Note: IB calls it
Simultaneous equations

System of equations: graphing +substitution + elimination

Page 156: 2-16 (only even)

~~Page 164: 4-26 (only even)~~

Overview

- 1 variable → 1 equation

$$2x + 10 = 5$$

- 2 variables → 2 equations

$$\begin{cases} 2x + y = 10 \\ x + y = 20 \end{cases}$$

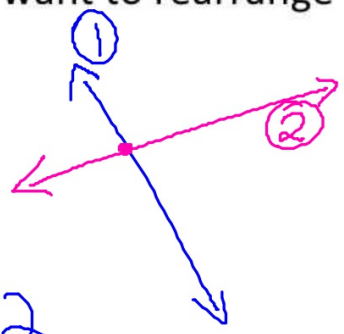
Solving by graphing

- Given a system, graph each line. You may want to rearrange each equation to slope-intercept form.

- Example:

① $3x+y=-4$

② $x-5y=-10$



$$\begin{cases} y=-3x-4 \\ y=\frac{1}{5}x+2 \end{cases}$$

(-1.88, 1.63)

① $3x+y=-4$

$y=-3x-4$

② $x-5y=-10$

$-5y=-10-x$

$5y=x+10$

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

or

$x=-1.88$

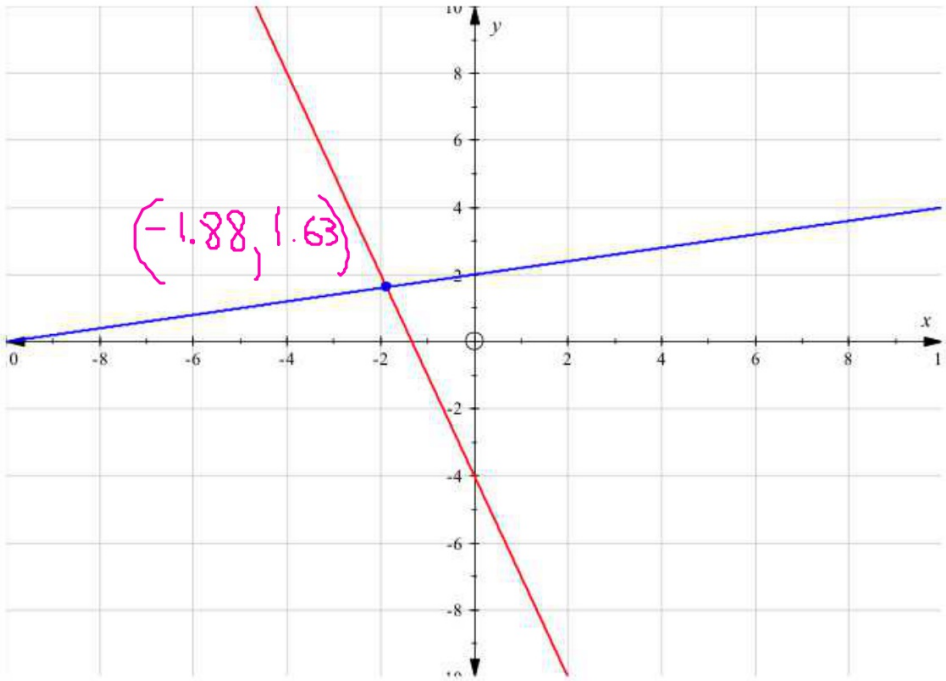
and

$y=1.63$

Solving by graphing:

Can two lines have more than 1 point in common?

This point in common is the "point of intersection", hence the solution to your system



In class, with your computers!

- Solve the following system!

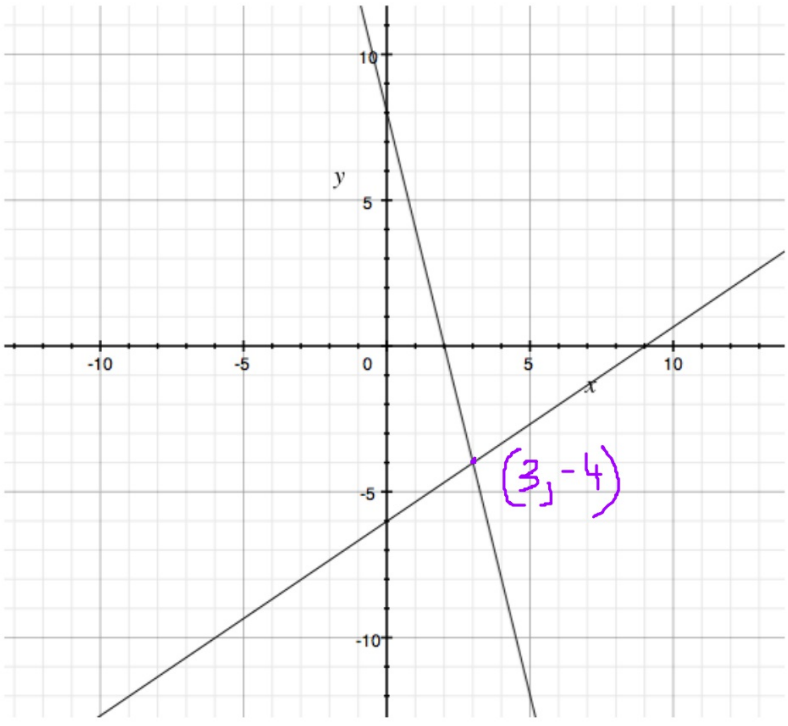
$$4x + y = 8 \quad \Longrightarrow \quad y = -4x + 8$$

$$2x - 3y = 18 \qquad y = +\frac{2}{3}x - 6$$

$(3, -4)$

or $x = 3$ and $y = -4$

see next slide for graph!



Solve by graphing

- What happens if lines are //

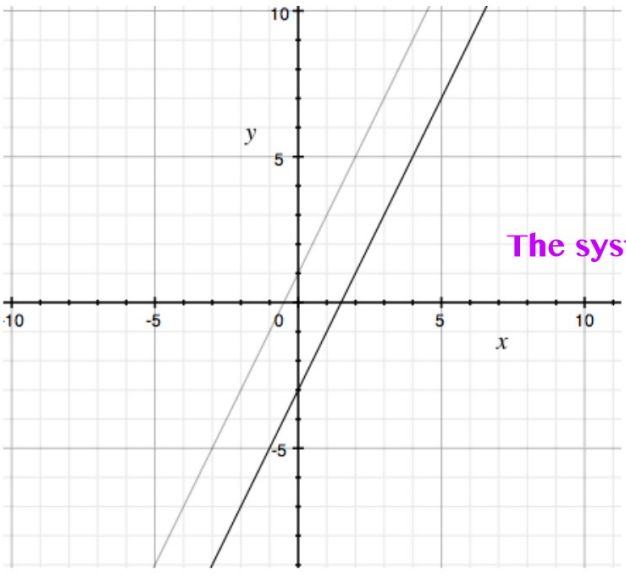
$$\begin{cases} y = 2x + 1 \\ y = 2x - 3 \end{cases}$$

No solution

There are no points in common!
No point of intersection!!!!!

What are you going to do?????

Think like a mathematician!!!!

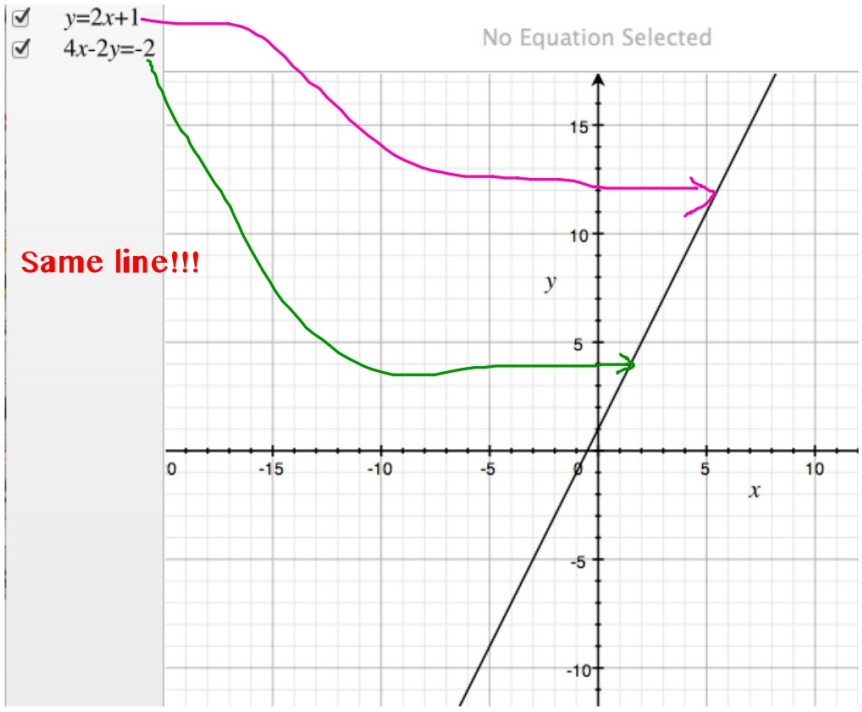


The system has NO SOLUTION!!!

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

(they are the same lines)

∞ solutions!



Think like a mathematician!!!

How many points in common these two lines have?????

1, 2, 10, 130, ... ∞, bc there are ∞ points in one line and they share them all

Solving by graphing

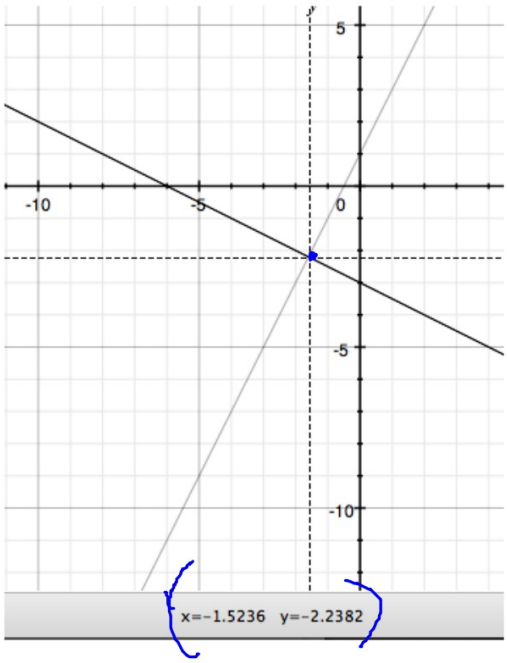
- What would happen here?

$y = 2x + 1$

$y = -\frac{1}{2}x - 3$

BEING $\perp$ does not impact our system. Whether perpendicular or not, there is still ONE point of intersection and ONLY ONE

$(-1.56, -2.2)$



$(-1.52, -2.24)$

Number of Solutions

- ☑ One solution: It is the point of intersection.
- ☑ NO solution: When lines are parallel
- ☑ Infinite solutions: Lines are the Same line