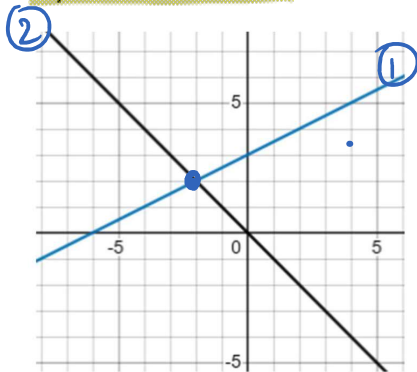# 6.1 Part 2

6.1 – Solving Systems of Equations – Part 2

The properties of systems of linear equations.

Recall - when graphing a system of linear equations, the solution is the point of intersection.

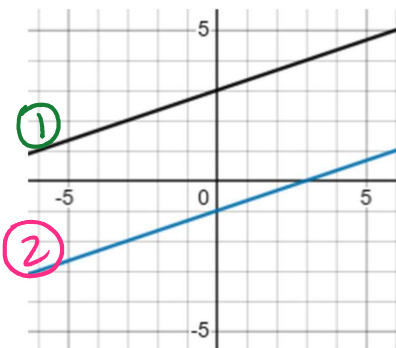A linear system can have three different solution possibilities.

(x, y)

$y = mx + b$

Option 1: One solution

② $y = -x$ and $2y = x + 6$

$m = -1$
$b = 0$

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

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

$m = \frac{1}{2}$
$b = 3$

Since the slopes are different, the lines intersect at exactly one point.

Intersecting Lines: **One solution (slopes are different)**
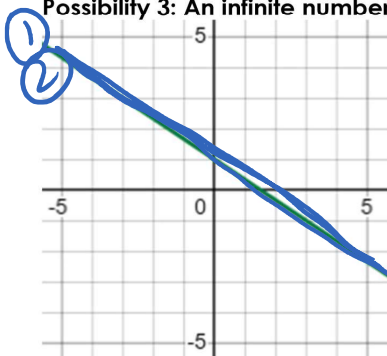
Option 2: No solution

① $y = \frac{1}{3}x + 3$ and $x - 3y + 6 = 9$

$m = \frac{1}{3}$
$b = 3$

②
$x - 3y + 6 = 9$
$-x \qquad -x$
$-3y + 6 = -x + 9$
$\quad -6 \qquad -6$
$-3y = -x + 3$

$y = \frac{1}{3}x - 1$
$m = \frac{1}{3}$
$b = -1$

The slopes are equal, and the y-intercepts are different. They don't intersect.

Parallel Lines: **No Solution (same slope, different y-intercept)**

Possibility 3: An infinite number of solutions

① $y = -\frac{2}{3}x + 1$ and $2x + 3y - 3 = 0$

$m = -\frac{2}{3}$
$b = 1$

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

$m = -\frac{2}{3}$
$b = 1$

The slopes and y-intercepts are equal. The straight lines are on top of each other.

Coincident Lines: **Many Solution Infinite number of solutions (same slope and same y-intercept)**

Example 1 : Determine the number of solutions for each system of equations

① ②
a) $3x + y = -1$ and $-6x = 2y + 12$
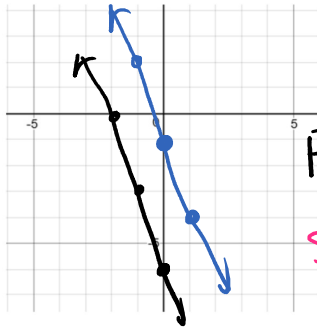
$y = -3x - 1$

$m = -3 = \frac{-3}{1}$

$b = -1$

$-2y = 6x + 12$

$y = -3x - 6$

$m = -3 = \frac{-3}{1}$

$b = -6$

parallel lines

Same Slope

① ②
b) $x + y + 2 = 0$ and $-2x - 4 = 2y$

$y = -x - 2$

$m = -1 = \frac{-1}{1}$

$b = -2$

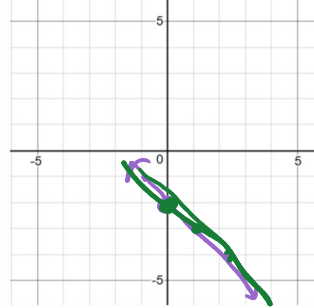$\frac{-2x}{2} - \frac{4}{2} = \frac{2y}{2}$

$-1x - 2 = y$

$y = -1x - 2$

$m = -1 = \frac{-1}{1}$

$b = -2$

Same line
Infinite number of solutions

Example 2 : Determine the number of solutions without graphing.

① ②
a) $y = \frac{2}{3}x + 1$ and $y = 2x - 1$

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

$b = 1$

$m = 2$

$b = -1$

Different slope

One solution
Intersecting lines

①
b) $y = -3x - 6$ and $2y = -6x - 12$

$m = -3$

$b = -6$

$\frac{2y}{2} = \frac{-6x}{2} - \frac{12}{2}$

$y = -3x - 6$

$m = -3$

$b = -6$

Same slope.

Same y-intercept

Same line
Infinite number of solutions.

Practice : p. 448 # 4, 6, 7, 10, 14

Mrs. Shaw

F & PC 10