Algebra II Test Review Sheet Name _____

Systems of Linear and Nonlinear Equations and Inequalities

1. There are <u>three</u> possible types of solutions for a system of two equations:
   A.) One solution
   B.) No solution: when does this occur? Parallel Lines
   C.) Infinitely many: when does this occur? Same Line (one equation is a multiple of the other)

2. Solve each system by **substitution**:

(a) $\begin{cases} 4x+7y=-1 \\ 2x+y=7 \end{cases}$ → $y = -2x+7$

$4x+7(-2x+7) = -1$
$4x-14x+49 = -1$
$-10x+49 = -1$
$-10x = -50$
$x = 5$
$y = -2(5)+7 = -3$
$(5, -3)$

(b) $\begin{cases} 8x-3y=-10 \\ 5-y=4x \end{cases}$ → $-y = 4x-5$
$y = -4x+5$

$8x-3(-4x+5) = -10$
$8x+12x-15 = -10$
$20x-15 = -10$
$20x = 5$
$x = 1/4$
$y = -4(1/4)+5 = -1+5 = 4$
$(1/4, 4)$

3. Solve each system by **elimination**:

(a) $\begin{cases} 8x-3y=-10 \\ 4x+y=5 \end{cases}$ x 3

$8x-3y = -10$
$12x+3y = 15$
$20x = 5$
$x = 1/4$
$4(1/4)+y = 5$
$1+y = 5$
$y = 4$
$(1/4, 4)$

(b) $\begin{cases} 4x+2y=8 \\ 6x-3y=0 \end{cases}$ x 3, x 2

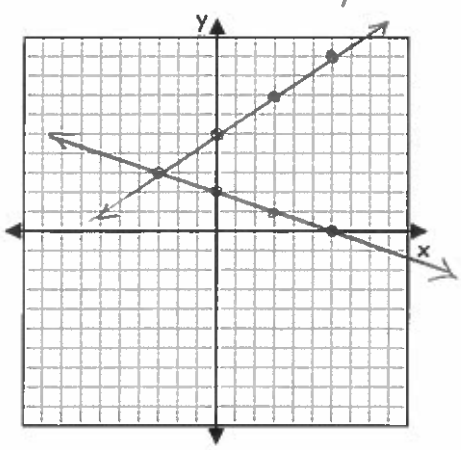
$12x+6y = 24$
$12x-6y = 0$
$24x = 24$
$x = 1$
$4x+2y = 8$
$4(1)+2y = 8$
$4+2y = 8$
$2y = 4$
$y = 2$
$(1, 2)$

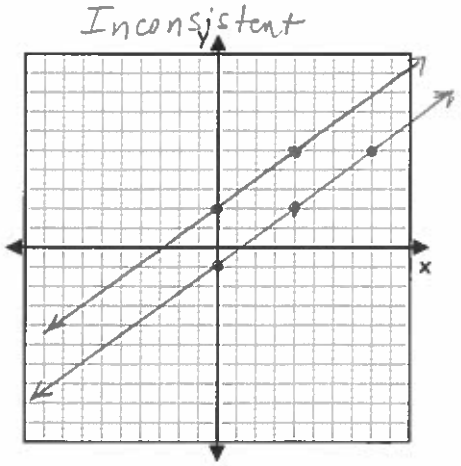
4. Solve each system by **graphing**. Express answers appropriately.

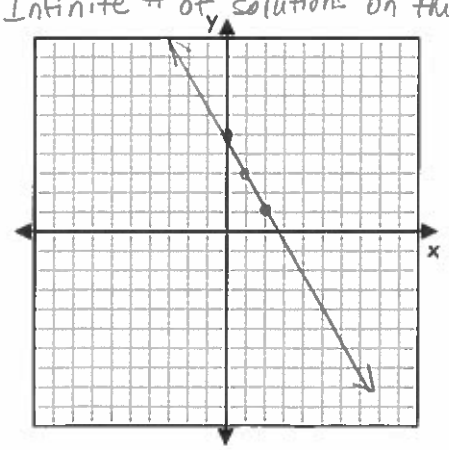
(a) $\begin{cases} 3y=2x+15 \\ y=-\frac{1}{3}x+2 \end{cases}$ $y = \frac{2}{3}x+5$
$(-3, 3)$
independent

(b) $\begin{cases} y=\frac{3}{4}x-1 \\ 4y=3x+8 \end{cases}$ Parallel Lines No Solution
$y = \frac{3}{4}x+2$
Inconsistent

(c) $\begin{cases} y=-2x+5 \\ 4x+2y=10 \end{cases}$ → $2y = -4x+10$ Dependent
$y = -2x+5$
same line
Infinite # of solutions on this Lin







5. Solve the system by **any method**.

(a) $\begin{aligned} 2x+3y&=7 \\ 4x-y&=-9 \end{aligned}$ $\xrightarrow{\times 3}$ $\left(-\frac{10}{7}, \frac{23}{7}\right)$

$2x+3y=7$
$12x-3y=-27$
$14x = -20$
$x = -\frac{20}{14} = -\frac{10}{7}$

$4\left(-\frac{10}{7}\right) - y = -\frac{63}{7}$
$-\frac{40}{7} - y = -\frac{63}{7}$
$-y = -\frac{23}{7}$ $\quad y = \frac{23}{7}$

(b) $\begin{aligned} y&=2x+5 \\ x+2y&=15 \end{aligned}$

$x + 2(2x+5) = 15$
$x + 4x + 10 = 15$
$5x + 10 = 15$
$5x = 5$
$x = 1$
$y = 2(1) + 5 = 7$

$(1, 7)$

(c) $y = \frac{1}{2}x + 2$ $\xrightarrow{\times 2}$
$\frac{1}{3}x + \frac{4}{9}y = 1$ $\xrightarrow{\times 9}$

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

$3(2y-4) + 4y = 9$
$6y - 12 + 4y = 9$
$10y - 12 = 9$
$10y = 21$
$y = \frac{21}{10}$

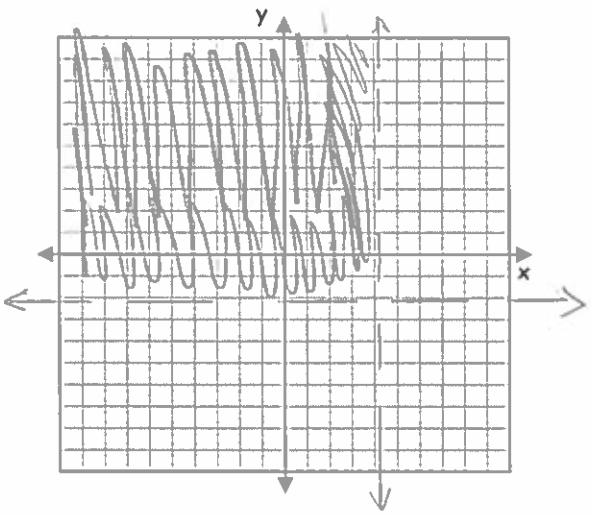
$x = 2\left(\frac{21}{10}\right) - 4$
$x = \frac{21}{5} - \frac{20}{5} = \frac{1}{5}$

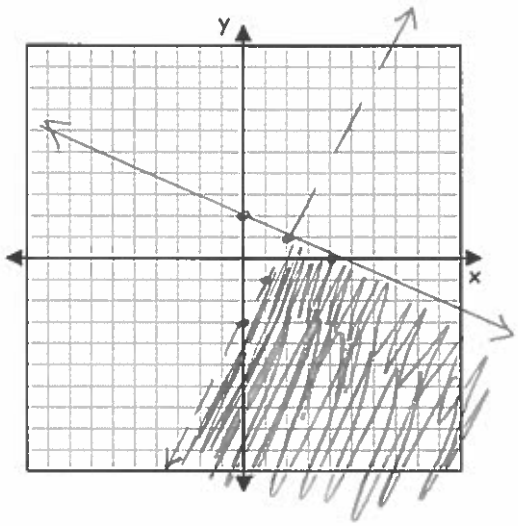
$\left(\frac{1}{5}, \frac{21}{10}\right)$

6. Solve each system of inequalities by **graphing**. Shade your answer section clearly.

(a) $\begin{cases} x < 4 \\ y > -2 \end{cases}$

(b) $\begin{cases} -y > -2x + 3 \\ 2y + x \le 4 \end{cases}$ $\rightarrow$ $y < 2x - 3$





7. Solve each Linear-Quadratic or Quadratic-Quadratic system by graphing on the calculator.

(a) $\begin{aligned} y&=x^2+5x-2 \\ y&=x-2 \end{aligned}$

$(-4, -6)$
$(0, -2)$

(b) $\begin{aligned} y&=x^2+2x-8 \\ 4x-y&=5 \end{aligned}$

$y = 4x - 5$

$(-1, -9)$ and
$(3, 7)$

(c) $\begin{aligned} 2x-y&=-10 \\ y&=x^2-2x-2 \end{aligned}$

$y = 2x + 10$

$(-2, 6)$ and
$(6, 22)$

(change your window or Zoom Out)

(d) $\begin{aligned} x-2y&=-5 \\ y+2&=x^2-2x-2 \end{aligned}$

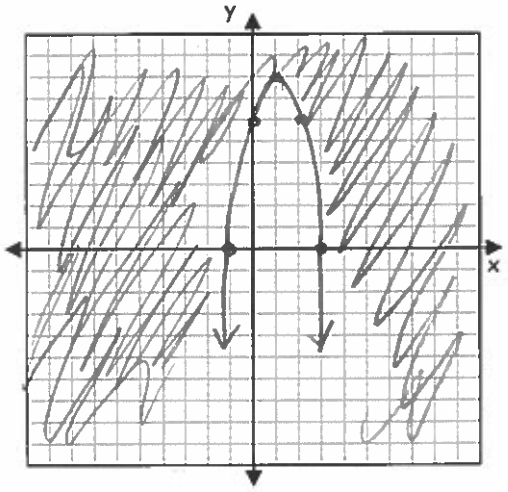
$y = x^2 - 2x - 4$
$-2y = -5 - x$
$y = \frac{x}{2} + 5/2$

$x = -1.589$
$y = 1.705$

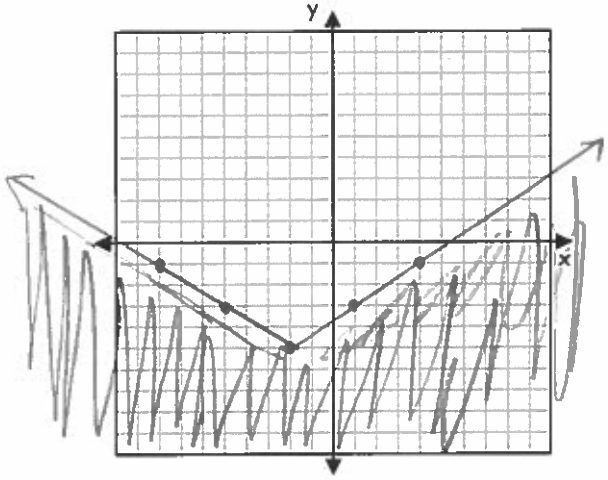
and $x = 4.089$
$y = 4.545$

8. Solve each non-linear inequality by **graphing**. Shade your answer section clearly.

(a) $y \geq -2(x-1)^2 + 8$

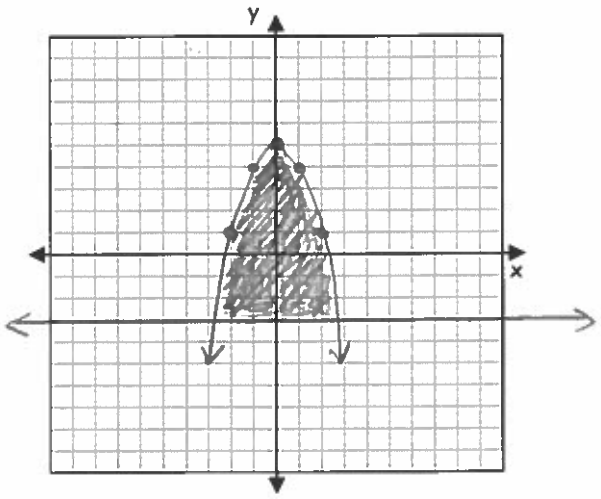


(b) $y \leq \frac{2}{3}|x+2| - 5$

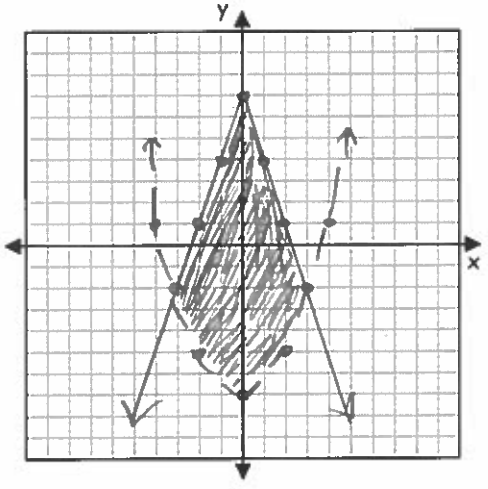


9. Solve each system of inequalities by **graphing**. Shade your answer section clearly.

(a) $\begin{cases} y \geq -3 \\ y \leq -x^2 + 5 \end{cases}$



(b) $\begin{cases} y \leq -3|x| + 7 \\ y \succ \frac{1}{2}x^2 - 7 \end{cases}$



10. Which of the following systems is $(0,0)$ a solution to?

(a) $\begin{cases} y \geq -3 \\ y \leq -x^2 + 5 \end{cases}$
$0 \geq -3$ ✓
$0 \leq 0 + 5$ ✓

(b) $\begin{cases} x < 4 \\ y > -2 \end{cases}$
✓ $0 < 4$
✓ $0 > -2$

(c) $\begin{cases} y \leq -3|x| + 7 \\ y \succ \frac{1}{2}x^2 - 7 \end{cases}$
✓ $0 \leq -3(0) + 7$
✓ $0 > \frac{1}{2}(0) - 7$

(d) $\begin{cases} -y > -2x + 3 \\ 2y + x \leq 4 \end{cases}$
✗ $0 > 0 + 3$

(e) $\begin{cases} y \succ x \\ y \succ -x^2 + 5 \end{cases}$
✗ $0 > 0$