

What's Going On?

Checking In

F.F.M.

Minds on

What's a "Solution"?

Action!

Solving by Substitution!

Consolidation

A Little Tougher?

Learning Goal - I will be able to solve linear systems by substitution.

Checking In

F.F.M.

Does this linear system have

0 1 or infinite solutions?

$$y = 2x - 5$$

$$\text{slope} = 2$$

$$y\text{-int} = -5$$

$$\begin{aligned} 4x - 2y &= 6 \\ -4x & \quad -4x \\ \hline -2y &= -4x + 6 \\ \hline y &= 2x - 3 \end{aligned}$$

Minds on

RECAP

The graphs of two linear equations (in two variables) may intersect at

one point - non-parallel

no points - parallel and "distinct" → different y -intercepts

an infinite number of points - coincide / same line

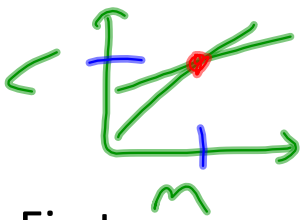
Minds on

Solving by Substitution

This is it.

Today you learn one of the most fantastic mathematical skills of your life!

Today we will learn how to solve a system of linear equations **without graphing!!!**

Minds on

Solving by Substitution

First, remember what a linear system is...

$$C = 0.40m$$
$$C = 10 + 0.10m$$

A set of two or more
linear equations considered
at the same time.

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Solving by Substitution

Now, what is a 'solution' to a linear system?

- point of intersection
- where the lines cross
- where the x - and y - values are the same in both equations
- where the independent and dependent variables are the same in both equations

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Solving by Substitution

Okay.

So a system of linear equations is a set of two or more *lines* represented by equations.

system of linear equations

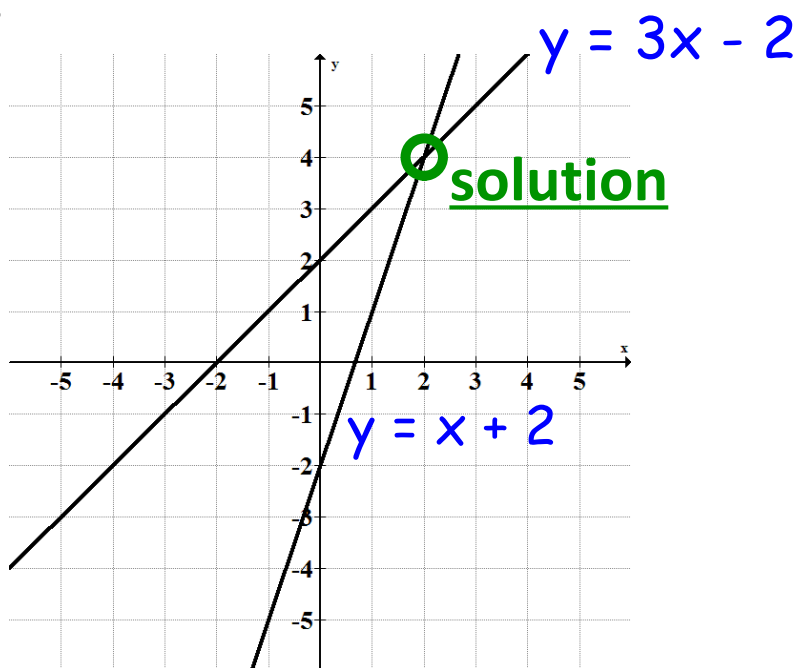
$$y = 3x - 2$$

$$y = x + 2$$

Minds on

Solving by Substitution

A solution to a system of linear equations is the point of intersection!!



Action!

Solving by Substitution

Today we learn how to find that point of intersection
without graphing!!!

Action!

Solving by Substitution

system of linear equations

$$y = 3x - 2$$

$$y = x + 2$$

At the point of intersection what do we know about the value of y for each equation?

The values of y are the same!!!

Action!

Solving by Substitution
system of linear equations

$$y =$$
$$y =$$

If the values of y are the same.....

$$x + 2 = 3x - 2$$

Action!

$$3x - 2 = x + 2$$

 $-x$ $-x$

$$2x - 2 = 2$$

 $+2$ $+2$

$$\frac{2x}{2} = \frac{4}{2}$$

$$x = 2$$

Action!

$$y = 3x - 2$$

$$y = x + 2$$

What this tells us is that in the solution to this system of linear equations, $x = 2$.

So, we know that the x -value of the point of intersection is 2.

What about the y -value???

Action!

$$y = 3x - 2$$

$$y = x + 2$$

To find the y-value of the point of intersection, plug $x = 2$ into either equation.

$$y = 3x - 2$$

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

$$y = 6 - 2$$

$$y = 4$$

Action!

$$y = 3x - 2$$

$$y = x + 2$$

To check that our point of intersection (2, 4) is correct, we do a L.S. = R.S. check for **BOTH** of our equations.

$y = 3x - 2$		$y = x + 2$	
L.S.	R.S.	L.S.	R.S.
(4)	$3(2) - 2$	(4)	$(2) + 2$
4	$6 - 2$	4	4
4	4		

Because the point **satisfies** both equations, (2, 4) **is** the solution to the system of linear equations.

Consolidation

A Little Tougher?

What is the solution to the system of linear equations below?

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

$$y = 2x - 4$$

$$\frac{5}{2}x - 3 = 2x - 4$$

$$2\left(\frac{5}{2}x - 3\right) = 2(2x - 4)$$

$$5x - 6 = 4x - 8$$

$$-4x$$

$$-4x$$

$$x - 6 = -8$$

$$+6$$

$$+6$$

$$x = -2$$

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

$$y = -4 - 4$$

$$y = -8$$

Consolidation

A Little Tougher?

What is the solution to the system of linear equations below?

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

$$7x + y = 0$$

$$7x + y = 0$$

$$-7x \quad -7x$$

$$y = -7x$$

$$5x - 3(-7x) - 2 = 0$$

$$5x + 21x - 2 = 0$$

$$26x - 2 = 0$$

$$+2 \quad +2$$

$$\frac{26x}{26} = \frac{2}{26}$$

$$x = \frac{1}{13}$$

$$2x + y = 6$$

$$3x + 2y = 10$$

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

$$y = 6 - 2x$$

Substitute $y = 6 - 2x$ into (2)

$$3x + 2(6 - 2x) = 10$$

$$3x + 12 - 4x = 10$$

$$-x + 12 = 10$$

$$\begin{array}{r} -x + 12 = 10 \\ -12 \\ \hline -x = -2 \end{array}$$

$$x = 2$$

$$\begin{aligned}x + 3y &= 2 \\ 2x + 5y &= 3\end{aligned}$$

Consolidation

A Little Tougher?

What is the solution to the system of linear equations below?

$$2x + 2y = 7$$

$$x + y = 6$$

Consolidation

A Little Tougher?

What is the solution to the system of linear equations below?

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

$$6x - 3y - 9 = 0$$

