DO NOW:

Find the POI (Point of intersection) of the following linear system:

1) $2x + y = 4$
2) $3x-16y = 6$

$y = 4 - 2x$

SOLUTION Next Page

x = 2 - 0.5y

Sub into equation 2:

3(2-0.5y) - 16y = 6
6 - 1.5y - 16y = 6
-17.5 y = 6-6
y = 0

$3x - 16(4 - 2x) = 6$

$3x - 64 + 32x = 6$

$\frac{35x}{35} = \frac{70}{35}$

$x = 2$

Sub this value of y into equation1:
2x + y = 4
2x + 0 = 4
2x = 4
x = 2

Verify by checking:

1)
2x + y = 4
2(2) + 0 = 4
4 = 4

2)
3x -16y = 6
3(2) - 16(0) = 6
6 - 0 = 6

Both values are correct!

Lesson 6: Equivalent linear systems

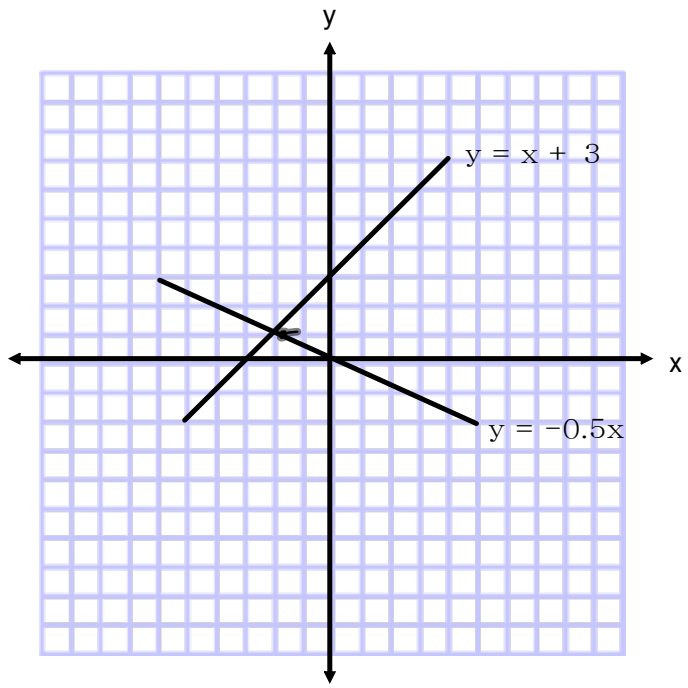
By the end of this lesson you should

- understand what an equivalent linear system is
- be able to compare equivalent systems
- be able to create equivalent systems

Equivalent linear systems both have the same solution (POI)

We can take one linear system and create a new system that is equivalent to this system by adding and subtracting the systems.

We can also multiply the system by a constant that is greater than zero to create a new, equivalent linear system.



The POI, or solution, of this system is: (-2, 1)

What other linear systems have the same solution?

There is an algebraic method to find another system that has the same solution:

We can take the two equations in the system and first add them together to create a new linear equation.

We then subtract the original equations.

This will give us two new equations that, when graphed, will have the same solution (POI) as the original system.

EXAMPLE 1: Using addition and subtraction to create a new linear system

$y = 1x + 3$
$y = -0.5x + 0$
$2y = 0.5x + 3$

Add the equations together as if there were three separate columns

$2y = 0.5x + 3$

$y = 1x + 3$
$y = -0.5x$
$0y = 1.5x + 3$

Subtract the equations using the same method

This is 0 = 1.5 x + 3 (meaning there is no y-intercept) which can be re-written as

$1.5x = -3$

$x = -2$

$2y = 0.5x + 3$

$x = -2$

$2y = 0.5(-2) + 3$

$2y = -1 + 3$

$2y = 2$

$y = 1$

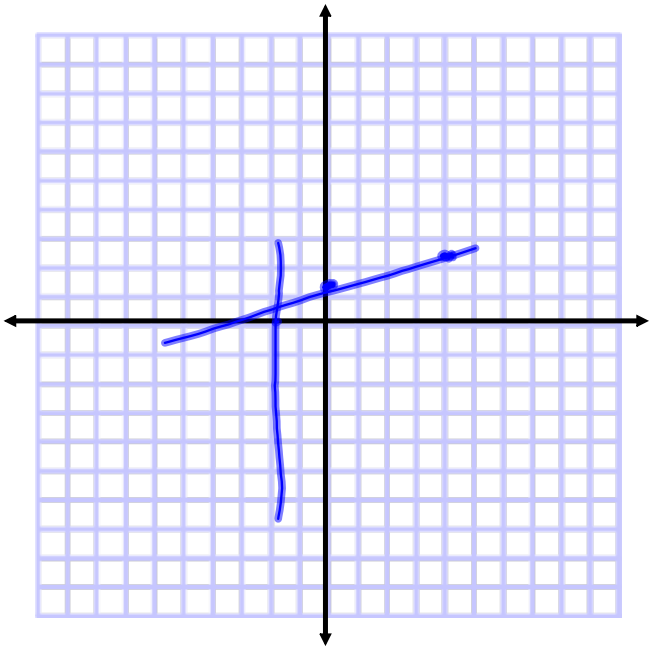
The new linear system is:

$2y = 0.5x + 3$

$x = -2$

$y = \frac{1}{4}x + 1.5$

Graph the system on the axis:



Now take our original system:

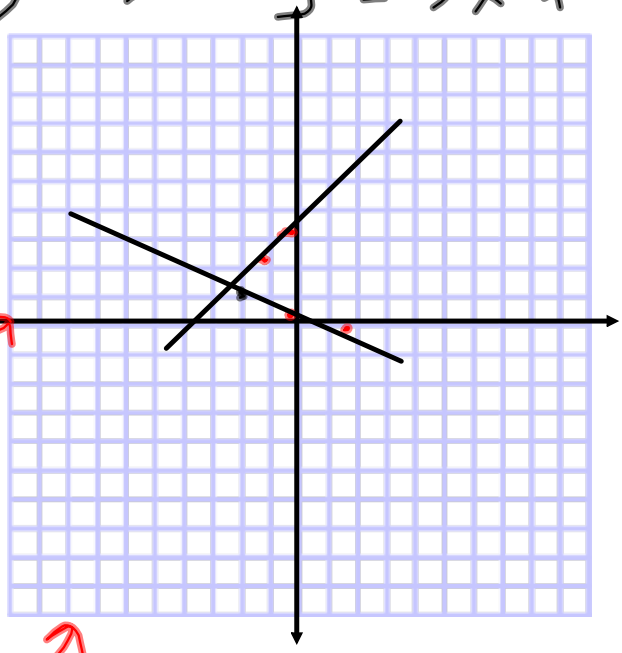
1) $y = -0.5x$

2) $y = x + 3$

Multiply the first equation by 2 and the second by 3. Then graph these new equations. What is the solution?

$2(y = -0.5x) \rightarrow 2y = -1x$

$3(y = x + 3) \rightarrow 3y = 3x + 9$



Substitution:

$y = -0.5x$

$3(-0.5)x = 3x + 9$

$-1.5x - 3x = 9$

$-4.5x = 9$

$x = -2$

$y = -0.5(-2)$

$y = 1$