Warm Up

For each equation below, **substitute** the given number in place of the variable written in **bold**. Then solve each for the variable that remains.

1. $y = x + 1$, if **x = 3**

$y = 3 + 1$

$y = 4$

2. $x + y = 4$, if **y = 2**

$x + 2 = 4$

$-2 \quad -2$

$x = 2$

3. $y = 5 + 3x$, if **x = 4**

$y = 5 + 3(4)$

$y = 5 + 12$

$y = 17$

Warm Up

In your own words, define **consistent.**

at least one solution

What kind of lines create an **inconsistent** system of equations?
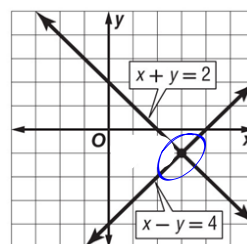
parallel

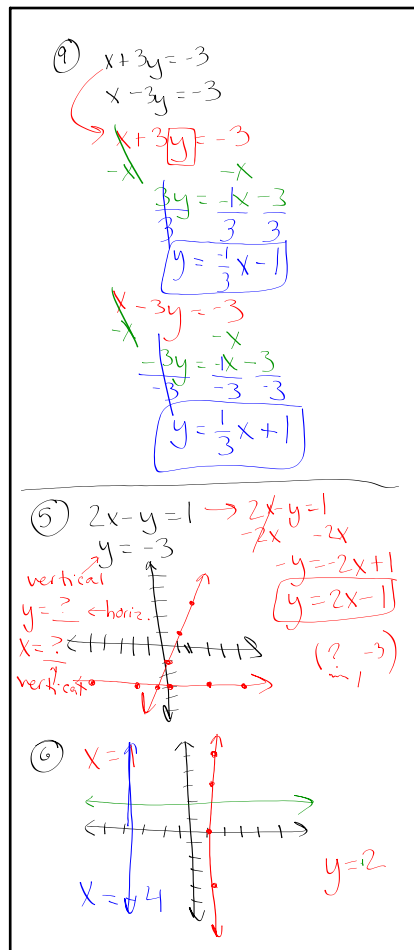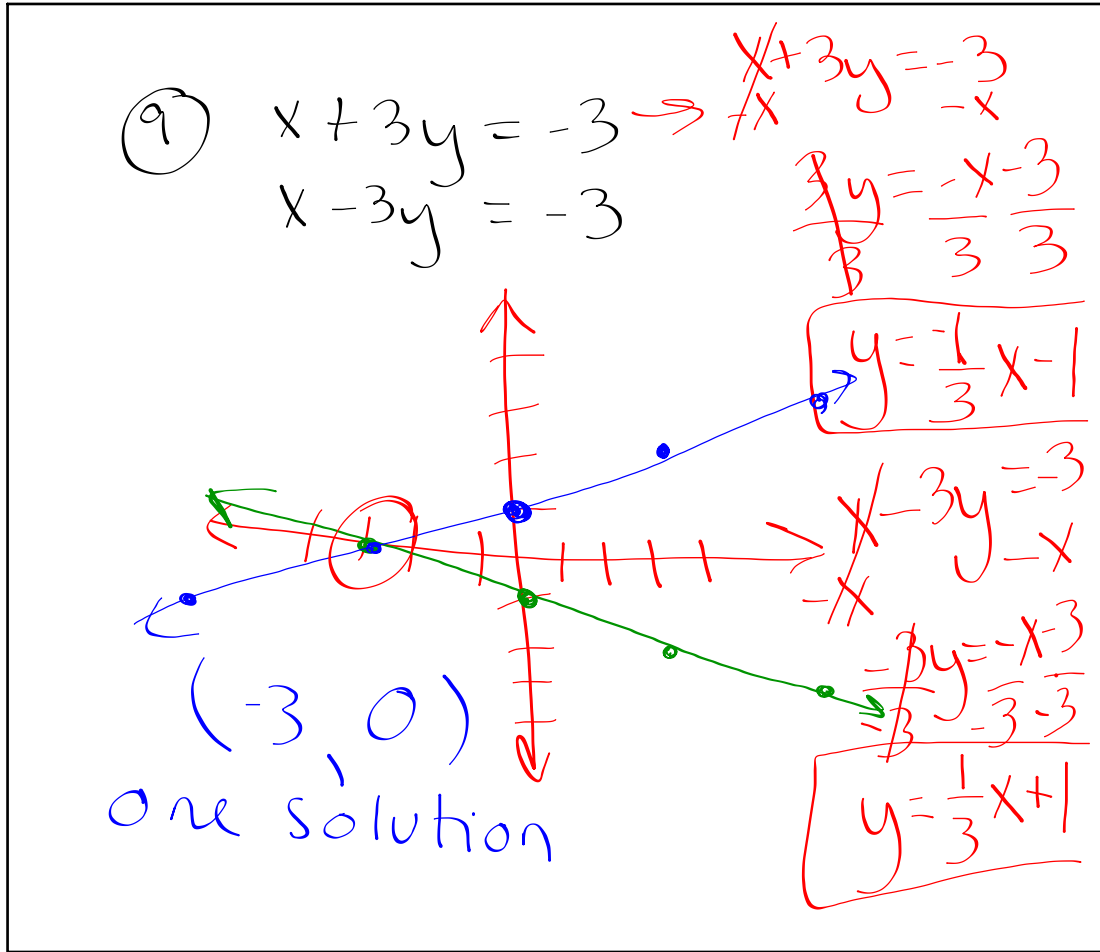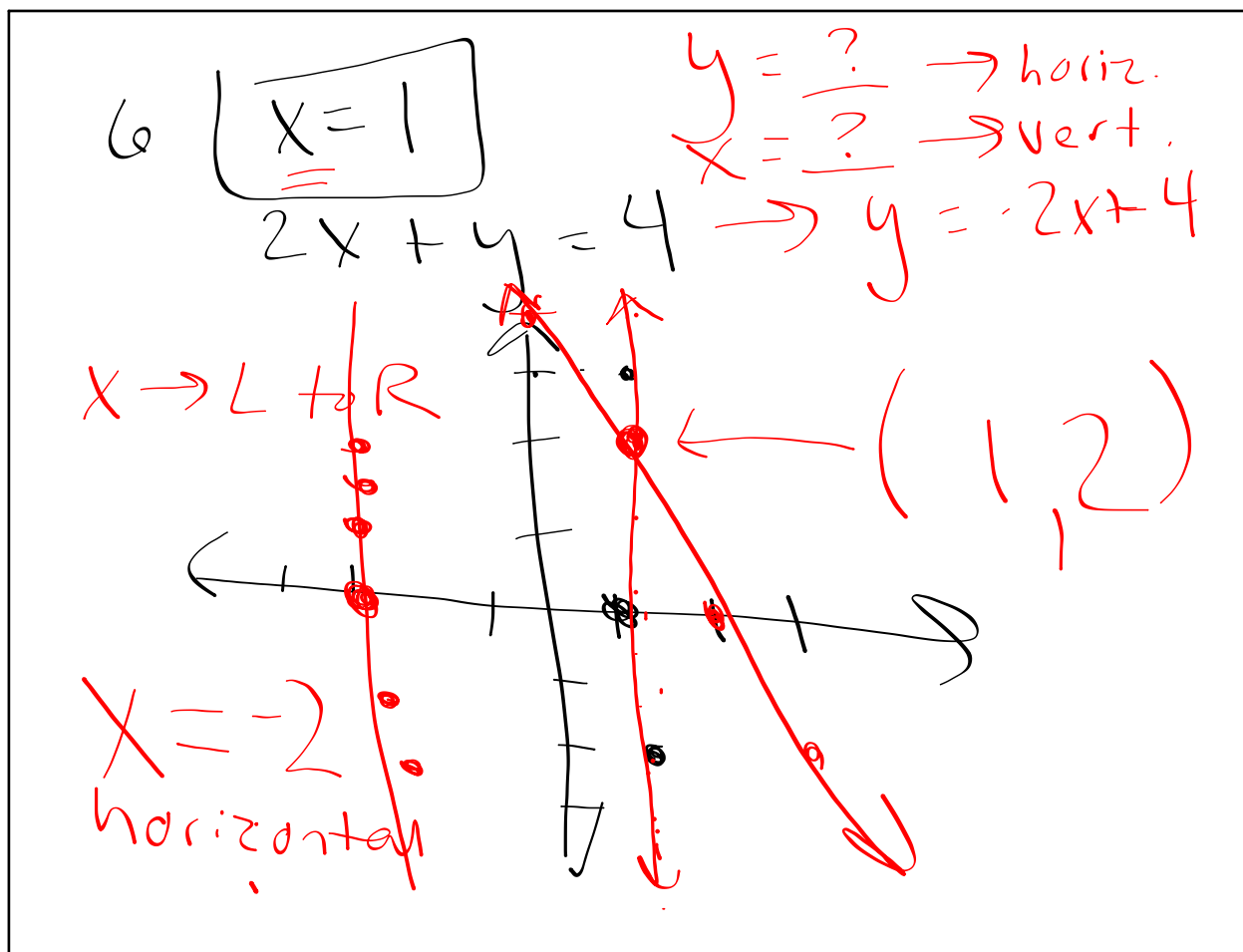What is true of a **dependent** system of equations?

share the same line!   infinite solutions

Name the **solution** for the following system of equations:

$(3, -1)$

⑨ $x + 3y = -3$ → $\cancel{x} + 3y = -3$
  $x - 3y = -3$ $-x$

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

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

$x - 3y = -3$
$-x$

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

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

$(-3, 0)$

one solution

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⑨ $x + 3y = -3$
  $x - 3y = -3$

$x + 3y = -3$
$-x$ $-x$

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

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

$x - 3y = -3$
$-x$

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

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

⑤ $2x - y = 1$ → $2x - y = 1$
  $y = -3$ $-2x$ $-2x$

vertical $-y = -2x + 1$
$y = \underline{?}$ ← horiz.
$x = \underline{?}$ $\boxed{y = 2x - 1}$
vertical $(\underset{-1}{?}, -3)$

⑥ $x = $

$x = -4$ $y = 2$

6 | $\boxed{x = 1}$

$y = ? \rightarrow$ horiz.
$x = ? \rightarrow$ vert.

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

$x \rightarrow L \text{ to } R$

$(1, 2)$

$x = -2$

horizontal

$x + 3y = -3$

$-x \qquad -x$

$\dfrac{3y}{3} = \dfrac{-1x}{3} - \dfrac{3}{3}$

$y = \dfrac{-1}{3}x - 1$

$x - 3y = -3$

$-x \qquad -x$

$\dfrac{-3y}{-3} = \dfrac{-x}{-3} - \dfrac{3}{-3}$

$y = \dfrac{1}{3}x + 1$

Substitution

Clear Learning Target

You will be able to use the substitution method to solve systems of equations algebraically.

Example #1: Solve.

$$y = 2x + 1$$

"the same as!!" $3x + y = -9$ ☆ find/get one variable alone

$x + y = 1$ $3x + (2x+1) = -9$

$3x + 2x + 1 = -9$

$\boxed{x = 3}$

$5x + 1 = -9$

$\cancel{3} + y = 1$ $-1 \quad -1$

$\cancel{y} = -2$

$\dfrac{5x}{5} = \dfrac{-10}{5}$

$\boxed{(-2, -3)}$ $\boxed{x = -2}$

$y = 2(-2) + 1$

$y = -4 + 1$

$\boxed{y = -3}$

You Try! Solve using substitution.

$$y = 4x - 6$$

$$5x + 3y = -1$$

$5x + 3(4x - 6) = -1$

$5x + 12x - 18 = -1$

$17x - 18 = -1$

$ +18 \quad +18$

$\boxed{(1, -2)}$ $\dfrac{17x}{17} = \dfrac{17}{17}$

$\boxed{x = 1}$

$y = 4(1) - 6$

$\boxed{y = -2}$

Example #2: Solve using substitution.

$$x + 2y = 6$$

$$3x - 4y = 28$$

Solve X

$$x + 2y = 6$$
$$-2y \quad -2y$$

$$\boxed{x = -2y + 6}$$

Solve y:

$$x + 2y = 6$$
$$-x \qquad -x$$

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

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

You Try! Solve using substitution.

$$4x + 5y = 11$$

$$y - 3x = -13$$