

Solving 2x2 Systems of Equations Video Lecture

Section 4.1, 4.2, 4.3 and 4.5

Course Learning Objective:

- 1) Solve systems of 2x2 equations.**
- 2) Solve applications involving 2x2 systems of equations.**

Weekly Learning Objectives:

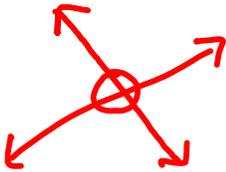
- 1) Solve a 2x2 system of linear equations by graphing.**
- 2) Use the substitution method to solve a 2x2 system of linear equations.**
- 3) Use the addition/elimination method to solve a 2x2 system of linear equations.**
- 4) Determine the number of solutions of a 2x2 system.**
- 5) Solve problems that can be modeled by a system of two linear equations.**

Solving Systems of Equations (2x2 only)

A system of equations is any collection of equations. A solution to a linear system of equations is a point or set of points that makes both equations true at the same time.

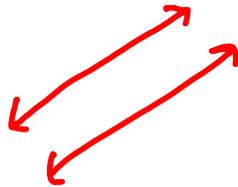
There are three possibilities for the solution to a 2x2 system of linear equations:

Intersecting Lines



Solution: (x,y)

Parallel Lines



Solution:



Coinciding Lines



Solution:
{(x,y): equation of line}

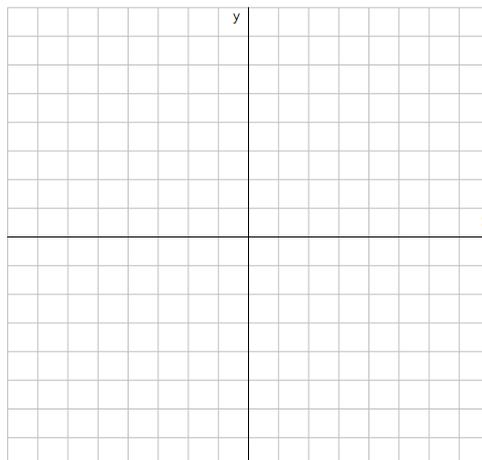
How to solve a 2x2 system graphically:

- 1) Graph each line on the same coordinate axes
- 2) Find the intersection point if it exists

Find the solution to the system:

$$x + y = -5$$

$$-2x + y = 1$$



How to solve a 2x2 system using the substitution method:

- 1) Solve one of the equations for one of its variables
- 2) Substitute the expression for the variable found in step 1 into the other equation
- 3) Find the value of one variable by solving the equation from step 2
- 4) Find the value of the other variable by substituting the value found in step 3 into any equation of the system
- 5) Check solution (optional)

$$-3x - 5y = -17$$

$$4x = y - 8$$

$$y = \frac{1}{7}x + 3$$

$$x - 7y = -21$$

$$y = 2x - 3$$

$$2y - 4x = 4$$

How to solve a 2x2 system of equations using the elimination method:

- 1) Rewrite each equation in standard form: $Ax + By = C$
- 2) If necessary, multiply one or both equations by some nonzero number so that the coefficient of one variable in one equation is the opposite of its coefficient in the other equation
- 3) Add the equations
- 4) Find the value of one variable by solving the equation from step 3
- 5) Find the value of the other variable by substituting the value found in step 4 into either one of the original equations
- 6) Check solution (optional)

$$x + y = -5$$

$$-2x + y = 1$$

$$2x - 3y = 7$$

$$-4x + 6y = 14$$

$$4x + 3y = 1$$

$$3x + 2y = 2$$

A pharmacist needs 500 milliliters of a 20% Phenobarbital solution but has only 5% and 25% Phenobarbital solutions available. Find how many milliliters of each he should mix to get the desired solution.

A grocer needs to mix cashews worth \$6 per pound with peanuts worth \$2 per pound to obtain 10 pounds of a mixture worth \$3 per pound. How many pounds of each kind of nut must be used?

When a plane flies with the wind, it can travel 4200 miles in 6 hours. When the plane flies in the opposite direction against the wind, it takes 7 hours to fly the same distance. Find the speed of the plane in still air and the speed of the wind.

With the current you can row 24 miles in 3 hours. Against the same current, you can row only $\frac{2}{3}$ of this distance in 4 hours. Find your rowing speed in still water and the speed of the current.

A rectangular lot whose perimeter is 320 feet is fenced along three sides. An expensive fencing along the lot's length costs \$16 per foot, and an inexpensive fencing along the lot's two side widths costs only \$5 per foot. The total cost of the fencing along the three sides comes to \$2140. What are the lot's dimensions?