

# Section 4.1: Solving Systems by Graphing and Substitution

Tuesday, October 22, 2013  
8:55 AM

system of equations: any collection of two or more equations

$2 \times 2$  systems: 2 equations, 2 variables  
↑  
"two by two"

the solution set to a  $2 \times 2$  system:

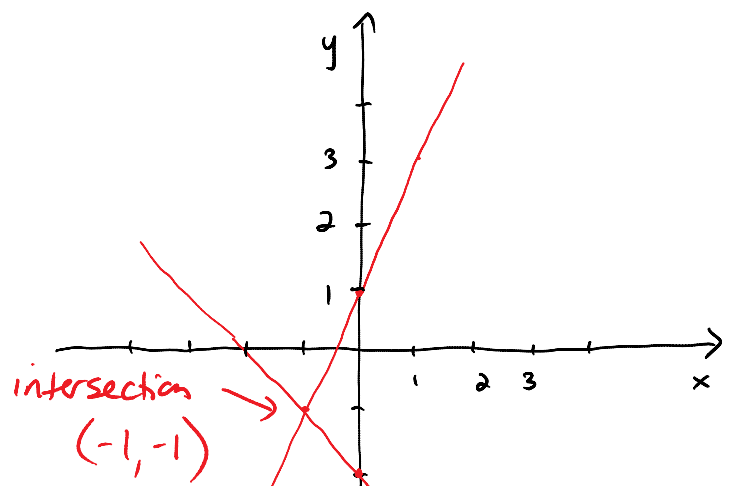
the set of ordered pairs which satisfy both equations at the same time

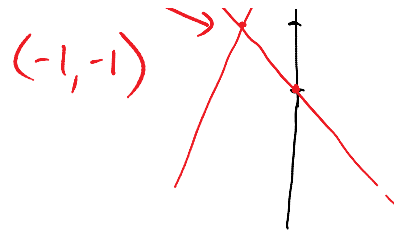
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solving a system by graphing:

$$\text{solve } \begin{cases} y = 2x + 1 \\ x + y = -2 \end{cases}$$

$$y = -x - 2$$





the solution set is  $\{(-1, -1)\}$

solving by substitution:

$$\text{solve } \begin{cases} y = 2x + 1 \\ x + y = -2 \end{cases}$$

$$x + y = -2$$

$$x + (2x + 1) = -2$$

$$3x = -3$$

$$x = -1$$

$$\begin{aligned} y &= 2x + 1 \\ &= -2 + 1 \\ &= -1 \end{aligned}$$

$\{(-1, -1)\}$

$$\text{solve: } \begin{cases} x - y = -4 \\ 3y - 5x = 6 \end{cases}$$

$$x - y = -4$$

$$3y - 5x = 6$$

$$\begin{aligned}x - y &= -4 \\x &= y - 4\end{aligned}$$

$$\begin{aligned}3y - 5x &= 6 \\3y - 5(y - 4) &= 6\end{aligned}$$

$$\begin{aligned}3y - 5y + 20 &= 6 \\-2y &= -14 \\y &= 7\end{aligned}$$

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$$\begin{aligned}x &= y - 4 \\&= 3\end{aligned}$$

$$\boxed{\{(3, 7)\}}$$

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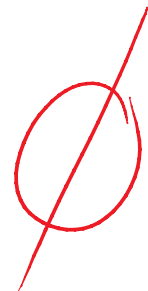
$$\begin{cases}2x - 3y = 6 \\y = \frac{2}{3}x - 4\end{cases}$$

$$2x - 3y = 6$$

$$2x - 3\left(\frac{2}{3}x - 4\right) = 6$$

$$2x - 2x + 12 = 6$$

$$12 = 6$$



note: the two lines are parallel, so  
no intersections & no solutions

$$\begin{cases} y = 3(x-4) \\ 3x - y = 12 \end{cases}$$

} same line

so the solution set is the set of all point on that line

$$3x - y = 12$$

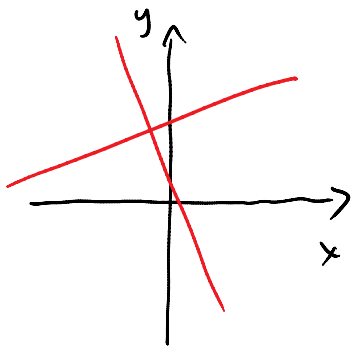
$$3x - 3(x-4) = 12$$

$$3x - 3x + 12 = 12$$

$$12 = 12$$

$$\{(x, y) \mid 3x - y = 12\}$$

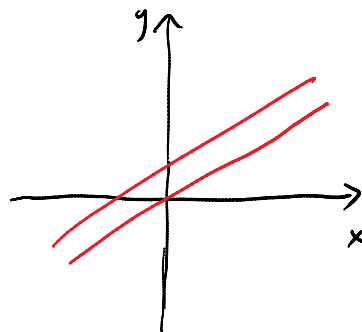
three types of solutions for  $2 \times 2$  systems:



two lines meet at a single point

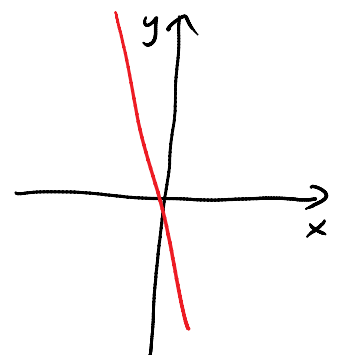
solution set:

"



two lines don't meet (parallel)

"



two lines are actually the same line

"

Solution set:  
that point

$\emptyset$

the set of points  
on that line

Independent

Inconsistent

Dependent