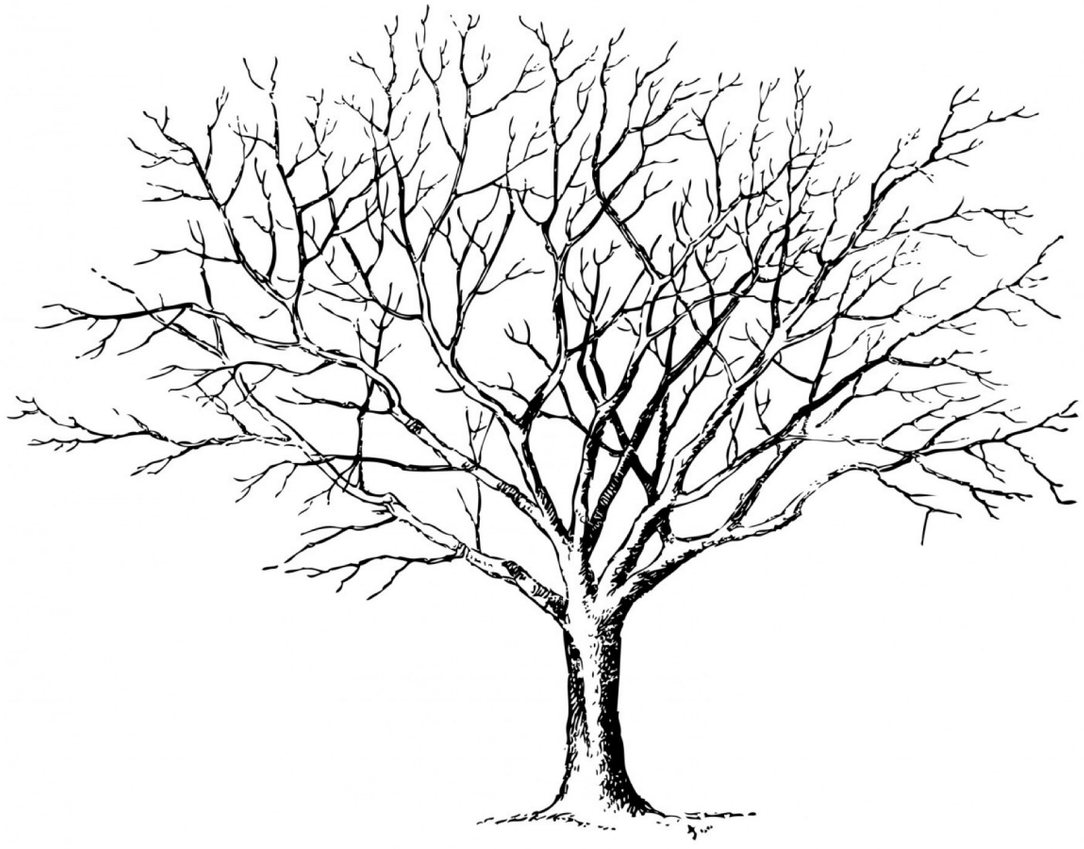
TheTutor

MATH · PHYSICS



Live-Lecture

Math 1201 Chapter 7

Systems of equations

Chapter 7 - Systems of equations

Substitution

Solve ONE of the equation for ONE of the variables

Replace the variable in the **other** equation

Solve for your first answer
(rearrange to get variable by itself)

Plug first answer back in to find the second answer

Elimination

Lineup x, y and numbers

Pick which variable to eliminate, either x or y

Multiply one or both of the equation(s) to get the **same** number, but **opposite** sign

Add the two equations

Solve for your first answer

Plug first answer into **either** of the original equations to find the second answer

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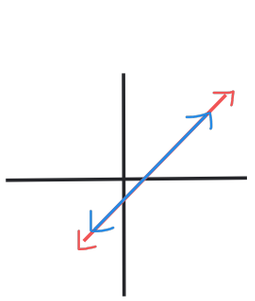
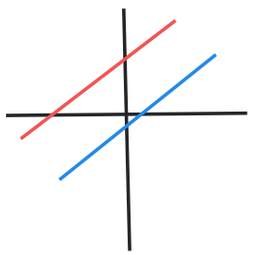
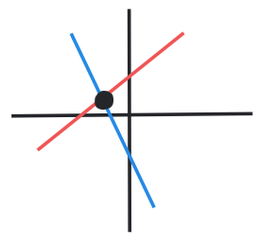
Number of solutions

Same slope (parallel) = no solution



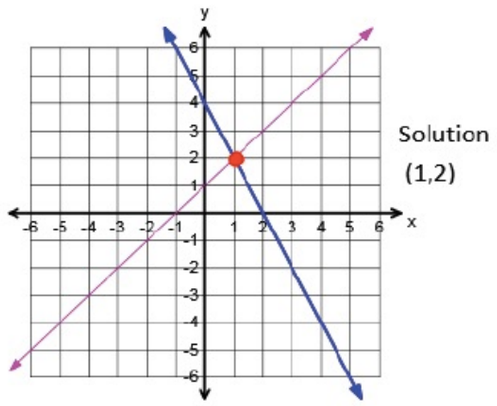
Same equation = infinite solutions





Different slope = one solution

Solve by graphing



- Change both equations to slope intercept form
- Graph both lines using the y-intercept and rise over run
- The point where the lines meet is your solution

Solve by checking

To check your answer or to work out some multiple choice questions you can try this:

- Plug both answers into each equation
- they should give you the same answer

Word problems

Assign variables for each item to calculate

One equation for the money

One equation for how many there are

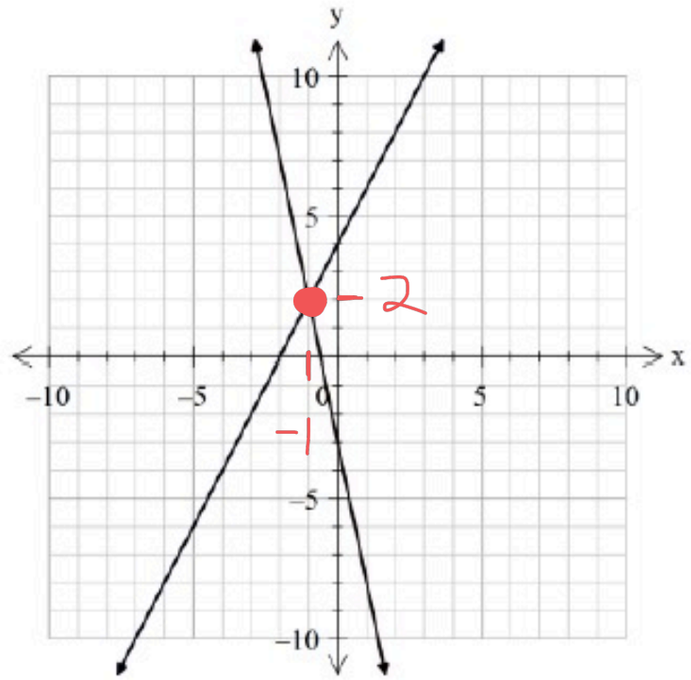
Note: there are other types of word problems, but the money question seems to be the most popular

Math 1201

Chapter 7 SAMPLE Test Systems of Equations

Multiple Choice (9 marks)

1. What is the solution to the system graphed?



A. (2, -1)

B. (1, -2)

C. (-1, 2)

D. (-2, 1)

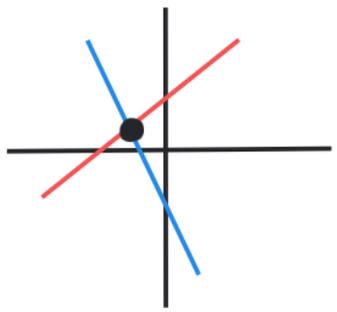
4. Which system has exactly one solution?

A. $\begin{cases} y + 4x = -2 \\ y = -4x + 5 \end{cases}$

B. $\begin{cases} 6x + 3y = -1 \\ 2x + y = 4 \end{cases}$

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

D. $\begin{cases} 3x - y = 2 \\ y - 4 = 3(x - 2) \end{cases}$



Different slope = one solution

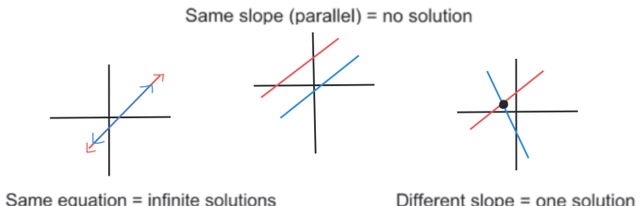
$y = \text{slope} \times - \text{y-int}$

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

slope

slope

Number of solutions



2. What is the solution to the system of equations $\begin{cases} y = 2x - 1 \\ y = -x + 5 \end{cases}$?

A. (-2, -3) B. (-3, 2) C. (3, 2) D. (2, 3)

$$y = 2x - 1$$
$$y = -x + 5$$

Solve ONE of the equation for ONE of the variables

$$y = 2x - 1$$

Replace the variable in the **other** equation

$$2x - 1 = -x + 5$$

Solve for your first answer
(rearrange to get variable by itself)

$$2x - 1 = -x + 5$$

$$2x + x = 5 + 1$$

Substitution

Solve ONE of the equation for ONE of the variables

Replace the variable in the **other** equation

Solve for your first answer
(rearrange to get variable by itself)

Plug first answer back in to find the second answer

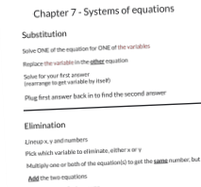
$$\frac{3x}{3} = \frac{6}{3}$$

$$x = 2$$

Plug first answer back in to find the second answer

$$y = 2x - 1$$

$$y = 2(2) - 1 = 3$$


Chapter 7 - Systems of equations

Substitution

Solve ONE of the equation for ONE of the variables

Replace the variable in the other equation

Solve for your first answer
(rearrange to get variable by itself)

Plug first answer back in to find the second answer

Elimination

Lineup x, y and numbers

Pick which variable to eliminate, either x or y

Multiply one or both of the equation(s) to get the same number, but

Add the two equations

5. In which system are the lines parallel?

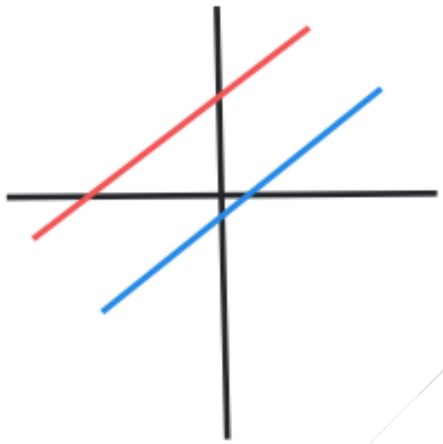
A. $\begin{cases} 2x - y = 3 \\ x + 2y = 3 \end{cases}$

B. $\begin{cases} 2x + 3y = 5 \\ 6x + 9y = 1 \end{cases}$

C. $\begin{cases} x - y = 10 \\ x + y = 10 \end{cases}$

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

Same slope (parallel) = no solution



$y = \text{slope} \times + \text{y-int}$

B. $\begin{cases} 2x + 3y = 5 \\ 6x + 9y = 1 \end{cases}$

$2x + 3y = 5$

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

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

$6x + 9y = 1$

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

$y = \frac{-2}{3}x + \frac{1}{9}$

same slope

7. For which system is (-3, 5) the solution?

A. $\begin{cases} 2x + y = -1 \\ x + 2y = 7 \end{cases}$

B. $\begin{cases} 5x - 3y = 12 \\ 2x + 3y = 18 \end{cases}$

C. $\begin{cases} 4x - 3y = -27 \\ 2x + 4y = 12 \end{cases}$

D. $\begin{cases} 3x + 2y = 1 \\ 6x - 4y = 2 \end{cases}$

Solve by checking

To check your answer or to work out some multiple choice questions you can try this:

- Plug both answers into each equation
- they should give you the same answer

$x = -3 \quad y = 5$

$2(-3) + (5) = -1$

$-1 = -1$ ✓

$(-3) + 2(5) = 7$

$7 = 7$ ✓

6. Julie is asked to solve the system below by elimination. Which of the following steps would be the best way to begin?

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

A. Multiply ① by 2 and multiply ② by 3
B. Multiply ② by 2
C. Multiply ① by 2
D. Multiply ② by 2 and multiply ① by -2

C. Multiply ① by 2

$$\text{①}\ 2x + y = -3 \quad \cdot 2$$
$$\text{②}\ 3x - 2y = 2$$

$4x + 2y = -6$

$3x - 2y = 2$

Elimination

Lineup x, y and numbers

Pick which variable to eliminate, either x or y

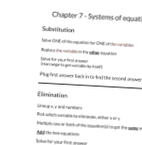
Multiply one or both of the equation(s) to get the **same** number, but **opposite** sign

Add the two equations

Solve for your first answer

Plug first answer into **either** of the original equations to find the second answer

the **same** number, but **opposite** sign



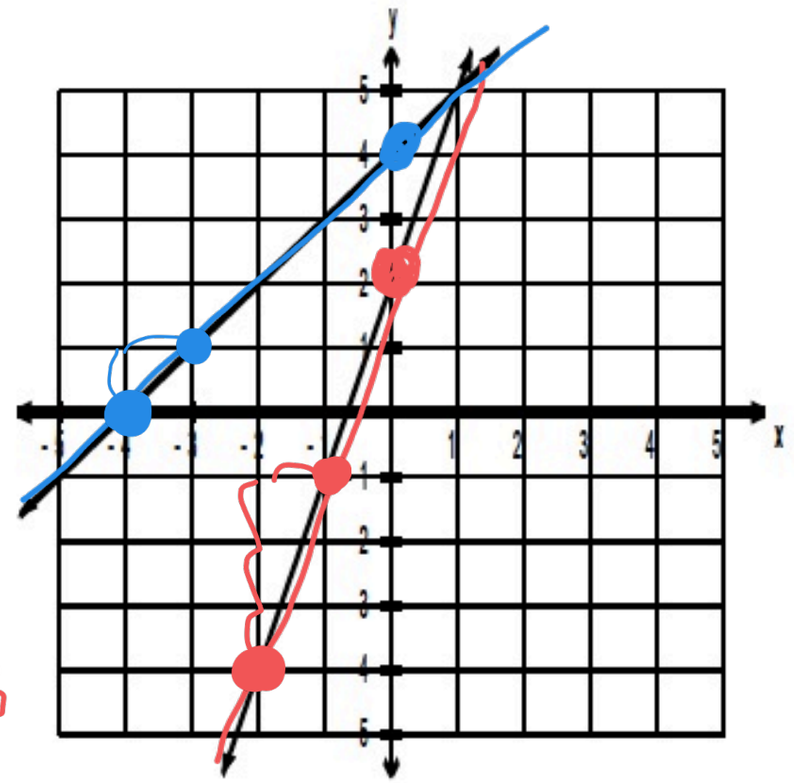
3. Which two equations are represented in the following graph?

A. $\begin{cases} y = -x + 4 \\ y = -3x + 2 \end{cases}$

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

C. $\begin{cases} y = x + 4 \\ y = 3x + 2 \end{cases}$

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



slope $= \frac{1}{1} = 1$

slope $= \frac{3}{1} = 3$

positive slopes

$y = \text{slope} \times + \text{y-int}$

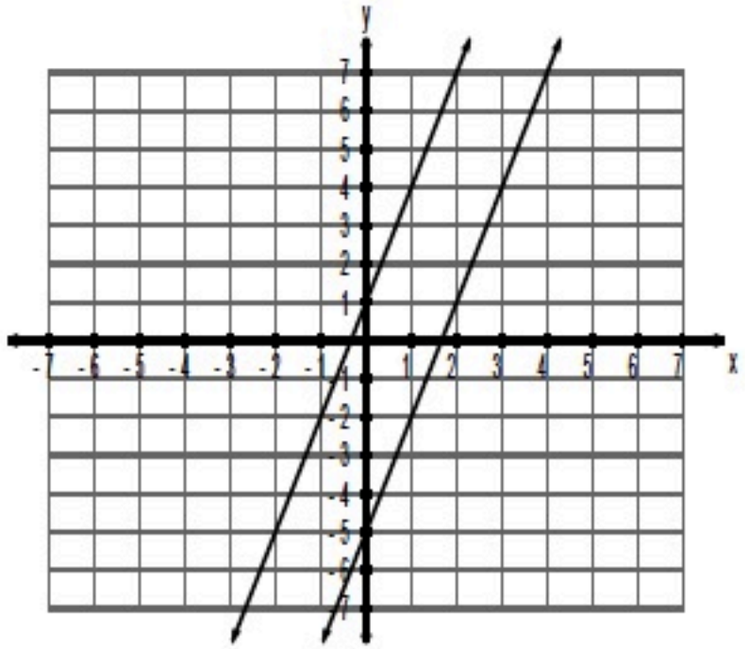
8. Which graph represents the solution to the linear system $\begin{cases} y = -3x - 5 \\ y = 3x + 1 \end{cases}$?

neg

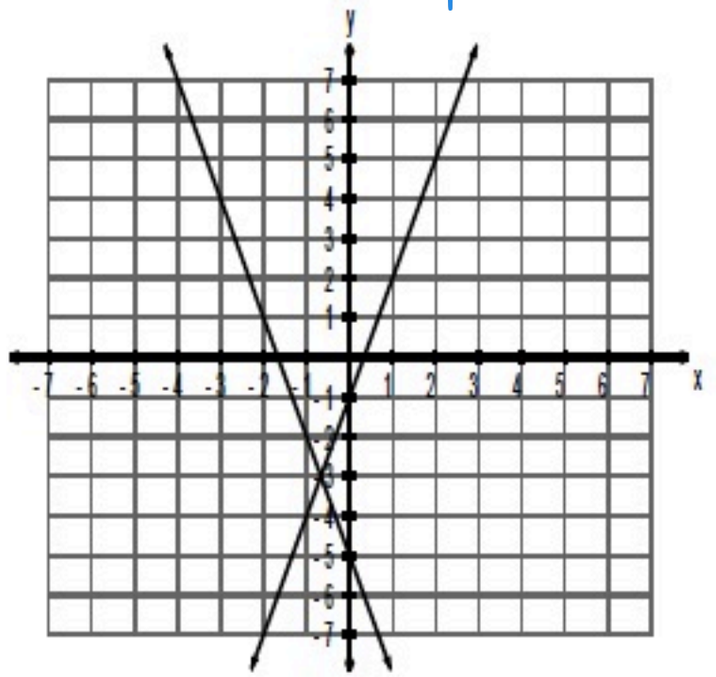
y-int

pos

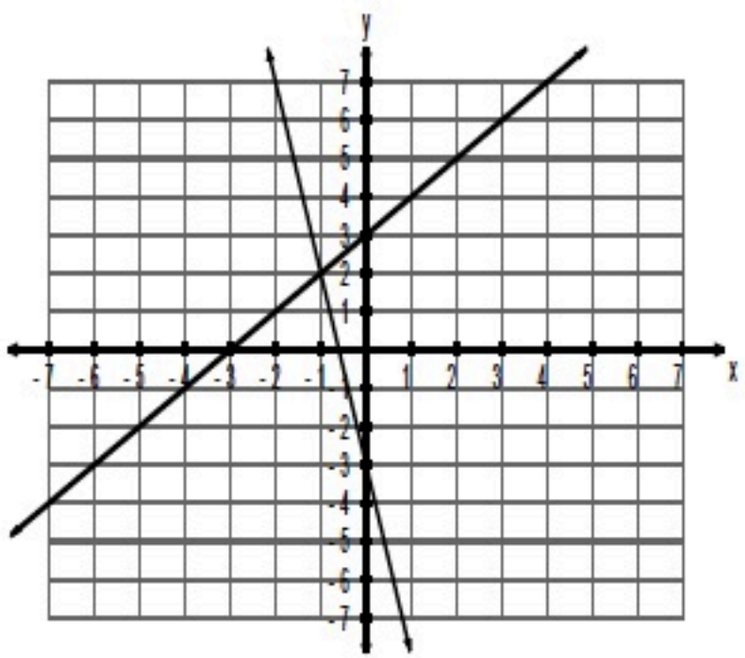
~~A.~~



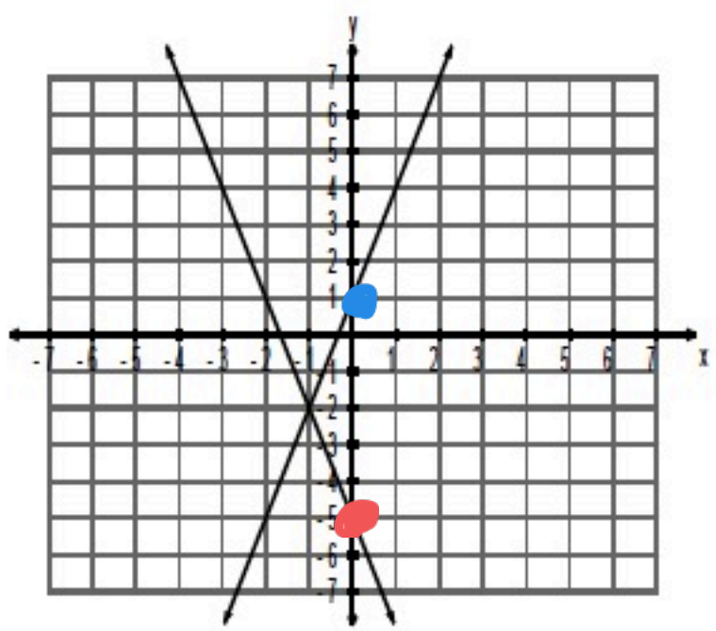
~~B.~~



~~C.~~



D.



9. Sam scored 80% on Part A of a math test and 92% on part B of the math test. His total mark on the test was 63. The total possible marks for the test was 75. Which system of equations represents this situation?

A. $\begin{cases} 80A + 92B = 63 \\ A + B = 75 \end{cases}$

B. $\begin{cases} 0.80A + 0.92B = 63 \\ A + B = 75 \end{cases}$

C. $\begin{cases} 80A + 92B = 75 \\ A + B = 63 \end{cases}$

D. $\begin{cases} 0.80A + 0.92B = 75 \\ A + B = 63 \end{cases}$

A = marks A

B = marks B

Marks: $A + B = 75$

Percent: $0.80 \cdot A + 0.92 \cdot B = 63$

10. Solve the system by graphing. (3 marks)

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

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

$y = \text{slope} \times + y\text{-int}$

$\text{slope} = \frac{2}{3} \leftarrow$ 2 up, 3 right

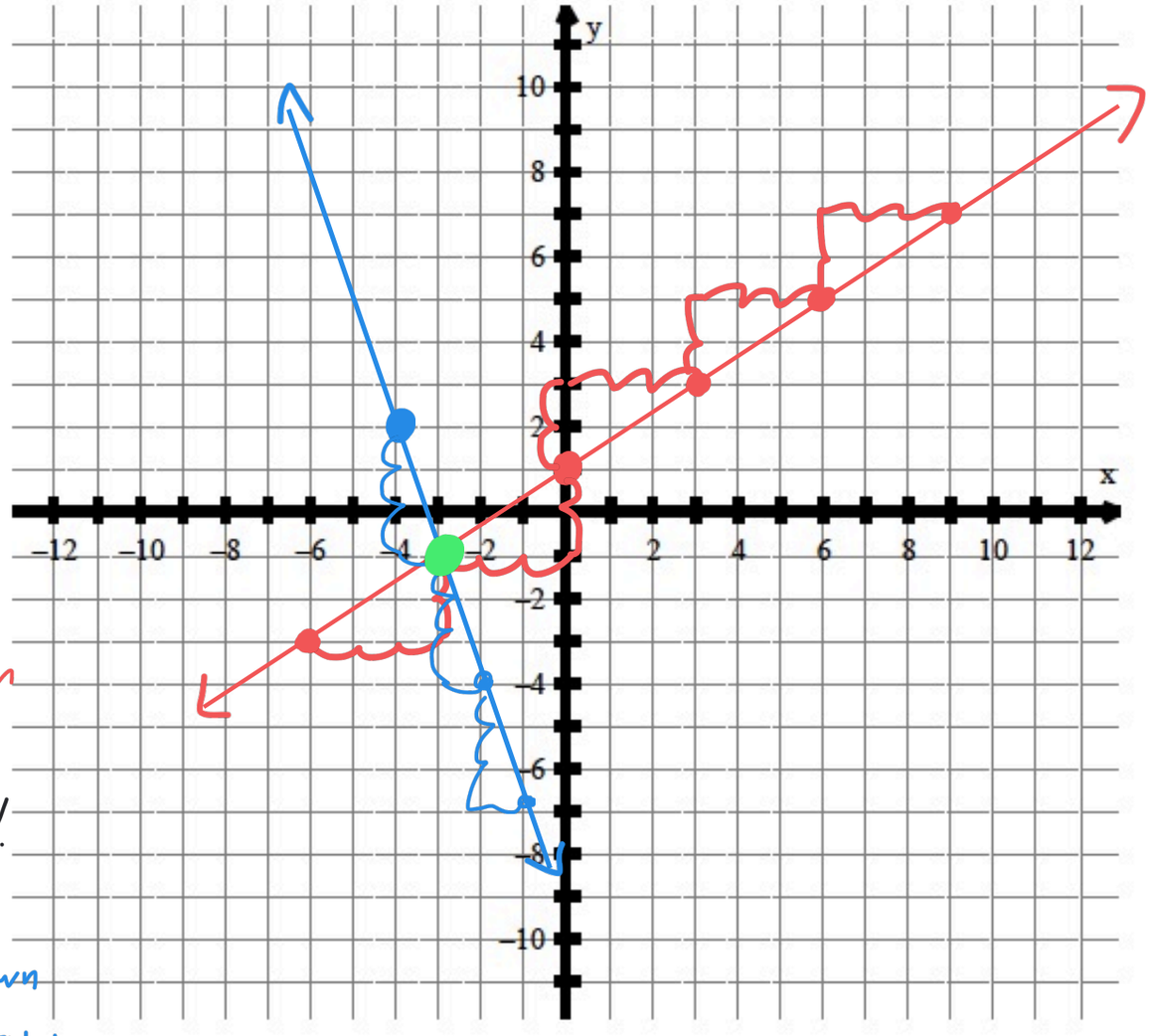
$y\text{-int} = 1$

$y - 2 = -3(x+4)$

point-slope form

point: SIGN CHANGE! $(-4, +2)$

$\text{slope} = \frac{-3}{1} \leftarrow$ 3 down, 1 right



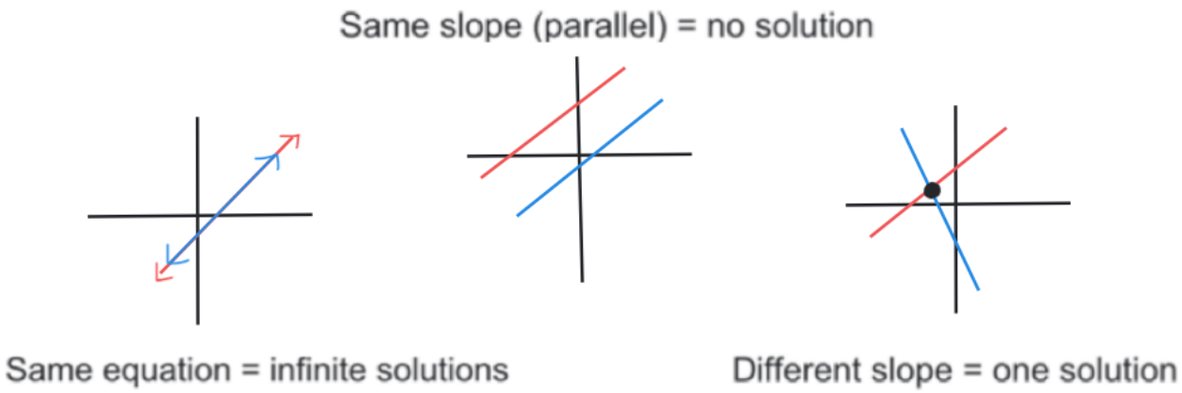
Solution

$(-3, -1)$

11. Without solving the system, determine whether there are 0, 1 or an infinite number of solutions. Explain how you know! (3 marks)

$$\begin{cases} 3x + 2y = 8 \\ 4.5x + 3y = 12 \end{cases}$$

Number of solutions



$3x + 2y = 8$

$\frac{2y}{2} = \frac{-3x}{2} + \frac{8}{2}$

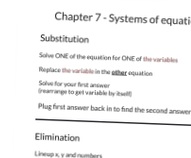
$y = \frac{-3}{2}x + 4$

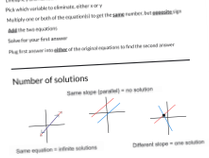
$4.5x + 3y = 12$

$\frac{3y}{3} = \frac{-4.5x}{3} + \frac{12}{3}$

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

Same equation = infinite solutions





12. Algebraically solve each system: (3

a) $\begin{cases} 6x + 8y = 5 \\ 10x - 8y = 51 \end{cases}$

Add the two equations

$$\begin{array}{r} 6x + 8y = 5 \\ +\ 10x - 8y = 51 \\ \hline 16x \quad = 56 \end{array}$$

Solve for your first answer

$$\frac{16x}{16} = \frac{56}{16}$$

$$x = 3.5$$

Elimination

~~Lineup x, y and numbers~~

~~Pick which variable to eliminate, either x or~~ y

~~Multiply one or both of the equation(s) to get the **same** number, but **opposite**~~ sign

Add the two equations

Solve for your first answer

Plug first answer into **either** of the original equations to find the second answer

Plug first answer into **either** of the original equations to find the second answer

$$6x + 8y = 5$$

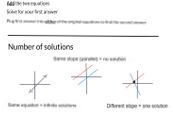
$$6(3.5) + 8y = 5$$

$$21 + 8y = 5$$

$$8y = -21 + 5$$

$$\frac{8y}{8} = \frac{-16}{8}$$

$$y = -2$$



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

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

$\frac{1}{2}x + \frac{1}{2}y = 1 \quad \cdot 2$

$x - 3y = 6$

$x + y = 2$

$x - 3y = 6$

$x + y = 2 \quad \cdot(-1)$

Add the two equations

$$\begin{array}{r} x - 3y = 6 \\ + \; -x - y = -2 \\ \hline -4y = 4 \end{array}$$

Solve for your first answer

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

$\boxed{y = -1}$

Plug first answer into **either** of the original equations to find the second answer

$x + y = 2$

$x - 1 = 2$

$x = 2 + 1$

$\boxed{x = 3}$

Elimination

Lineup x, y and numbers

Pick which variable to eliminate, either x or y

Multiply one or both of the equation(s) to get the **same** number, but **opposite** sign

Add the two equations

Solve for your first answer

Plug first answer into **either** of the original equations to find the second answer

13. Holy Spirit High School is selling tickets to its Spring Concert. Adult tickets cost $4 and student tickets cost $2.50. 900 tickets are sold and the school makes $2820.

a) Write a system of linear equations to represent this situation. (1 mark)

b) Algebraically determine how many adult and student tickets were sold. (3 marks)

A = adult S = student

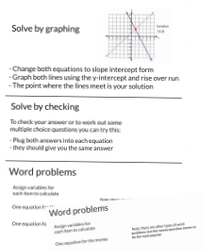
One equation for the money

$4A + $2.50S = $2820

4A + 2.5S = 2820

One equation for how many there are

A + S = 900



A + S = 900 (-4)

4A + 2.5S = 2820

-4A - 4S = -3600

$\frac{-1.5S}{-1.5} = \frac{-780}{-1.5}$

S = 520

A + S = 900

A + 520 = 900

A = 900 - 520

A = 380