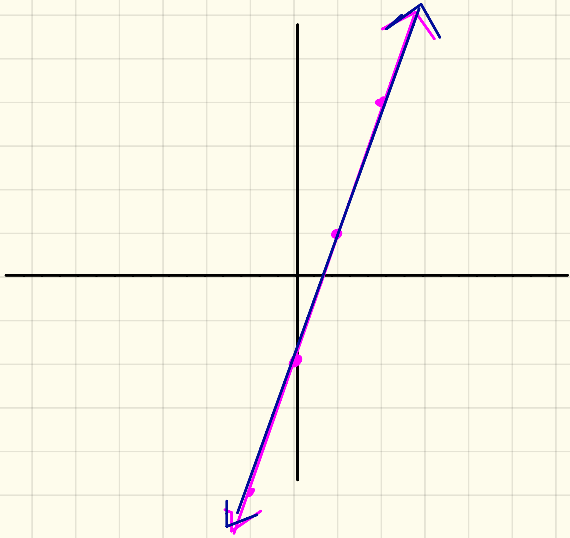
Why do they not intersect? What do the 2 equations have in common?

The 2 equations have the same slope, thus the lines will never cross & will remain parallel.

Let's consider the 2 equations:

$y = 3x - 2$

$y = 3x - 2$



$\boxed{1}$ Graph the 2 equations.

$\boxed{2}$ Do they intersect? If so, where?

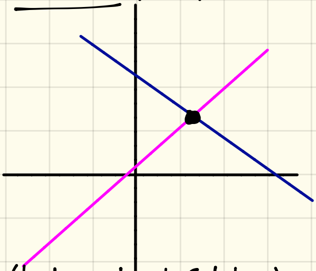
The 2 lines intersect at every point on the line.

Why do they intersect at every point? What do the 2 equations have in common?

The 2 equations have the same slope and same y-intercept. Since they have they are the same equations the 2 lines lie on top of one another, thus having an infinite amount of solutions.

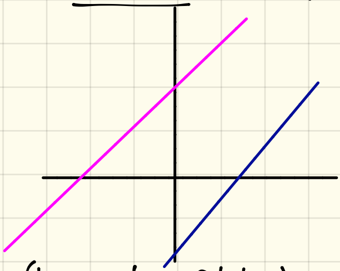
Conclusion There are 3 possible solutions for solving systems.

CASE A 1 solution



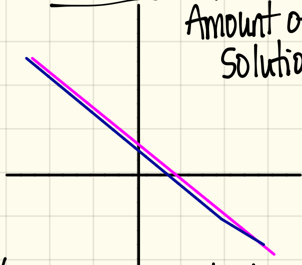
(Independent Solution)
↳ different slopes

CASE B No solution



(Inconsistent Solution)
↳ same slope

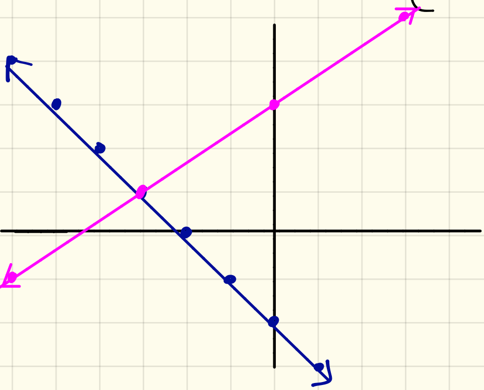
CASE C Infinite Amount of Solutions



(Dependent Solution)
↳ same equations

[Example 1] Solve the system.

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



Solution $(-3,1)$

Check answer: $(-3,1)$

$x = -3, \quad y = 1$

$1 = -(-3) - 2$

$1 = 3 - 2$

$1 = 1. \checkmark$

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

$1 = -2 + 3$

$1 = 1. \checkmark$

[More Examples] Determine whether the ordered pair is a solution of the system.

$$3x+2y=4$$
$$-x+3y=-5$$

$(2,-1)$.

$$3(2)+2(-1)=4$$
$$6+{}^{-}2=4$$
$$4=4\ \checkmark$$

$$-(2)+3(-1)=-5$$
$$-2+{}^{-}3=-5$$
$$^{-}5=-5\ \checkmark$$

$(2,-1)$ is the solution to the system.