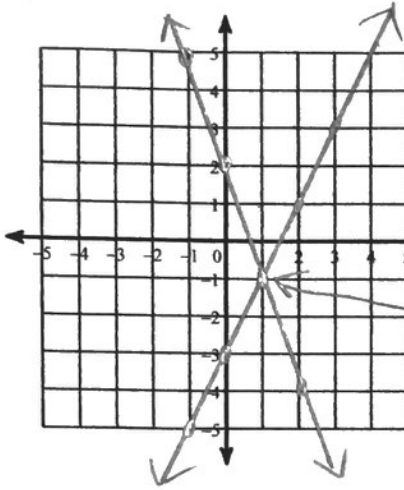


Solving Systems of Equations by Graphing

Solve each system by graphing (find the point of intersection of the two lines).

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

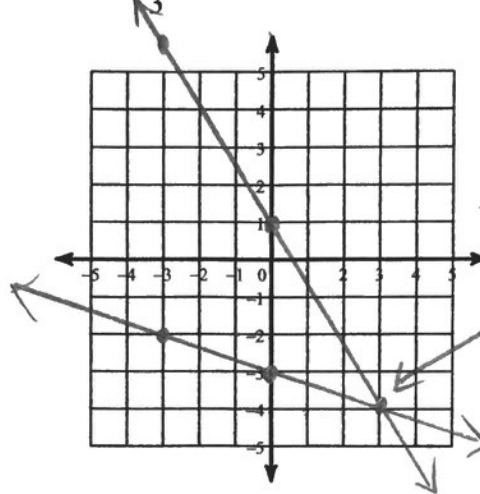
slope 2 Rise 1 Run
y-intercept



Solution:
 $(1, -1)$

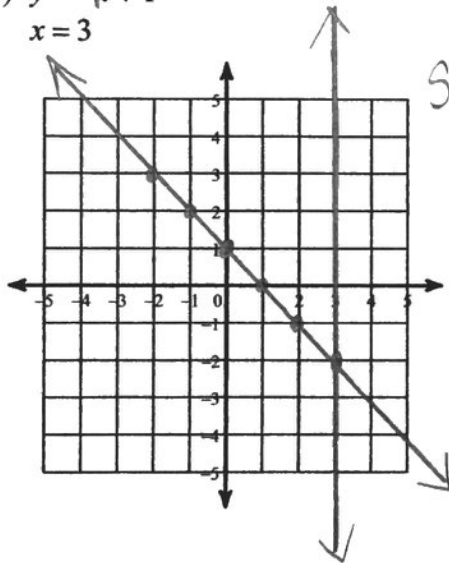
2) $y = -\frac{5}{3}x + 1$

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



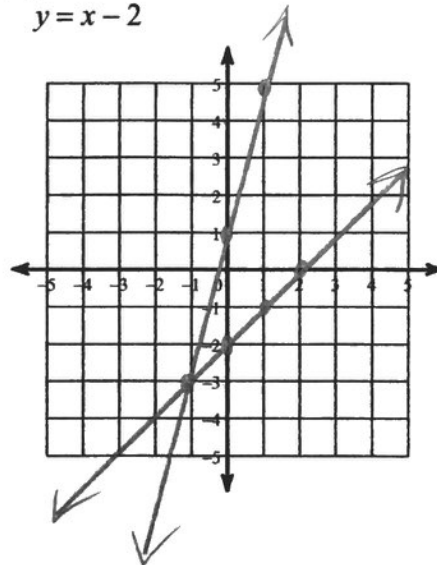
Solution:
 $(3, -4)$

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



Solution:
 $(3, -2)$

4) $y = 4x + 1$
 $y = x - 2$

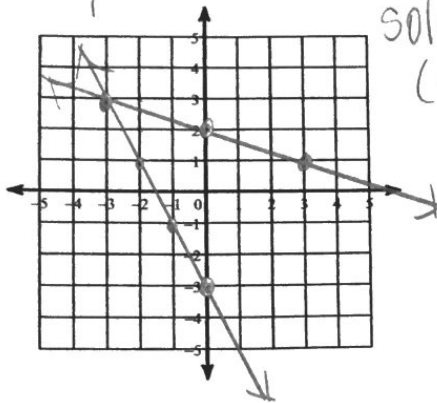


Solution:
 $(-1, -3)$

5/11

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

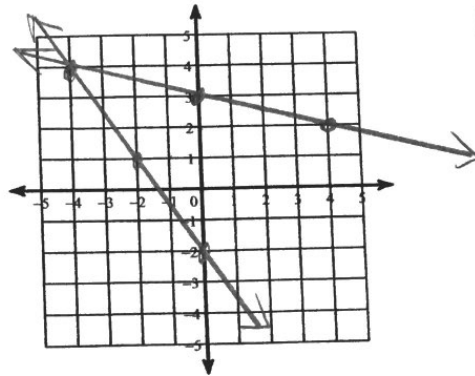
$y = -2x - 3$



Solution:
(-3, 3)

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

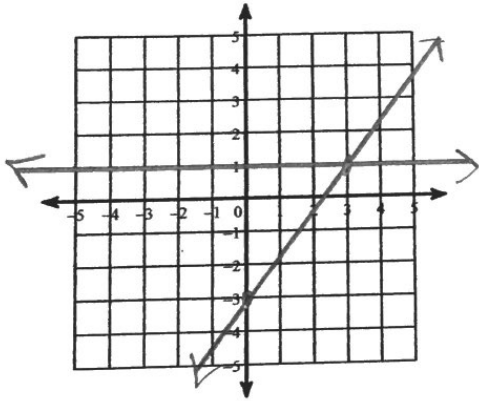
$y = -\frac{3}{2}x - 2$



Solution:
(-4, 4)

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

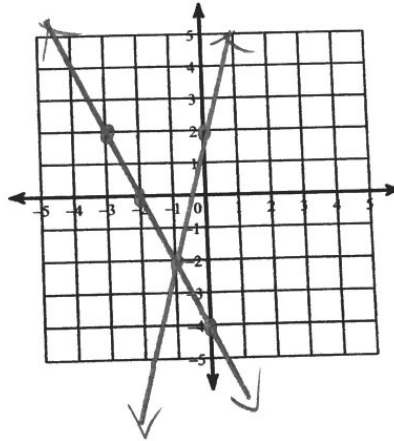
$y = 1$



Solution:
(3, 1)

8) $y = -2x - 4$

$y = 4x + 2$



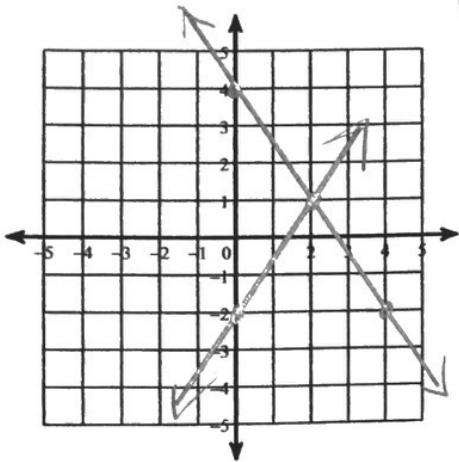
Solution:
(-1, 2)

5/11

9) $y = -\frac{3}{2}x + 4$

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

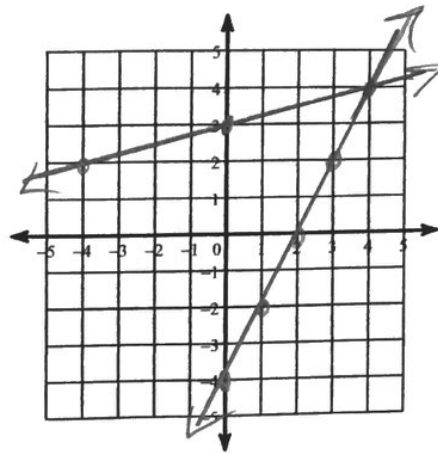
Solution:
(2,1)



10) $y = 2x - 4$

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

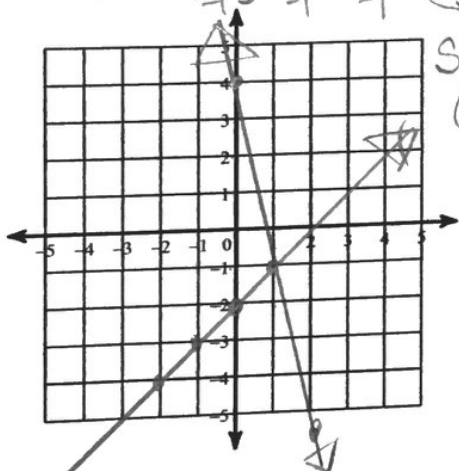
Solution:
(4,4)



11) $5x + y = 4$
 $x - y = 2$

Solve for y
 $y = -5x + 4$
 $y = x - 2$

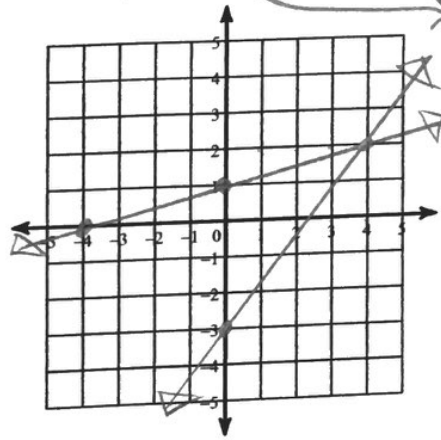
Solution:
(1,-1)



12) $x - 4y = -4$
 $5x - 4y = 12$

$y = \frac{1}{4}x + 1$
 $-4y = -5x + 12$
 $y = \frac{5}{4}x - 3$

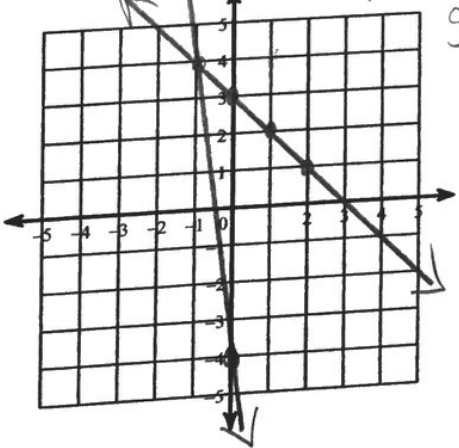
Solution:
(4,2)



13) $x + y = 3$
 $8x + y = -4$

$y = -x + 3$
 $y = -8x - 4$

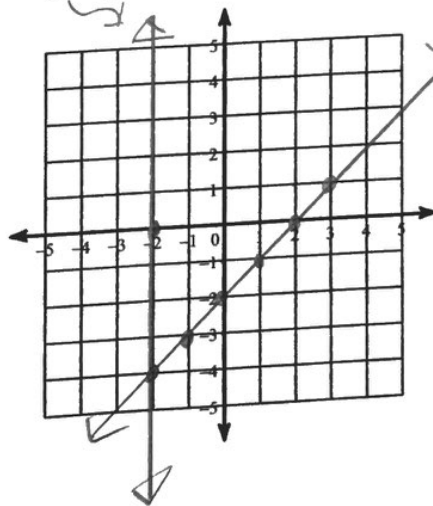
Solution:
(-1,4)



14) $x - y = 2$
 $x = -2$

$y = x - 2$

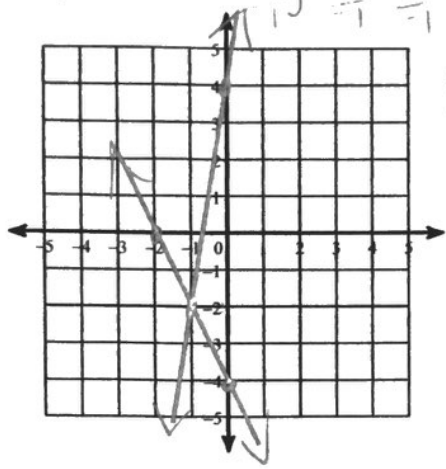
Solution:
(-2,-4)



Solve each system by graphing (find the point of intersection of the two lines).

21) $-6x + y = 4$
 $-y - 2x = 4$

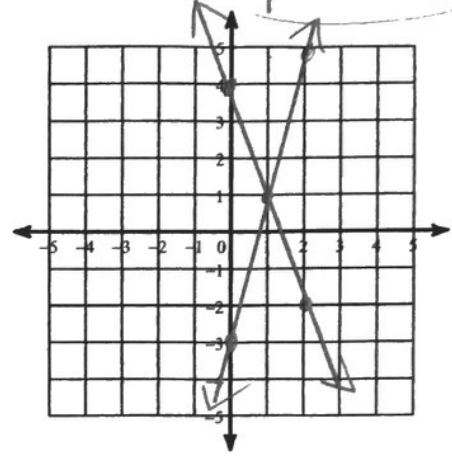
$y = 6x + 4$
 $y = -2x - 4$
 $y = 2x + 4$



solution:
 $(-1, -2)$

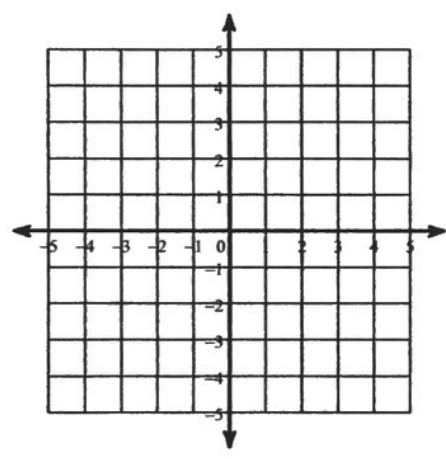
22) $-y - 3 + 4x = 0$
 $-4 = -3x - y$

$y = -3x + 4$
 $-y = -4x + 3$
 $y = 4x - 3$



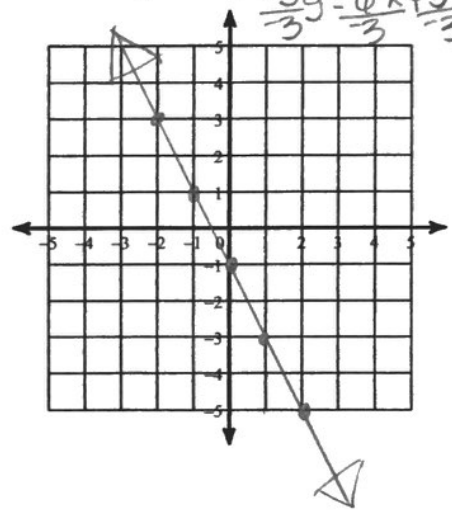
solution:
 $(1, 1)$

23) $0 = -3x - 4 - 2y$
 $2 - \frac{1}{2}x = y$



24) $-2x - y = 1$
 $-6x = 3y + 3$

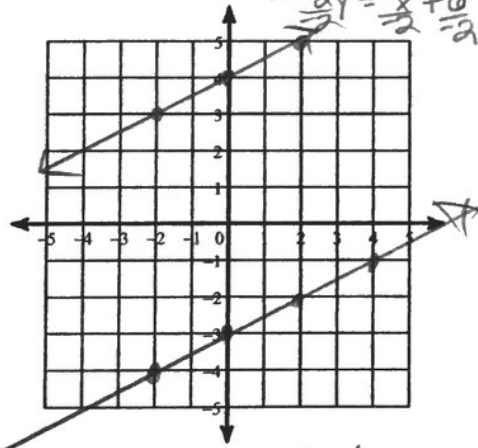
$y = -2x - 1$
 $y = -2x - 1$



Infinitely many solutions

25) $x - 2y + 8 = 0$
 $-6 - 2y = -x$

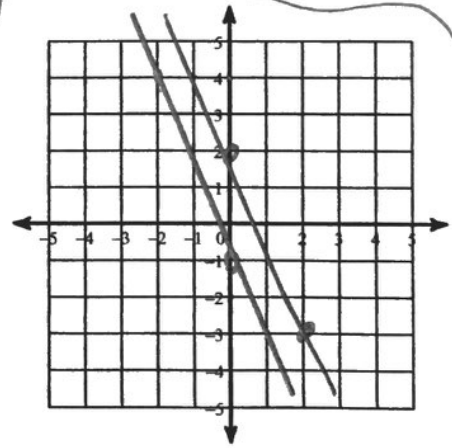
$y = \frac{1}{2}x + 4$
 $y = \frac{1}{2}x - 3$



No solution

26) $-2y - 5x = 2$
 $-5x = 2y - 4$

$y = \frac{5}{2}x - 1$
 $y = \frac{5}{2}x + 2$



No solution

Steps for Solving by Substitution:

5/12
Notes

- ① Solve one of your equations for x or y
- ② Substitute "plug" that into the other equation
- ③ Solve for the variable
- ④ Substitute "plug" your answer into either equation
- ⑤ Solve for the other variable
- ⑥ Write as a coordinate (x, y) , if possible

Not possible with \rightarrow No solution

Infinitely Many Solutions

Examples

$$x = -4$$

$$3x + 2y = 20$$

$$3(-4) + 2y = 20$$

$$\begin{array}{r} -12 + 2y = 20 \\ +12 \quad +12 \end{array}$$

$$\frac{2y}{2} = \frac{32}{2}$$

$$y = 16$$

solution
 $(-4, 16)$

$$x = -5y + 4$$

$$3x + 15y = -1$$

$$3(-5y + 4) + 15y = -1$$

$$\begin{array}{r} -15y + 12 + 15y = -1 \\ \cancel{-15y} + 12 + \cancel{15y} = -1 \end{array}$$

$$12 = -1 \quad \text{No solution}$$

False

$$3x + 2y = -12$$

$$y = x - 1$$

$$3x + 2(x - 1) = -12$$

$$3x + 2x - 2 = -12$$

$$\begin{array}{r} 5x - 2 = -12 \\ +2 \quad +2 \end{array}$$

$$5x = -10$$

$$x = -2$$

solution

$(-2, -3)$

$$y = -2 - 1$$

$$y = -3$$

$$x = 5y + 10$$

$$2x - 10y = 20$$

$$2(5y + 10) - 10y = 20$$

$$\begin{array}{r} 10y + 20 - 10y = 20 \\ \cancel{10y} + 20 - \cancel{10y} = 20 \end{array}$$

$$20 = 20 \quad \text{Infinitely Many Solutions}$$

True

Solutions

$$2x + y = 3$$

$$-4x + y = -9$$

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

$$\begin{array}{r} -6x + 3 = -9 \\ -3 \quad -3 \end{array}$$

$$\begin{array}{r} -6x = -12 \\ -6 \quad -6 \\ x = 2 \end{array}$$

$$y = -2x + 3$$

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

$$y = -4 + 3$$

$$y = -1$$

solution
(2, -1)

5/12

Coordinate Algebra

Name: Practice

Solving Systems by Substitution

Date: _____ Block: _____

Solve each system by substitution.

<p>1.) $y = -2$ $4x - 3y = 18$</p> $4x - 3(-2) = 18$ $4x + 6 = 18$ $\begin{array}{r} 4x + 6 = 18 \\ -6 \quad -6 \\ \hline 4x = 12 \\ \frac{4x}{4} = \frac{12}{4} \\ x = 3 \end{array}$ <p>Solution $(3, -2)$</p>	<p>2.) $y = 5x - 7$ $-3x - 2y = -12$</p> $-3x - 2(5x - 7) = -12$ $-3x - 10x + 14 = -12$ $-13x + 14 = -12$ $\begin{array}{r} -13x + 14 = -12 \\ -14 \quad -14 \\ \hline -13x = -26 \\ \frac{-13x}{-13} = \frac{-26}{-13} \\ x = 2 \end{array}$ <p>$y = 5(2) - 7$ $y = 10 - 7$ $y = 3$</p> <p>Solution $(2, 3)$</p>
<p>3.) $y = -3x + 5$ $5x - 4y = -3$</p> $5x - 4(-3x + 5) = -3$ $5x + 12x - 20 = -3$ $17x - 20 = -3$ $\begin{array}{r} 17x - 20 = -3 \\ +20 \quad +20 \\ \hline 17x = 17 \\ x = 1 \end{array}$ <p>$y = -3(1) + 5$ $y = -3 + 5$ $y = 2$</p> <p>Solution $(1, 2)$</p>	<p>4.) $2x - 3y = -1$ $y = x - 1$</p> $2x - 3(x - 1) = -1$ $2x - 3x + 3 = -1$ $-1x + 3 = -1$ $\begin{array}{r} -1x + 3 = -1 \\ -3 \quad -3 \\ \hline -1x = -4 \\ \frac{-1x}{-1} = \frac{-4}{-1} \\ x = 4 \end{array}$ <p>$y = 4 - 1$ $y = 3$</p> <p>Solution $(4, 3)$</p>
<p>5.) $-3x - 3y = 3$ $y = -5x - 17$</p> $-3x - 3(-5x - 17) = 3$ $-3x + 15x + 51 = 3$ $12x + 51 = 3$ $\begin{array}{r} 12x + 51 = 3 \\ -51 \quad -51 \\ \hline 12x = -48 \\ x = -4 \end{array}$ <p>$y = -5(-4) - 17$ $y = 20 - 17$ $y = 3$</p> <p>Solution $(-4, 3)$</p>	<p>6.) $-4x + y = 6 \rightarrow y = 4x + 6$ $-5x - y = 21$</p> $-5x - 1(4x + 6) = 21$ $-5x - 4x - 6 = 21$ $-9x - 6 = 21$ $\begin{array}{r} -9x - 6 = 21 \\ +6 \quad +6 \\ \hline -9x = 27 \\ \frac{-9x}{-9} = \frac{27}{-9} \\ x = -3 \end{array}$ <p>$y = 4(-3) + 6$ $y = -12 + 6$ $y = -6$</p> <p>Solution $(-3, -6)$</p>

Practice 5/12

7.) $-7x - 2y = -13$
 $x - 2y = 11 \quad x = 2y + 11$
 $x = 2(-4) + 11$
 $x = -8 + 11$
 $x = 3$

$-7(2y + 11) - 2y = -13$
 $-14y - 77 - 2y = -13$
 $-16y - 77 = -13$
 $+77 \quad +77$

 $-16y = 64$
 $\frac{-16y}{-16} = \frac{64}{-16}$
 $y = -4$

solution
 $(3, -4)$

8.) $-3x + 3y = 4$
 $-x + y = 3 \quad y = x + 3$

$-3x + 3(x + 3) = 4$
 $-3x + 3x + 9 = 4$
 $9 = 4$ False
 No Solution

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

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

$-3x - 4(-x - 1) = 2$
 $-3x + 4x + 4 = 2$
 $x + 4 = 2$
 $-4 \quad -4$

 $x = -2$

$y = -(-2) - 1$
 $y = 2 - 1$
 $y = 1$

solution
 $(-2, 1)$

10.) $-2x - y = -9$
 $5x - 2y = 18$

$\frac{-y}{-1} = \frac{2x - 9}{-1}$
 $y = -2x + 9$

$5x - 2(-2x + 9) = 18$
 $5x + 4x - 18 = 18$
 $9x - 18 = 18$
 $+18 \quad +18$

 $9x = 36$
 $\frac{9x}{9} = \frac{36}{9}$
 $x = 4$

$y = -2(4) + 9$
 $y = -8 + 9$
 $y = 1$

solution
 $(4, 1)$

Steps for solving by ELIMINATION

- ① Line up equations
- ② Check to see if you can eliminate a variable
- ③ Eliminate 1 variable and solve
- ④ Substitute that back into one equation + solve
- ⑤ Write as a coordinate (x, y) if possible

Examples:

$$\begin{array}{r} -6x + y = -16 \\ -5x - y = -28 \\ \hline -11x = -44 \\ \frac{-11}{-11} = \frac{-44}{-11} \\ x = 4 \end{array}$$

$$\begin{array}{r} -6(4) + y = -16 \\ -24 + y = -16 \\ +24 \quad +24 \\ \hline y = 8 \end{array}$$

Solution:
 $(4, 8)$

$$\begin{array}{r} -5x + 4y = -1 \\ 5x - 6y = 19 \\ \hline -2y = 18 \\ y = -9 \end{array}$$

$$\begin{array}{r} -5x + 4(-9) = -1 \\ -5x - 36 = -1 \\ +36 \quad +36 \\ \hline -5x = 35 \\ \frac{-5}{-5} = \frac{35}{-5} \\ x = 7 \end{array}$$

Solution:
 $(7, -9)$

$$\begin{array}{r} x - 12y = -27 \\ (5x + 6y = 27) \end{array}$$

$$\begin{array}{r} x - 12y = -27 \\ -10x + 12y = 54 \\ \hline -9x = 27 \\ \frac{-9}{-9} = \frac{27}{-9} \\ x = -3 \end{array}$$

$$\begin{array}{r} -3 - 12y = -27 \\ +3 \quad +3 \\ \hline -12y = -24 \\ \frac{-12}{-12} = \frac{-24}{-12} \\ y = 2 \end{array}$$

Solution:
 $(-3, 2)$

$$\begin{array}{r} 8x + y = -1 \\ 2x = 3y - 3 \end{array} \quad \begin{array}{r} 3(-8x + y = -1) \\ -2x + 3y = -3 \end{array} \quad \begin{array}{r} 24x - 3y = 3 \\ -2x + 3y = -3 \\ \hline 22x = 0 \\ \frac{0}{22} = \frac{0}{22} \\ x = 0 \end{array}$$

$$\begin{array}{r} -8(0) + y = -1 \\ 0 + y = -1 \\ y = -1 \end{array}$$

Solution:
(0, -1)

$$\begin{array}{r} -9x + 5y = 8 \\ 18x - 10y = 16 \end{array}$$

$$\begin{array}{r} -18x + 10y = 16 \\ 18x - 10y = -16 \\ \hline 0 = 0 \end{array}$$

0 = 0 True / Infinitely Many Solutions

$$\begin{array}{r} 5x = 7 + 6y \\ -10x + 12y = -18 \end{array} \quad \begin{array}{r} 2(5x - 6y = 7) \\ -10x + 12y = 14 \end{array} \quad \begin{array}{r} 10x - 12y = 14 \\ -10x + 12y = -18 \\ \hline 0 = -4 \end{array}$$

0 = -4 False / NO SOLUTION

Coordinate Algebra

Name: Practice 5/13

Solving Systems by Elimination

Date: _____ Block: _____

Solve each system by Elimination.

<p>1.) $\begin{array}{r} -4x - 2y = -12 \\ 4x + 8y = -24 \end{array}$</p> $\begin{array}{r} 6y = -36 \\ y = -6 \end{array}$ <p>Solution: (6, -6)</p>	<p>2.) $\begin{array}{r} x - y = 11 \\ 2x + y = 19 \end{array}$</p> $\begin{array}{r} 3x = 30 \\ x = 10 \end{array}$ <p>Solution (10, -1)</p>
<p>3.) $\begin{array}{r} -6x + 5y = 1 \\ 6x + 4y = -10 \end{array}$</p> $\begin{array}{r} 9y = 9 \\ y = 1 \end{array}$ <p>Solution: (-1, -1)</p>	<p>4.) $\begin{array}{r} -2x - 9y = -25 \\ -4x - 9y = -23 \end{array}$</p> $\begin{array}{r} 2x + 9y = 25 \\ -4x - 9y = -23 \\ \hline -2x = 2 \\ x = -1 \end{array}$ <p>Solution: (-1, 3)</p>
<p>5.) $\begin{array}{r} 8x + y = -16 \\ -1(-3x + y = -5) \end{array}$</p> $\begin{array}{r} 8x + y = -16 \\ 3x + y = 5 \\ \hline 11x = -11 \\ x = -1 \end{array}$ <p>Solution: (-1, -8)</p>	<p>6.) $\begin{array}{r} -4x - 15y = -17 \\ -4(-x + 5y = -13) \end{array}$</p> $\begin{array}{r} -4x - 15y = -17 \\ 4x - 20y = 52 \\ \hline -35y = 35 \\ y = -1 \end{array}$ <p>Solution: (8, -1)</p>

$$\begin{array}{r} 7.) \quad (-x - 7y = 14) \\ \quad (-4x - 14y = 28) \end{array} \quad \begin{array}{r} 4x + 28y = -56 \\ \underline{-1x - 14y = 28} \\ 14y = -28 \\ y = -2 \end{array}$$

$$-4x - 14(-2) = 28$$

$$\begin{array}{r} -4x + 28 = 28 \\ \underline{-28 \quad -28} \end{array}$$

$$\begin{array}{r} -4x = 0 \\ \underline{-4 \quad -4} \end{array}$$

$$x = 0$$

Solution:
(0, -2)

$$\begin{array}{r} 8.) \quad (5x + 4y = -14) \\ \quad (3x + 6y = 6) \end{array} \quad \begin{array}{r} -15x - 12y = 42 \\ \underline{15x + 30y = 30} \\ 18y = 72 \\ y = 4 \end{array}$$

$$3x + 6(4) = 6$$

$$\begin{array}{r} 3x + 24 = 6 \\ \underline{-24 \quad -24} \end{array}$$

$$3x = -18$$

$$x = -6$$

Solution:
(-6, 4)

$$\begin{array}{r} 9.) \quad (2x + 8y = 6) \\ \quad (-5x - 20y = -15) \end{array} \quad \begin{array}{r} -10x - 40y = -30 \\ \underline{10x + 40y = 30} \\ 0 = 0 \end{array}$$

True/Infinitely Many Solutions

$$\begin{array}{r} 10.) \quad 3 + 2x - y = 0 \\ \quad -3 - 7y = 10x \end{array} \quad \begin{array}{r} 5(2x - y = -3) \\ -10x - 5y = -15 \\ \underline{10x - 5y = -15} \\ -12y = -12 \\ y = 1 \end{array}$$

$$\begin{array}{r} 2x - y = -3 \\ \underline{+1 \quad +1} \end{array}$$

$$2x = -2$$

$$x = -1$$

Solution:
(-1, 1)