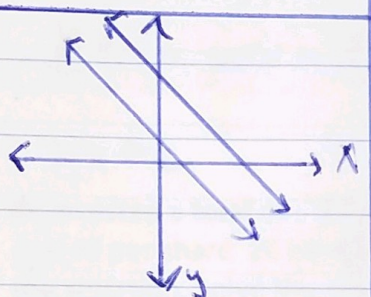
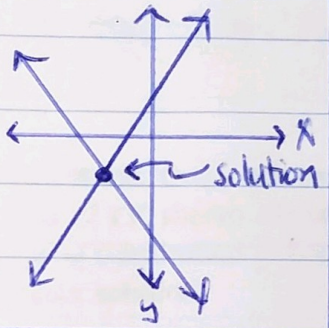
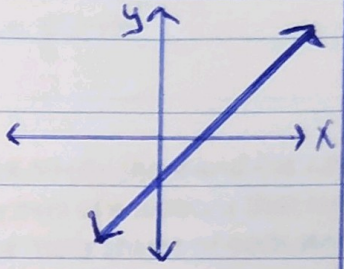
3.1 Systems of 2 Equations in 2 Variables w/ Word Problems

Solutions of Systems of Linear Equations

You can have zero, one, or infinitely many solutions.

	No Solution	One Solution	Infinite Solutions
how to notice	Same slope Not same y-int	Not same slope Not same y-int	Same slope Same y-int
graphically	 parallel lines		 same line
algebraically	False statement like $0 = -5$	solve like normal	true statement like $3 = 3$

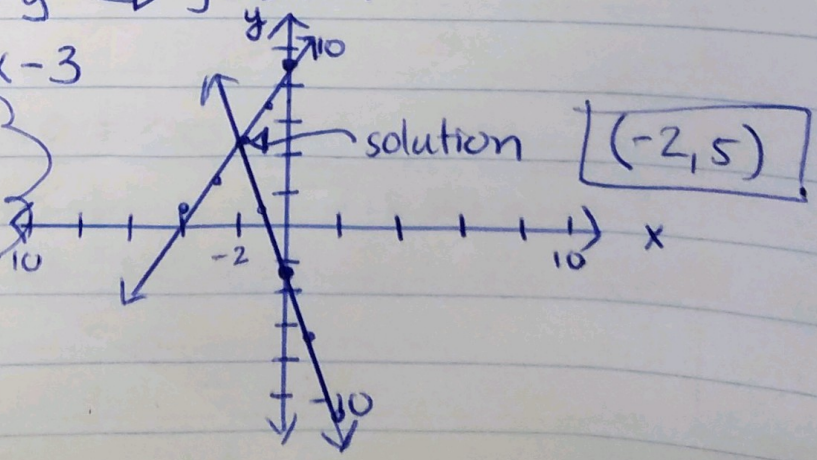
Solving by Graphing

① Sketch lines on one graph.

② The solution is the intersection point (look at chart above for alternatives)

EX #1 $\begin{cases} 2x+9=y \\ y=-4x-3 \end{cases} \Rightarrow y = 2x+9$

Problem w/ graphing:
IT'S NOT EXACT!!



Solving by Substitution

① Pick one equation and isolate a variable.

② Substitute the expression from part ① into the other equation and solve.

③ Solve for the next variable by using your answer from part ② & equation from part ①.

Ex #2

Eli invested a total of $2000 in two stocks. One stock cost $18.50 per share and the other cost $10.40 per share. Eli bought a total of 130 shares. Write a system of equations that represents the situation. Solve the system using substitution to find how many shares of each stock Eli bought. Remember to interpret your solution.

x = # of shares @ \$18.50

y = # of shares @ \$10.40

$$\begin{cases} 2000 = 18.50x + 10.40y \\ 130 = x + y \end{cases}$$

① $y = 130 - x$

② $2000 = 18.50x + 10.40(130 - x)$

$2000 = 18.50x + 1352 - 10.40x$

$2000 = 8.1x + 1352$

$648 = 8.1x$

$x = 80$

③ $y = 130 - 80 = 50$

Eli bought 80 shares at \$18.50 and 50 shares at \$10.40.

Solving by Elimination

① "Line up" the variables.

② Pick a variable to eliminate, making sure the coefficients are opposites (might need to multiply).

③ Combine straight down & solve.

④ Substitute the answer from part ③ into an original equation & solve.

A karate school offers a package of 12 group lessons and 2 private lessons for $110. It also offers a package of 10 group lessons and 3 private lessons for $125. Write a system of equations that represents the situation. Solve the system using elimination to find the cost of a single group lesson and a single private lesson.

x = cost of a group lesson

y = cost of a private lesson

$$\begin{cases} (12x + 2y = 110) \cdot 3 \Rightarrow 36x + 6y = 330 \\ (10x + 3y = 125) \cdot -2 \Rightarrow -20x - 6y = -250 \end{cases}$$

$16x = 80$

$x = 5$

A group lesson costs $5 and a private lesson costs $25.

$12(5) + 2y = 110$

$60 + 2y = 110$

$2y = 50$

$y = 25$

EX #4 Substitution:

$$\begin{cases} y = -6x - 10 \\ y = -3x - 4 \end{cases}$$

$-6x - 10 = -3x - 4$

$-10 = 3x - 4$

$-6 = 3x$

$x = -2$

$y = -6(-2) - 10$

$y = 12 - 10$

$y = 2$

$(-2, 2)$

Ex #5 $\begin{cases} y = -3x - 3 \\ y = 6x + 15 \end{cases}$ $(-2, 3)$

★ Ex #6 $\begin{cases} -2x + 2y = 0 \\ y = 4x + 24 \end{cases}$ $(-8, -8)$

Ex #7 $\begin{cases} 3x + 6y = 15 \\ y = x + 1 \end{cases}$ $(1, 2)$

★ Ex #8 $\begin{cases} -3x + 7y = -21 \\ 5x + y = -3 \end{cases}$ $(0, -3)$

Ex #9 $\begin{cases} 3x + y = -4 \\ 8x + 2y = -16 \end{cases}$ $(-4, 8)$

~~Elimination Practice~~

★ Ex #10 $\begin{cases} 5x + 4y = 7 \\ -4x - 4y = -4 \end{cases}$ $(3, -2)$

Ex #11 $\begin{cases} -3x - 6y = 3 \\ 3x + 6y = -3 \end{cases}$ Infinite Solutions

★ Ex #12 $\begin{cases} -8x - 6y = -32 \\ -2 = -2x - 3y \end{cases} \Rightarrow \begin{array}{l} -8x - 6y = -32 \\ -2x - 3y = -2 \end{array}$ $(7, -4)$

Ex #13 $\begin{cases} 6x + y = 28 \\ x - 3y = 30 \end{cases}$ $(6, -8)$

★ Ex #14 $\begin{cases} -15x + 2y = -2 \\ -5x + y = -1 \end{cases}$ $(0, -1)$

Ex #15 $\begin{cases} -8x - 2y = -10 \\ 3x - 7y = -4 \end{cases}$ $(1, 1)$