

Algebra 2 Chapter 3 Pre-Test

Key

1.) (5 pts each, 10 pts total) Solve each of the following systems of equations by graphing.

a)  $3x + 4y = 12$   
 $-x + 2y = 6$

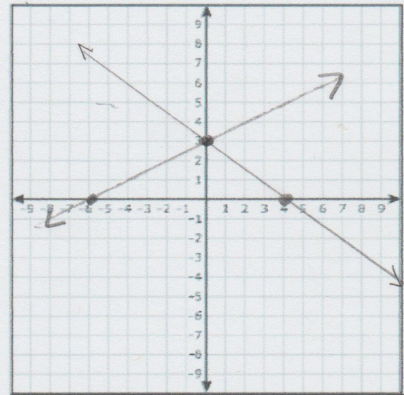
$x=0$   
 $3(0) + 4y = 12$   
 $4y = 12$   
 $\frac{4y}{4} = \frac{12}{4}$

$y = 3$   
 $(0, 3)$

$y=0$   
 $3x + 4(0) = 12$   
 $3x = 12$   
 $\frac{3x}{3} = \frac{12}{3}$   $x = 4$   
 $(4, 0)$

$x=0$   
 $- (0) + 2y = 6$   
 $\frac{2y}{2} = \frac{6}{2}$   
 $y = 3$   
 $(0, 3)$

$y=0$   
 $-x + 2(0) = 6$   
 $-\frac{x}{-1} = \frac{6}{-1}$   
 $x = -6$   
 $(-6, 0)$



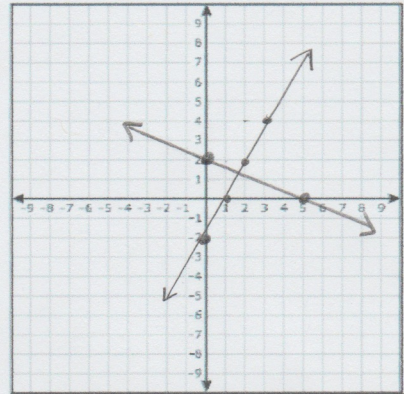
solution  $x = 0$   
 $(0, 3)$

b)  $2x + 5y = 10$   
 $y = 2x - 2$

$x=0$   
 $2(0) + 5y = 10$   
 $5y = 10$   
 $\frac{5y}{5} = \frac{10}{5}$   
 $y = 2$   
 $(0, 2)$

$y=0$   
 $2x + 5(0) = 10$   
 $2x = 10$   
 $\frac{2x}{2} = \frac{10}{2}$   
 $x = 5$   
 $(5, 0)$

$y = 2x - 2$   
 ↑  
 y-int start here  
 slope  $\frac{2 \text{ up}}{1 \text{ right}}$



$x \approx \frac{5}{3}$   
 just approximate and show intersection

2.) (5 pts each, 10 pts total) Solve each of the following systems of equations through substitution.

a)  $4x + 2y = 20$   
 $y = 2x - 2$

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

$4x + 4x - 4 = 20$   
 $+4 \quad +4$

$4x + 4x = 24$

$\frac{8x}{8} = \frac{24}{8}$

$x = 3$

if  $x = 3$

$y = 2(3) - 2$   
 $6 - 2$   
 $4$

$(3, 4)$

$$\begin{aligned} \text{b) } 5x - 3y &= 7 \\ 6x + y &= 13 \end{aligned}$$

$$\begin{aligned} 6x + y &= 13 \\ -6x & \quad -6x \end{aligned}$$

$$y = -6x + 13$$

$$5x - 3y = 7$$

$$5x - 3(-6x + 13) = 7$$

$$5x + 18x - 39 = 7$$

$$\begin{aligned} 23x - 39 &= 7 \\ +39 & +39 \end{aligned}$$

$$\frac{23x}{23} = \frac{46}{23}$$

$$x = 2$$

$$\text{If } x = 2$$

$$\boxed{(2, 1)}$$

$$-5(2) - 3y = 7$$

$$\begin{aligned} 10 - 3y &= 7 \\ -10 & \quad -10 \end{aligned}$$

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

$$y = 1$$

3.) (5 pts each, 10 pts total) Solve each of the following systems of equations through elimination.

$$\begin{aligned} \text{a) } 2x + 7y &= -8 \\ x - 4y &= 11 \end{aligned}$$

$$\begin{aligned} 2x + 7y &= -8 \\ -2(x - 4y) &= -2(11) \end{aligned}$$

$$\begin{aligned} 2x + 7y &= -8 \\ + -2x + 8y &= -22 \\ \hline \end{aligned}$$

$$\frac{15y}{15} = \frac{-30}{15}$$

$$y = -2$$

$$\text{If } y = -2$$

$$2x + 7(-2) = -8$$

$$\begin{aligned} 2x - 14 &= -8 \\ +14 & +14 \end{aligned}$$

$$\frac{2x}{2} = \frac{6}{2}$$

$$x = 3$$

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

$$\begin{aligned} \text{b) } 4x - 5y &= 31 \\ 2x + 3y &= -1 \end{aligned}$$

$$\begin{aligned} 4x - 5y &= 31 \\ -2(2x + 3y) &= -2(-1) \end{aligned}$$

$$\begin{aligned} 4x - 5y &= 31 \\ + -4x - 6y &= 2 \\ \hline \end{aligned}$$

$$\frac{-11y}{-11} = \frac{33}{-11}$$

$$y = -3$$

$$\text{If } y = -3$$

$$4x - 5(-3) = 31$$

$$\begin{aligned} 4x + 15 &= 31 \\ -15 & -15 \end{aligned}$$

$$\frac{4x}{4} = \frac{16}{4}$$

$$x = 4$$

$$\boxed{(4, -3)}$$

4.) (5 pts each, 10 pts total) Solve each of the following systems of equations through any method.

$$\begin{array}{r} \text{a) } 3x + 4y = -21 \\ + \quad -4x - 4y = 16 \\ \hline -x = -5 \end{array}$$

$$x = 5$$

$$\boxed{(5, -9)}$$

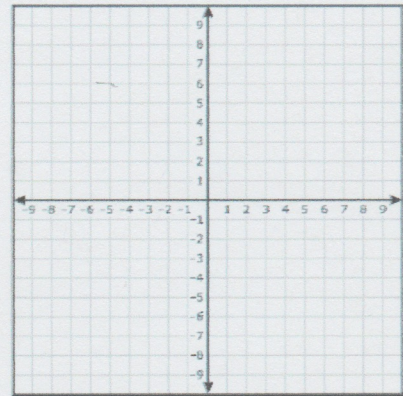
$$3(5) + 4y = -21$$

$$15 + 4y = -21$$

$$-15 \quad -15$$

$$\frac{4y}{4} = \frac{-36}{4}$$

$$y = -9$$



$$\text{b) } 8x + 4y = 16$$

$$y = -4x + 5$$

$$8x + 4y = 16$$

$$8x + 4(-4x + 5) = 16$$

$$8x - 16x + 20 = 16$$

$$-8x + 20 = 16$$

$$-20 \quad -20$$

$$\frac{-8x}{-8} = \frac{-4}{-8} \quad x = \frac{1}{2} \quad \left(\frac{1}{2}, 3\right)$$

$$\text{if } x = \frac{1}{2}$$

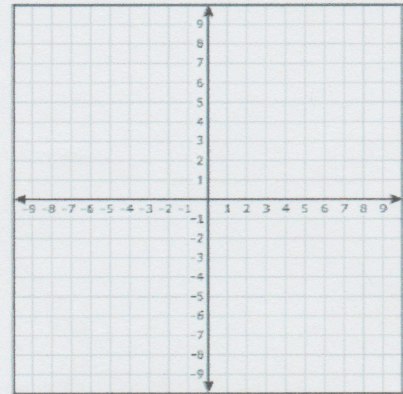
$$8\left(\frac{1}{2}\right) + 4y = 16$$

$$4 + 4y = 16$$

$$-4 \quad -4$$

$$\frac{4y}{4} = \frac{12}{4}$$

$$y = 3$$



5.) (5 pts each, 15 pts total) Solve each of the following systems of inequalities by graphing.

$$\text{a) } x + y > 2$$

$$x - y \leq 4$$

$$0 + 0 > 2$$

$$0 > 2 \quad \text{False}$$

$$x = 0$$

$$0 + y = 2$$

$$y = 2$$

$$(0, 2)$$

$$y = 0$$

$$x + 0 > 2$$

$$x = 2$$

$$(2, 0)$$

$$x - y \leq 4$$

$$x = 0$$

$$\frac{-y}{-1} = \frac{4}{-1}$$

$$y = -4$$

$$(0, -4)$$

$$y = 0$$

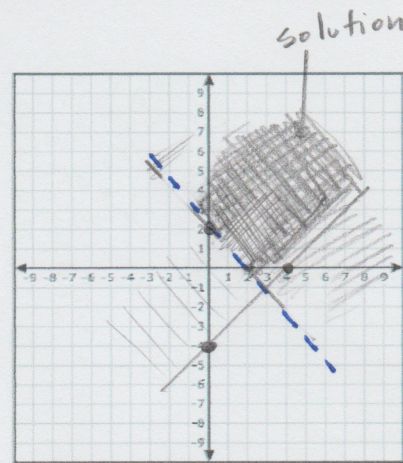
$$x = 4$$

$$(4, 0)$$

$$0 - 0 \leq 4$$

$$0 \leq 4$$

$$\text{True}$$



$$\begin{aligned} \text{b) } & 2x + y > 2 \\ & x - y \geq 3 \end{aligned}$$

$$x=0$$

$$2x + y = 2$$

$$(0, 2) \quad \begin{aligned} 2(0) + y &= 2 \\ y &= 2 \end{aligned}$$

$$y=0$$

$$2x + 0 = 2$$

$$(1, 0) \quad \begin{aligned} 2x &= 2 \\ \frac{2x}{2} &= \frac{2}{2} \\ x &= 1 \end{aligned}$$

$$\begin{aligned} 0 + 0 &> 2 \\ &\text{false} \end{aligned}$$

$$\begin{aligned} \text{c) } & y > 3x + 2 \\ & y \leq -2x + 1 \end{aligned}$$

$$0 \leq -2(0) + 1$$

$$\begin{aligned} 0 &\leq 1 \\ &\text{true!} \end{aligned}$$

$$x - y \geq 3$$

$$x=0$$

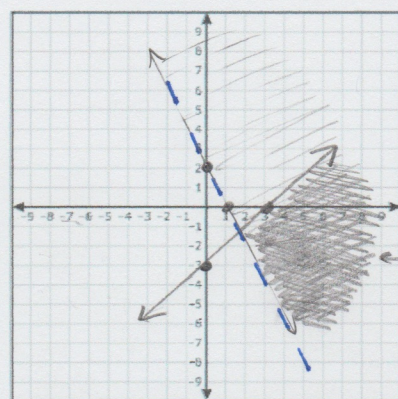
$$\begin{aligned} 0 - 0 &\geq 3 \\ &\text{false} \end{aligned}$$

$$(0, -3) \quad \begin{aligned} -y &\geq 3 \\ y &= -3 \end{aligned}$$

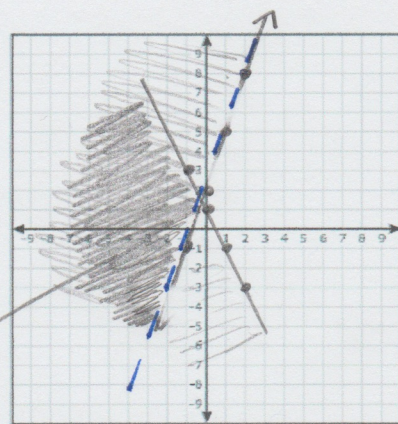
$$y=0$$

$$x = 3$$

$$(3, 0)$$



solution



solution

$$0 > 3(0) + 2$$

$$0 > 2 \quad \text{false}$$

6.) (10 pts each, 20 pts total) Graph each system of constraints. Name all vertices. Then find the values of x and y that maximize or minimize the objective function.

a)  $x + y \leq 6$   
 $2x + y \leq 10$   
 $x \geq 0$   
 $y \geq 0$

$0 + 0 \leq 6$   
 $0 \leq 6$   
 true!

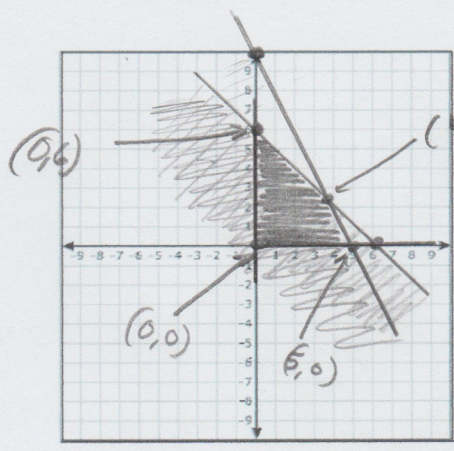
$2(0) + 0 \leq 10$   
 $0 \leq 10$   
 true!

$x=0 \quad y=6 \quad y=0$   
 $(0,6) \quad (6,0) \quad x=6$

$x=0 \quad y=10$   
 $y=0 \quad 2x=10 \Rightarrow x=5$

Vertices:  
 $(0,0), (6,6)$   
 $(5,0), (4,2)$

Find the maximum for  $P = 4x + y$



Kind of tricky...

$x \geq 0 \quad y \geq 0$   
 use (1,1) use (1,1)  
 $1 \geq 0 \quad 1 \geq 0$   
 true! true!

max is 20  
 @ (5,0)

$P = 4x + y$

$(0,0)$	$4(0) + (0) = 0$
$(0,6)$	$4(0) + 6 = 6$
$(5,0)$	$4(5) + 0 = 20$
$(4,2)$	$4(4) + 2 = 18$

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

$x + 2 = 6$   
 $-2 \quad -2$   
 $x = 4$

$2x + y = 10$   
 $2(6 - y) + y = 10$   
 $12 - 2y + y = 10$   
 $-12 \quad -12$   
 $-y = -2$   
 $y = 2$

$(4,2)$

b)  $4x + 2y \leq 4$   
 $2x + 4y \leq 4$   
 $x \geq 0$   
 $y \geq 0$

$0 + 0 \leq 4$   
 $0 \leq 4$   
 true!

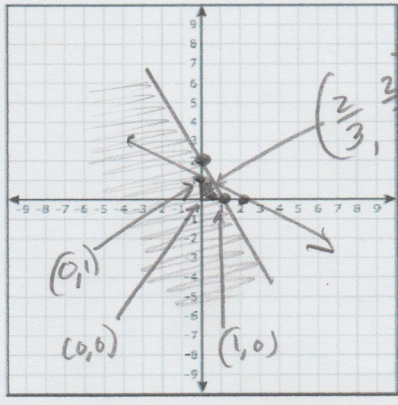
Vertices:  
 $(0,0), (0,1)$   
 $(1,0), (\frac{2}{3}, \frac{2}{3})$

Find the minimum for  $P = 3x + y$

$x=0 \quad 4x + 2y = 4$   
 $4(0) + 2y = 4 \Rightarrow 2y = 4 \Rightarrow y = 2$   
 $(0,2)$

$y=0 \quad 2x + 4y = 4$   
 $2x + 4(0) = 4 \Rightarrow 2x = 4 \Rightarrow x = 2$   
 $(2,0)$

$4x = 4 \Rightarrow x = 1$



this one is tricky to get. solve to make sure

$P = 3x + y$

$(0,0)$	$3(0) + 0 = 0$
$(0,1)$	$3(0) + 1 = 1$
$(1,0)$	$3(1) + 0 = 3$
$(\frac{2}{3}, \frac{2}{3})$	$3(\frac{2}{3}) + \frac{2}{3} = 2\frac{2}{3}$

Minimum 0 at (0,0)

$4y = \frac{12}{3} - \frac{4}{3}$   
 $\frac{1}{4} \cdot 4y = \frac{8}{3} \cdot \frac{1}{4}$   
 $y = \frac{8}{12} = \frac{2}{3}$

$x=0 \quad 4x + 2y = 4$   
 $2x + 4y \leq 4$   
 $-4x \quad -4x$   
 $2(0) + 4y \leq 4$   
 $\frac{2y}{2} = \frac{4-4x}{2}$   
 $y = 2 - 2x$   
 $(0,1)$   
 $\frac{4y}{4} \leq \frac{4}{4}$   
 $y \leq 1$   
 $y=0$

$2x + 4(0) = 4$   
 $2x = 4$   
 $x = 2$

$2(\frac{2}{3}) + 4y = 4$   
 $\frac{4}{3} + 4y = 4$   
 $4y = 4 - \frac{4}{3} = \frac{12}{3} - \frac{4}{3} = \frac{8}{3}$   
 $y = \frac{8}{12} = \frac{2}{3}$

$2x + 4(2 - 2x) = 4$   
 $2x + 8 - 8x = 4$   
 $-6x + 8 = 4$   
 $-6x = -4$   
 $x = \frac{2}{3}$

7.) (various pts each, 25 pts total) Solve each system using elimination.

a) (10 pts) Solve.

$$\begin{aligned} 2x - 3y + z &= -3 \\ x - 5y + 7z &= -11 \\ -10x + 4y - 6z &= 28 \end{aligned}$$

$$\begin{aligned} 2x - 3y + z &= -3 \\ -2(x - 5y + 7z) &= -11 \\ \hline 2x - 3y + z &= -3 \\ -2x + 10y - 14z &= 22 \\ \hline 7y - 13z &= 18 \end{aligned}$$

7y - 13z = 18  
-11y - z = 13  
You can use substitution here!

$$\begin{aligned} 7y - 13z &= 18 \\ -11y - z &= 13 \\ +z &+z \\ \hline -11y &= z + 13 \\ -13 &-13 \\ \hline z &= -11y - 13 \end{aligned}$$

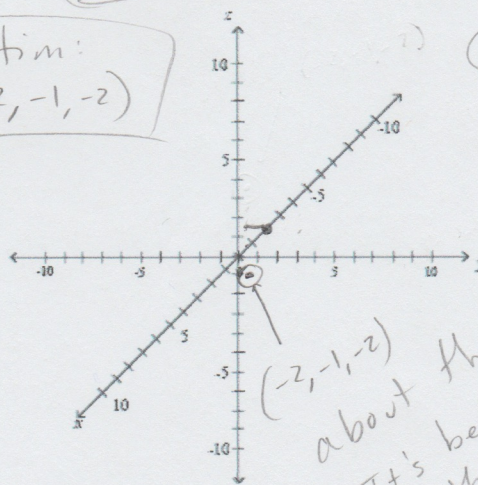
$$\begin{aligned} 7y - 13z &= 18 \\ 7y - 13(-11y - 13) &= 18 \\ 7y + 143y + 169 &= 18 \\ 150y + 169 &= 18 \\ 150y &= -151 \\ \frac{151y}{151} &= \frac{-151}{151} \\ y &= -1 \end{aligned}$$

b) (2.5 pts) Graph the above solution.

$$\begin{aligned} 5(2x - 3y + z) &= 5(-3) \\ -10x + 4y - 6z &= 28 \\ \hline 10x - 15y + 5z &= -15 \\ -10x + 4y - 6z &= 28 \\ \hline -11y - z &= 13 \end{aligned}$$

$$\begin{aligned} -11y - z &= 13 & 2x - 3y + z &= -3 \\ -11(-1) - z &= 13 & 2x - 3(-1) + (-2) &= -3 \\ 11 - z &= 13 & 2x + 3 - 2 &= -3 \\ -11 &-11 & 2x + 1 &= -3 \\ \hline -z &= 2 & -1 &-1 \\ \hline z &= -2 & \frac{2x}{2} &= \frac{-4}{2} \\ & & x &= -2 \end{aligned}$$

Solution:  
(-2, -1, -2)



(-2, -1, -2)  
about there.  
It's behind the paper!

c) (10 pts) Solve.

$$14x - 3y + 5z = -15$$

$$3x + 2y - 6z = 10$$

$$7x - y + 4z = -5$$

$$\begin{aligned} 2(14x - 3y + 5z &= -15) \\ 3(3x + 2y - 6z &= 10) \end{aligned}$$

$$28x - 6y + 10z = -30$$

$$9x + 6y - 18z = 30$$

$$\hline 37x - 8z = 0$$

$$\begin{aligned} 3x + 2y - 6z &= 10 \\ 2(7x - y + 4z &= -5) \end{aligned}$$

$$3x + 2y - 6z = 10$$

$$14x - 2y + 8z = -10$$

$$17x + 2z = 0$$

$$\begin{aligned} 37x - 8z &= 0 \\ 4(17x + 2z &= 0) \end{aligned}$$

$$37x - 8z = 0$$

$$68x + 8z = 0$$

$$\hline 105x = 0$$

$$\frac{105x = 0}{105 \quad 105}$$

$$x = 0$$

$$\text{if } x = 0$$

$$37x - 8z = 0$$

$$37(0) - 8z = 0$$

$$\frac{-8z = 0}{-8 \quad -8}$$

$$z = 0$$

$$\text{if } x = 0 \text{ and } z = 0$$

$$14x - 3y + 5z = -15$$

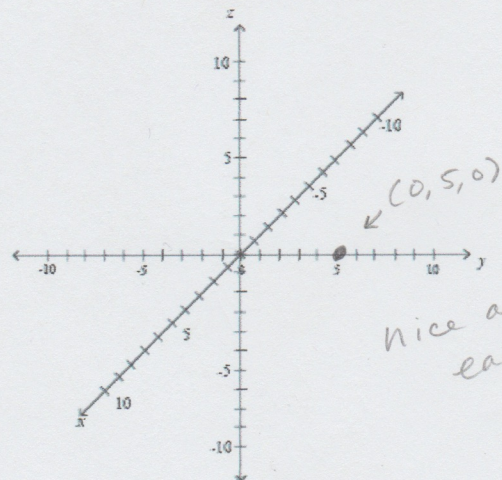
$$14(0) - 3y + 5(0) = -15$$

$$\frac{-3y = -15}{-3 \quad -3}$$

$$y = 5$$

$$(0, 5, 0)$$

d) (2.5 pts) Graph the above solution.



Nice and easy!