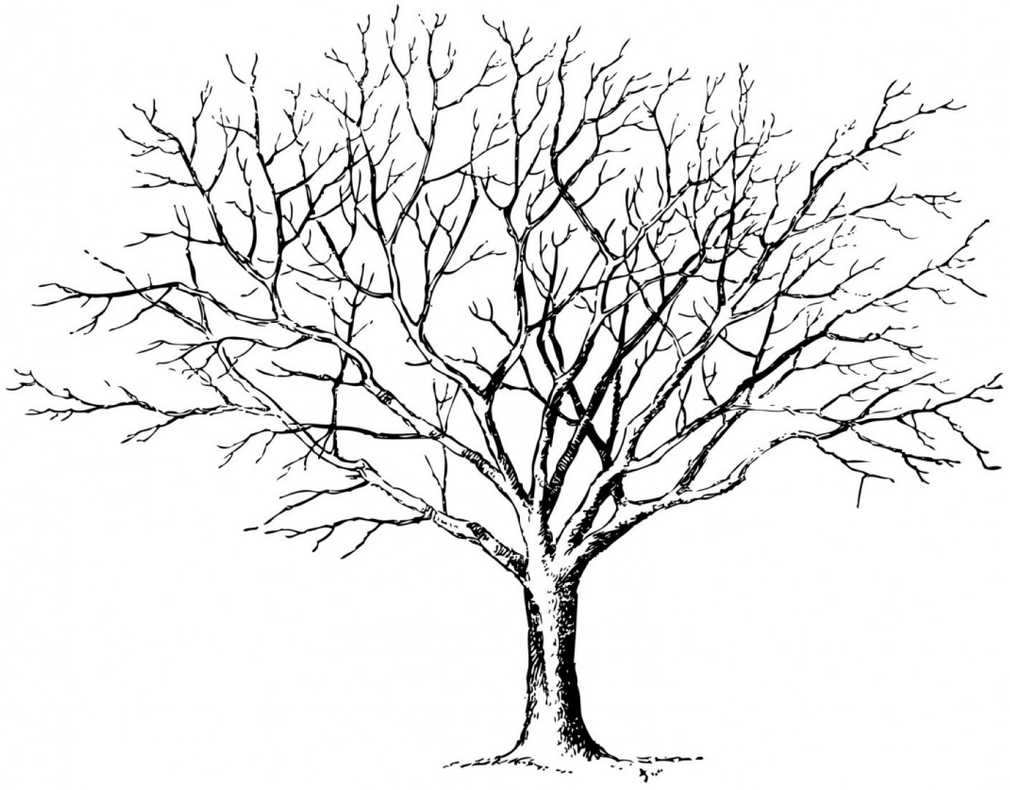
TheTutor

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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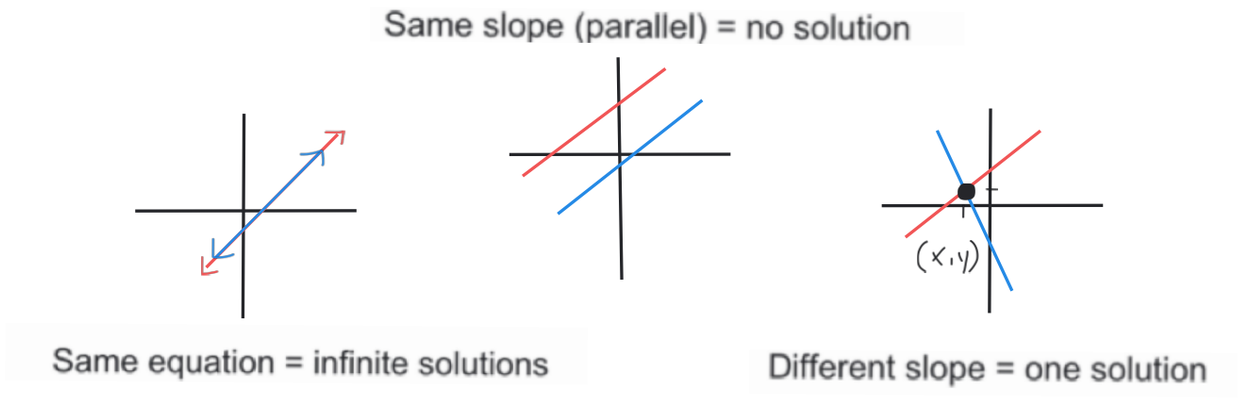
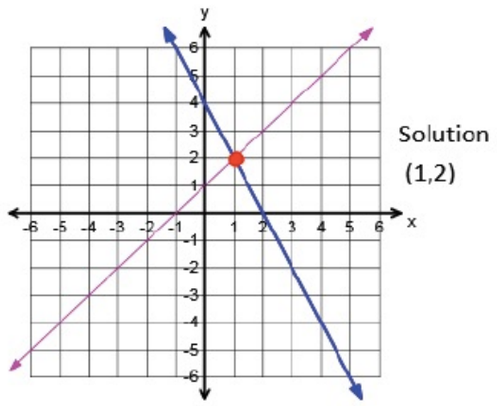
Number of solutions



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

1. Solve each linear system **algebraically**. Use the **algebraic** method of your choice. [12 marks]

a) $-3x - 6y = 9$
$2x + 2y = -4$

Solve ONE of the equation for ONE of the variables

$-3x - 6y = 9$

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

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

Replace the variable in the **other** equation

$2x + 2y = -4$

$2x + 2\left(-\frac{1}{2}x - \frac{3}{2}\right) = -4$

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

$2x - 1x - 3 = -4$

$2x - 1x = -4 + 3$

$1x = -1$

$x = -1$

Plug first answer back in to find the second answer

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

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

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

$y = -1$

$(-1, -1)$

Substitution

Solve ONE of the equation for ONE of the variables

Replace the variable in the **other** equation

Solve for your first answer
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Plug first answer back in to find the second answer

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

b) $3x - 4y = 13$
$5x + 3y = 12$

Solve ONE of the equation for ONE of the variables

$3x - 4y = 13$

$\frac{-4y}{-4} = \frac{-3x}{-4} + \frac{13}{-4}$

$y = \frac{3}{4}x - \frac{13}{4}$

Replace the variable in the **other** equation

$5x + 3y = 12$

$5x + 3\left(\frac{3}{4}x - \frac{13}{4}\right) = 12$

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

$5x + 3\left(\frac{3}{4}x - \frac{13}{4}\right) = 12$

$5x + \frac{9}{4}x - \frac{39}{4} = 12$

$5x + \frac{9}{4}x = 12 + \frac{39}{4}$

$\frac{\frac{29}{4}x}{\frac{29}{4}} = \frac{\frac{87}{4}}{\frac{29}{4}}$

$x = 3$

Plug first answer back in to find the second answer

$y = \frac{3}{4}x - \frac{13}{4}$

$y = \frac{3}{4}(3) - \frac{13}{4}$

$y = -1$

$(3, -1)$

1. Solve each linear system **algebraically**. Use the **algebraic** method of your choice. [12 marks]

a) $-3x - 6y = 9$
$2x + 2y = -4$

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

$-3x - 6y = 9$
$2x + 2y = -4$ · 3

$-3x - 6y = 9$
$6x + 6y = -12$

Add the two equations

$-3x - 6y = 9$
$+\ 6x + 6y = -12$
$3x = -3$

Solve for your first answer

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

$x = -1$

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

$2x + 2y = -4$

$2(-1) + 2y = -4$

$-2 + 2y = -4$

$2y = -4 + 2$

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

$y = -1$

$(-1, -1)$

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

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Pick which variable to eliminate, either x or y

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Add the two equations

Solve for your first answer

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

c) $\frac{1}{2}x - \frac{1}{3}y = \frac{5}{12}$ $\cdot 12$

$\frac{5}{6}x + \frac{1}{2}y = \frac{1}{6}$ $\cdot 6$

Multiply by HIGHEST denominator

Multiply by HIGHEST denominator

$6x - 4y = 5$ $\cdot 3$

$5x + 3y = 1$ $\cdot 4$

Multiply them by EACH OTHER

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

$18x - 12y = 15$

$20x + 12y = 4$

Add the two equations

$$\begin{array}{r} 18x - 12y = 15 \\ +\ 20x + 12y = 4 \\ \hline \frac{38x}{38} = \frac{19}{38} \end{array}$$

$$\boxed{x = \frac{1}{2}}$$

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

$5x + 3y = 1$

$5\left(\frac{1}{2}\right) + 3y = 1$

$\frac{5}{2} + 3y = 1$

$3y = 1 - \frac{5}{2}$

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

$$\boxed{y = -\frac{1}{2}}$$

3. Solve the system by graphing.

$$2x + y = -3$$
$$3x - 2y = -15$$

- 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

$2x + y = -3$

$y = -2x - 3$

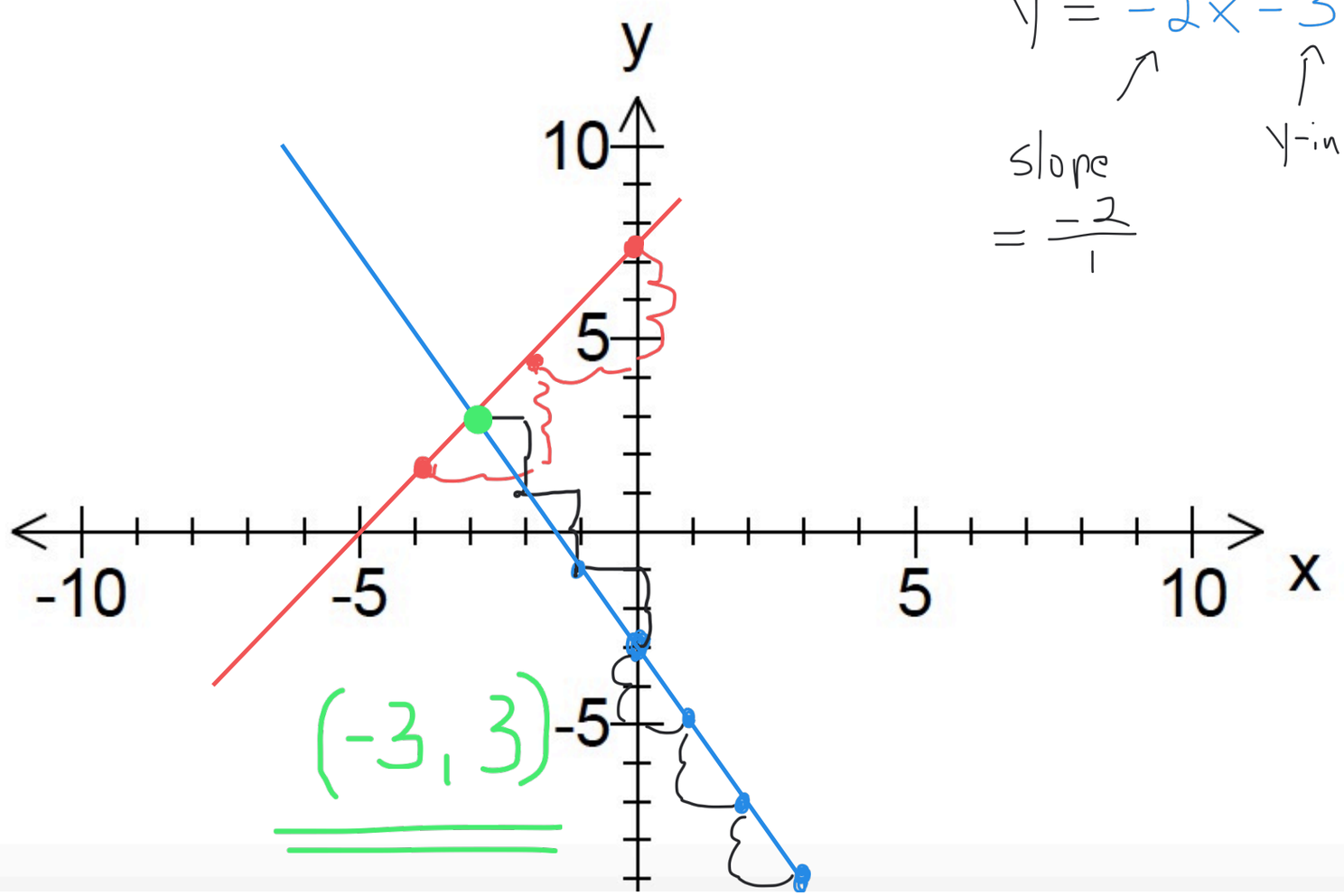
slope $= \frac{-2}{1}$ y-int

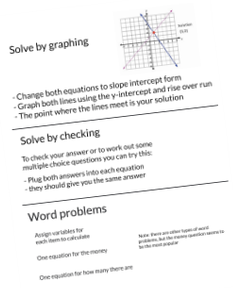
$3x - 2y = -15$

$\frac{-2}{-2}y = \frac{-3x}{-2} \frac{-15}{-2}$

$y = \frac{3}{2}x + 7.5$

slope y-int




Solve by graphing

- Change both equations to slope intercept form
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Solve by checking

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Word problems

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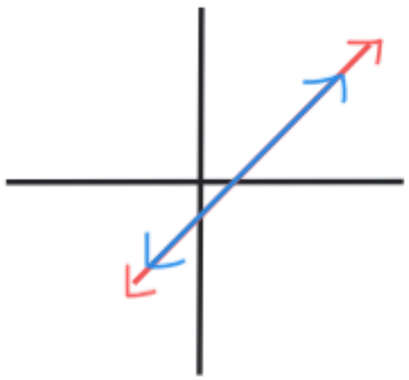
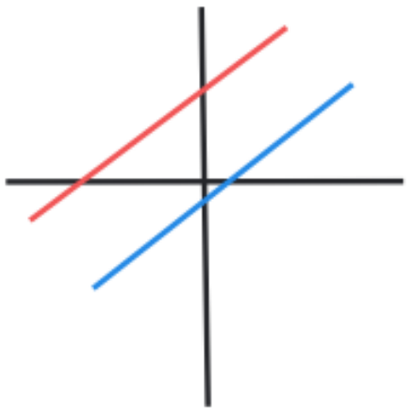
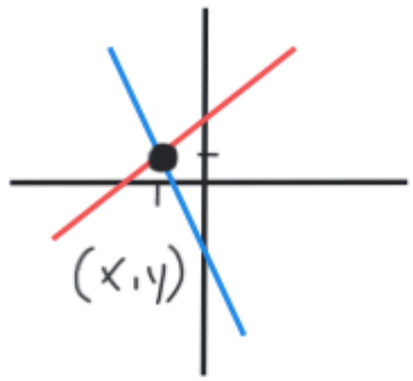
Number of solutions

Same slope (parallel) = no solution



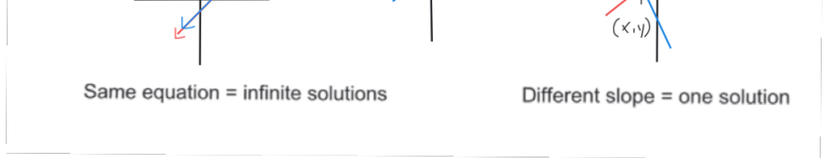
Same equation = infinite solutions





Different slope = one solution

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



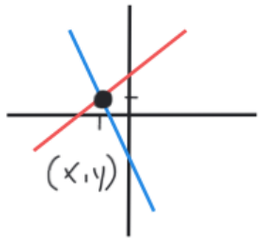
2. Which system has exactly one solution?

A. $y = -4x - 2$
$y = -4x + 5$

B. $6x - 3y = -1$
$-2x + y = 4$

C. $\frac{1}{3}x + \frac{1}{2}y = 2$
$\frac{1}{6}x + y = \frac{5}{2}$

D. $y = 3x - 2$
$y = 3x + 2$



Different slope = one solution

y = slope x + y-int

$6x - 3y = -1$ $\quad -2x + y = 4$

$\frac{-3y}{-3} = \frac{-6x}{-3} \frac{-1}{-3}$ $\quad y = 2x + 4$

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

$\frac{1}{3}x + \frac{1}{2}y = 2$ $\quad \frac{1}{6}x + y = \frac{5}{2}$

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

$\cdot 2 \quad \cdot 2 \quad \cdot 2$

$y = -\frac{2}{3}x + 4$ $\quad y = -\frac{1}{6}x + \frac{5}{2}$

different

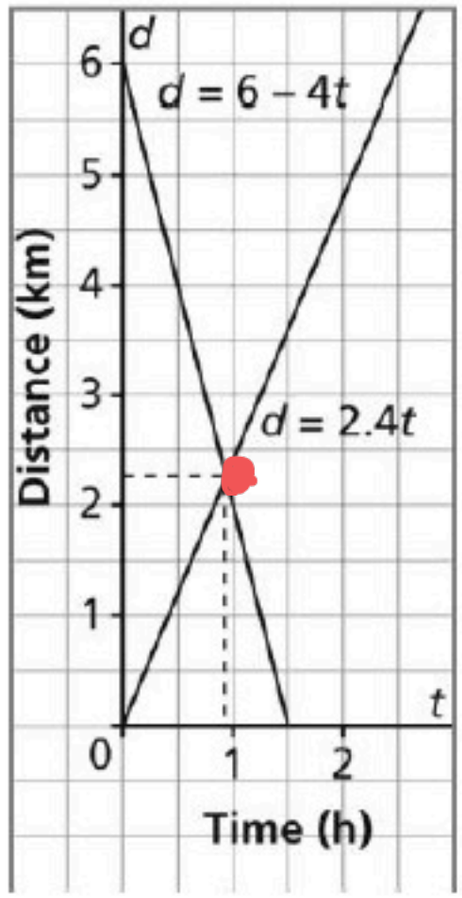
3. What is the solution to the system graphed below?

A. (2.2, 0.9)

B. (0.9, 2.2)

C. (-0.9, 2.2)

D. (-2.2, 0.9)



5. In which system of equations are the lines parallel?

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

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

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

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