

## Algebra RH

Essential Question: How do we solve a linear system algebraically?

Do Now: Solve the following linear system graphically.

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

$$y = -2x - 2$$

$$m = -2 \downarrow$$

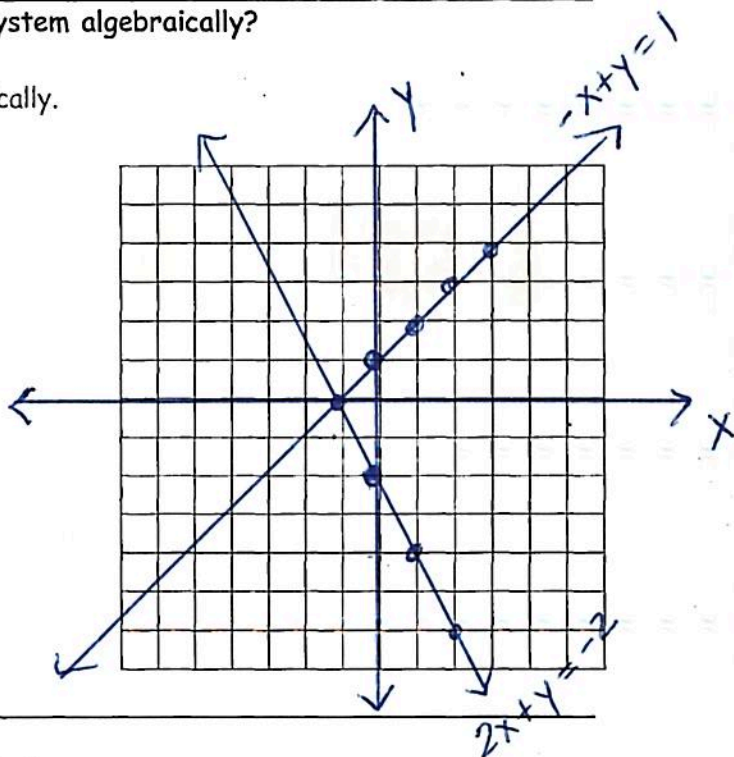
$$b = -2$$

$$m = \frac{1}{1}$$

$$b = 1$$

common  
solution  
(-1, 0)

x	y <sub>1</sub>	y <sub>2</sub>
-1	0	0



Solve the linear system from the Do Now algebraically.

$$-x + y = 1 \rightarrow$$

$$y = x + 1$$

$$2x + y = -2$$

$$2x + x + 1 = -2$$

$$3x + 1 = -2$$

$$3x = -3$$

$$x = -1$$

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

$$1 + y = 1$$

$$y = 0$$

$$(-1, 0)$$

Solving a Linear System by Substitution (*Substitution Method*)

- 1) isolate one variable (solve for x or y in one equation)
- 2) substitute the expression that represents the variable into the other equation and solve for that variable.
- 3) substitute the value in either equation and solve for the remaining variable.
- 4) Check your answer in both original equations.

Examples: Use the substitution method to solve the following linear systems. Don't forget to check!

1.  $2x + 2y = 3$   
 $x - 4y = -1$   
 $+4y +4y$

$x = 4y - 1$

$2x + 2y = 3$   
 $2(4y - 1) + 2y = 3$   
 $8y - 2 + 2y = 3$   
 $10y - 2 = 3$   
 $10y = 5$   
 $y = \frac{1}{2}$

$x - 4y = -1$   
 $x - 4\left(\frac{1}{2}\right) = -1$   
 $x - 2 = -1$   
 $x = 1$

check  $\left(1, \frac{1}{2}\right)$

$2x + 2y = 3$	$x - 4y = -1$
$2(1) + 2\left(\frac{1}{2}\right) = 3$	$1 - 4\left(\frac{1}{2}\right) = -1$
$2 + 1 = 3$	$1 - 2 = -1$
$3 = 3$ ✓	$-1 = -1$ ✓

2.  $2a + 4b = 10$   
 $3a - b = 1$   
 $-3a \quad -3a$

$-\frac{b}{-1} = \frac{1-3a}{-1}$   
 $b = -1 + 3a$

$2a + 4b = 10$   
 $2a + 4(3a - 1) = 10$   
 $2a + 12a - 4 = 10$   
 $14a - 4 = 10$   
 $14a = 14$   
 $a = 1$

$2a + 4b = 10$   
 $2(1) + 4b = 10$   
 $2 + 4b = 10$   
 $4b = 8$   
 $b = 2$

$a = 1, b = 2$

3.  $y = 3x + 4$   
 $y = 2x - 9$

$3x + 4 = 2x - 9$   
 $x + 4 = -9$   
 $x = -13$

$y = 3x + 4$   
 $y = 3(-13) + 4$   
 $y = -39 + 4$   
 $y = -35$

$x = -13, y = -35$   
 $(-13, -35)$  as an ordered pair