4.1 – SOLVING SYSTEMS OF EQUATIONS BY GRAPHING:
Solving two or more linear equations at the same time is a system of linear equations. A solution is any ordered pair that makes each equation work when you substitute it in for x and y.

Graphing – Find the point of intersection for the 2 lines. This is a solution.

Graph the solution for the system of linear equations:

$y = -2x + 3$

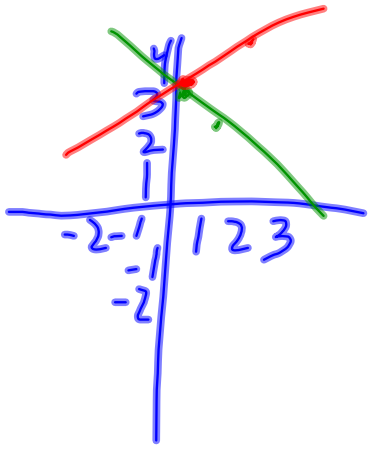
$y = x + 3$

$y = -2x + 3$

$y = x + 3$

$3 = -2(0) + 3$

$3 = 0 + 3$



$y = -2x + 3$

x	calculation	y	(x, y)
0	$f(0) = -2(0) + 3$	3	0, 3
1	$f(1) = -2(1) + 3$	1	1, 1

$y = x + 3$

x	y
0	3
1	y

solution

0, 3

1, y

x

$y = -2x + 3$

$y = x + 3$

Is $(0, 3)$ a solution?

$3 = -2(0) + 3$ $\quad 3 = 3$ ✓

$3 = 0 + 3$ $\quad 3 = 3$ ✓

Is $(4,-1)$ a solution for $\begin{cases} x+2y=2 \\ x-2y=6 \end{cases}$

$4+2(-1)=2$

$4-2(-1)=6$

Evaluate. The ordered pair must work in both equations to be a solution

Is $(-4,3)$ a solution? No

$-4+2(3)=2$

$-4-2(3)=6$

solve the system by graphing:

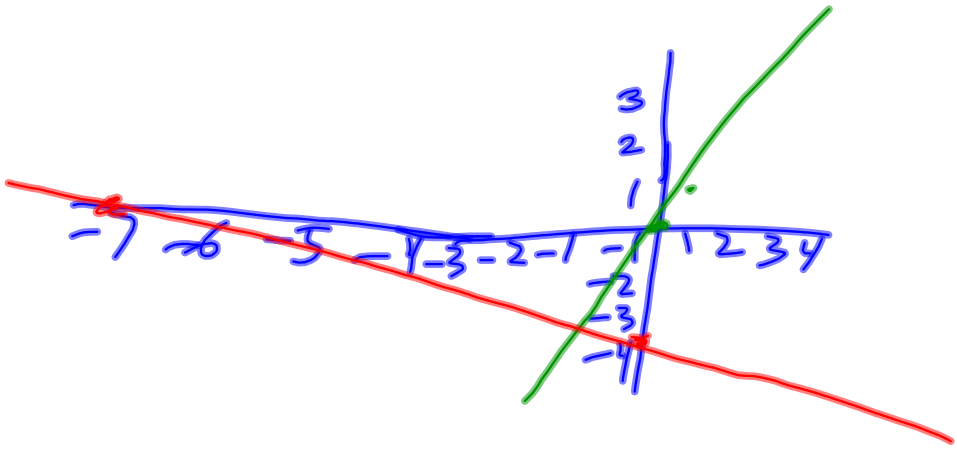
$x+2y=-7$ $\qquad$ $2x-3y=0$

x	calculation	y	(x, y)
0	$0+2y=-7$ $2y=-7$ $y=\frac{-7}{2}$		$(0,-3\frac{1}{2})$
	$x+2(0)=-7$	0	$(-7,0)$

$2x-3y=0$

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

x	calculation	y	(x,y)
0	$2(0)-3y=0$ $-3y=0$	0	$(0,0)$
0	$2x-3(0)=0$	0	$0,0$
1	$y=\frac{2}{3}(1)$	$\frac{2}{3}$	$(1,\frac{2}{3})$


3
2
1
-7
-6
-5
-4
-3
-2
-1
1
2
3
4
-2
-3
-4

$2x+y=5$

$2(0)+y=5$

$y=5$

$2x+0=5$

$2x=5$

$x=\frac{5}{2}$

x	y
0	5
$\frac{5}{2}$	0

$-x+y=2$

$-0+y=2$

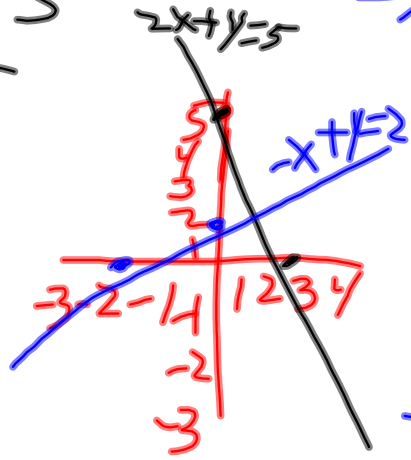
$y=2$

$-x+0=2$

$-x=2$

$x=-2$

x	y
0	2
-2	0



Systems of equations:

① independent system - has one solution (intersects at one point) different slopes

② inconsistent system - has no solution (never intersects. they are parallel lines) same slope, different y-intercept

③ dependent system - the graphs are for the same line

same slope, same intercept.

$2x-2y=4$

$y-x=6$

$2x-2y=4$

$-2x \qquad -2x$

$-2y = -2x+4$

$\frac{-2y}{-2} = \frac{-2x}{-2} + \frac{4}{-2}$

$y = x-2$

x	y
0	-2
1	-1

$y-x=6$

$y = x+6$

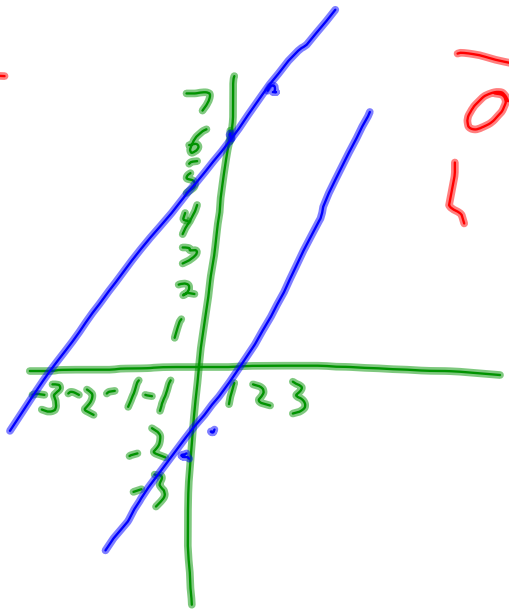
x	y
0	6
1	7

$y = x - 2$

x	y
0	-2
1	-1

$y = x + 6$

x	y
0	6
1	7



$$y = 2x + 3$$

$$-4x + 2y = 6$$

$y = 2x + 3$

$$\frac{2}{2}y = \frac{4}{2}x + \frac{6}{2}$$

$y = 2x + 3$

$4y - 2x = 6$

$8y = 4x - 12$

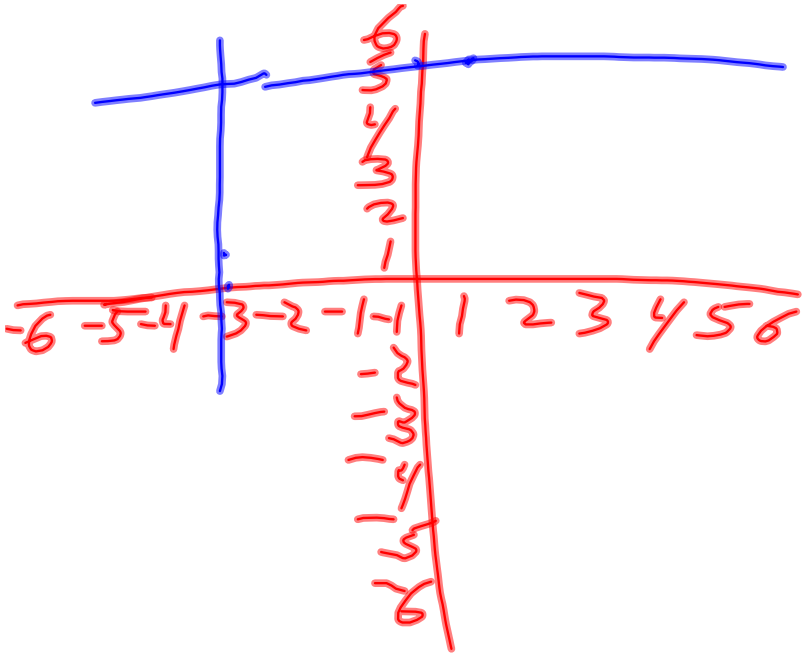
$4y - 2x = 6$

$\frac{4y}{4} = \frac{2x}{4} + \frac{6}{4}$

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

$\frac{8y}{8} = \frac{4x}{8} - \frac{12}{8}$

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



$x = -3$

$(-3, 0)$

$(-3, 1)$

$y = 5$

$(0, 5)$

$(1, 5)$

independent, dependent or inconsistent system

Without graphing:

* Convert both lines to slope intercept form:

$2x - 2y = 4$

$y - x = 6$

$-2x \quad -2x$

$\frac{-2y}{-2} = \frac{-2x}{-2} + \frac{4}{-2}$

$y = 1x - 2$

inconsistent system

$y = x + 6$

parallel lines → same slope, different y-intercepts

$3 = 4y + x$

$4y = -x + 3$

$3 = 4y + x$

$-4y \quad -4y$

$-4y + 3 = x$

$-3 \quad -3$

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

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

$4y = -x + 3$

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

dependent system -> both are the same line

$-5x+y=-9$

$x+3y=21$

$-5x+y=-9$

$y=5x-9$

$x+3y=21$

$-x \qquad -x$

$\frac{3y}{3}=\frac{-x}{3}+\frac{21}{3}$

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

different slopes

independent system