5 - 1

Graphing Systems

5 - 1

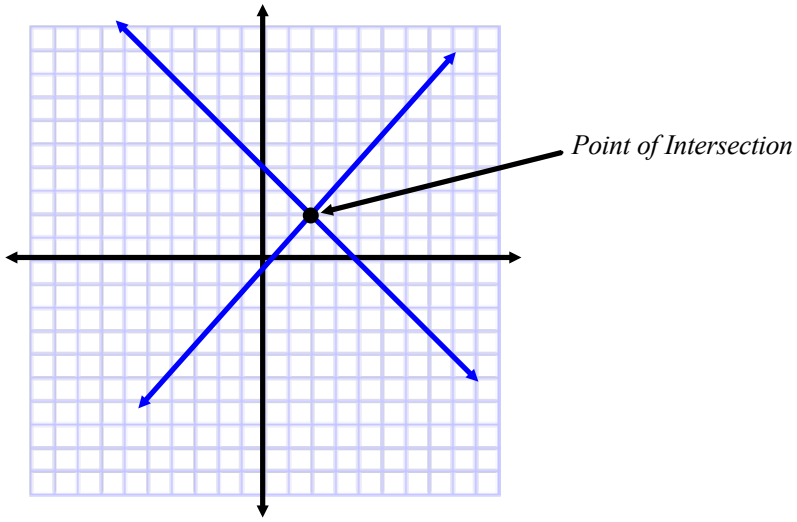
Graphing Systems

Systems of Equations

Two or more equations used to find a solution

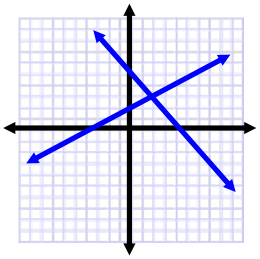
Point of Intersection (Solution)

Location where two lines, when graphed, cross

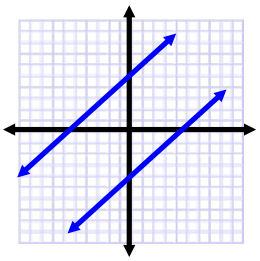


3 possible solution types

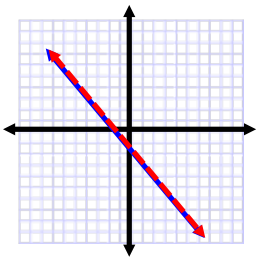
One Solution (Two lines Intersect)
Consistent & Independent



No Solution (Two lines are parallel)
Inconsistent



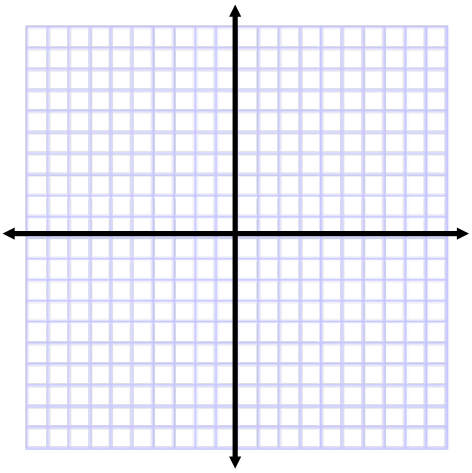
Infinitely Many Solutions (Two lines coincide)
Consistent & Dependent



Example

Graph the following equations. How many solutions exist? If one solutions exists, name it.

$$y = 2x + 4$$
$$y = -x - 2$$



5 - 2

Substitution

SUBSTITUTION

"to replace"

This method is best used when given a system that has one or both equations in single variable form.

Single Variable Form

When a single variable is equal to an algebraic expression or numeric value

Examples

y = 3x + 2
a = b - 5
w = -2t + 8
x = m
p = 3

Example 1

Solve the given system using Substitution. If one solution exists, represent that solution as an order pair

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

Example 2

Solve the given system using Substitution. If one solution exists, represent that solution as an order pair

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

Student Practice

Solve the given system using Substitution. If one solution exists, represent that solution as an order pair

1) $6x - 2y = -4$
$y = 3x + 2$

2) $x + 3y = 12$
$x = 8 + y$

5 - 3

Elimination with Addition

Elimination
"to get rid of"

This method is best used when given a system where both equations are in Standard Form.

The goal is to add the two equations together with the hope that one of the two variables will "eliminate".

Standard Form
Ax + By = C

Example 1

Solve the given system using Elimination. If one solution exists, represent that solution as an order pair

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

Student Practice

Solve the given system using Elimination. If one solution exists, represent that solution as an order pair

1) $3x - 2y = 4$
$x + 2y = 8$

2) $2x - 4y = 4$
$-2x + 4y = 8$

5 - 4

Elimination w/ Multiplication

Elimination w/ Multiplication

Sometimes equations in Standard Form don't always eliminate by just adding them together.

Sample

$$\begin{array}{r} x + y = 5 \\ (+)\ 2x + 3y = 4 \\ \hline 3x + 4y = 9 \end{array}$$

No Elimination occurred!

If No Elimination occurs, you can change one of the equations that is in Standard Form.

1) Identify which variable you want to Eliminate

2) Multiply one (or both) of the equations by a constant to allow the Elimination process to occur.

$$\begin{array}{r} -2(x + y = 5) \\ (+)\ \ 2x + 3y = 4 \\ \hline \end{array}$$

$$\begin{array}{r} -2x - 2y = -10 \\ (+)\ 2x + 3y = 4 \\ \hline y = -6 \end{array}$$

Now proceed to find the Point of Intersection.

Example 1

Solve the given system using Elimination. If one solution exists, represent that solution as an order pair

$$2x + y = 4$$
$$x + y = 8$$

Example 2

Solve the given system using Elimination. If one solution exists, represent that solution as an order pair

$$-x - 5y = 0$$
$$2x - 3y = 7$$

Example 3

Solve the given system using Elimination. If one solution exists, represent that solution as an order pair

$$2x - 3y = 2$$
$$5x + 4y = 28$$

Word Problem

John has 30 science-fiction and mystery books. Four times the number of science-fiction books minus the number of mystery books is 5. Create a system of equations, then use Elimination to solve for the number of science-fiction and mystery books that John has.

Student Practice

Solve the given system using Substitution. If one solution exists, represent that solution as an order pair

1) $6x - 2y = -4$
$-3x + y = 2$

2) $4x - 7y = 10$
$3x + 2y = -7$

5 - 5

Applying Systems

When choosing a method....

Substitution is best*....when one or both equations are in single variable form.*

Elimination is best*...when both equations are in standard form.*

If you can't decide which method to use, manipulate one or both of the equations in the system until it is in Substitution form or Elimination form.

Which method is best?

1) $9x - 8y = 42$
$4x + 8y = -16$

2) $3x + y = 42$
$y = 2x - 16$

3) $-2x + y = 42$
$4y = 8x - 16$

4) $x - y = 12$
$y - 8 = 2x - 16$

Word Problem

Ace Car Rental rents a car for $45 a day and $0.25 per mile. Star Car Rental rents a car for $35 a day and $0.30 per mile. How many miles would a driver need to drive before the cost of renting a car at ACR and renting a car at SCR were the same?