Algebra II
Linear/Quadratic Systems Review

Name ______________________
Period ________ Date ______________

Graph each system and label the points of intersection

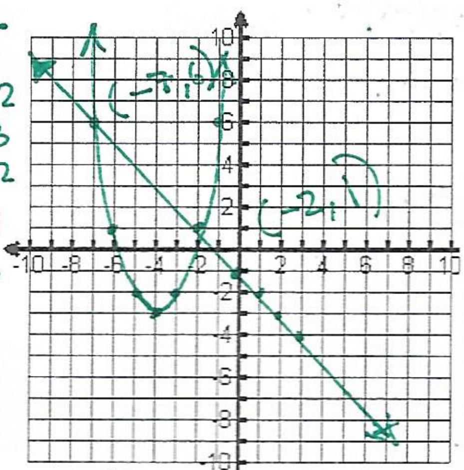
1.

$$\begin{cases} y = x^2 + 8x + 13 \\ y = -x - 1 \end{cases}$$

$y = (x^2 + 8x + 16) - 16 + 13$
$= (x^2 + 8x + 16) - 3$
$y = (x+4)^2 - 3$
vertex $(-4, -3)$

Line
$m = \frac{-1\downarrow}{1\rightarrow}$
$b = -1$

x	y
-2	1
-3	-2
-4	-3
-5	-2
-6	1
-7	6



Solution $(-7,6)$ & $(-2,1)$

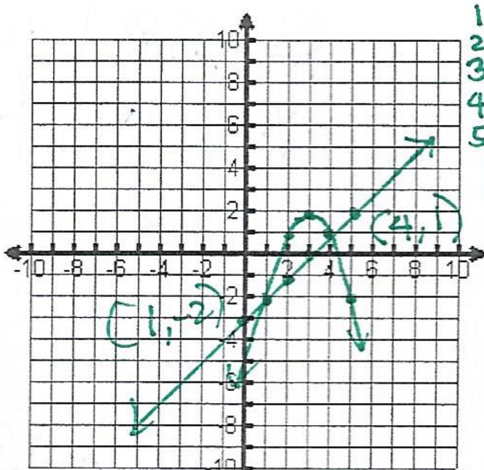
2.

$$\begin{cases} y = -x^2 + 6x - 7 \\ y = x - 3 \end{cases}$$

$m = \frac{1\uparrow}{1\rightarrow}$
$b = -3$

$y = (-x^2 + 6x) - 7$
$= -(x^2 - 6x + 9 - 9) - 7$
$= -(x^2 - 6x + 9) + 9 - 7$
$y = -(x-3)^2 + 2$
vertex $(3, 2)$

x	y
1	-2
2	1
3	2
4	1
5	-2

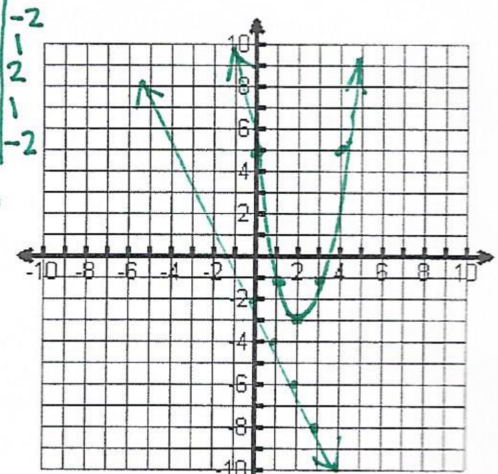


solution
$(1,-2)$ & $(4,1)$

3.

$$\begin{cases} y = 2x^2 - 8x + 5 \\ y = -2x - 2 \end{cases}$$

$y = 2x^2 - 8x + 5$
$= 2(x^2 - 4x + 4 - 4) + 5$
$= 2(x^2 - 4x + 4) - 8 + 5$
$y = 2(x-2)^2 - 3$
vertex $(2, -3)$



no real solution

List the number of real solutions

4.

$$\begin{cases} y = x^2 - 2x + 4 \\ y = -2x + 4 \end{cases}$$

$-2x + 4 = x^2 - 2x + 4$
$+2x - 4 \qquad +2x - 4$
$0 = x^2$
$x = 0$
$y = -2(0) + 4$
$y = 4$
$(0, 4)$ one real solution

5.

$$\begin{cases} y = x^2 - 4x + 6 \\ 3x + y = 8 \end{cases}$$

$-3x \qquad -3x$
$y = 8 - 3x$
$8 - 3x = x^2 - 4x + 6$
$-8 + 3x \qquad +3x - 8$
$0 = x^2 - x - 2$
$0 = (x-2)(x+1)$

$x - 2 = 0$	$x + 1 = 0$
$x = 2$	$x = -1$

two real solution

Solve by factoring

6.

$$\begin{cases} y = x^2 - 3x - 5 \\ y - 2 = 3x \end{cases}$$

$$\begin{array}{rcl} y - 2 &=& 3x \\ +2 && +2 \\ \hline y &=& 3x+2 \end{array}$$

$$\begin{array}{rcl} 3x+2 &=& x^2-3x-5 \\ -3x-2 && -3x-2 \\ \hline 0 &=& x^2-6x-7 \end{array}$$

$0 = (x-7)(x+1)$

$x-7=0$	$x+1=0$
$x_1 = 7$	$x_2 = -1$
$y_1 = 3(7)+2$	$y_2 = 3(-1)+2$
$y_1 = 23$	$y_2 = -1$

$(7, 23)$ & $(-1, -1)$ ✓✓

7.

$$\begin{cases} y = x^2 - 2x + 2 \\ y = 2x - 2 \end{cases}$$

$$\begin{array}{rcl} 2x-2 &=& x^2-2x+2 \\ -2x+2 && -2x+2 \\ \hline 0 &=& x^2-4x+4 \end{array}$$

$= (x-2)(x-2)$

$0 = (x-2)^2$

$$\begin{array}{rcl} x-2 &=& 0 \\ +2 && +2 \\ \hline x &=& 4 \end{array}$$

$y = 2(4) - 2$

$y = 6$

$(4, 6)$ ✓✓

Solve by any means

8.

$$\begin{cases} y = x^2 + 5x + 10 & \text{Eq. 1} \\ y = -3x - 1 & \text{Eq. 2} \end{cases}$$

Substitute Eq. 2 to Eq. 1

$$\begin{aligned} -3x - 1 &= x^2 + 5x + 10 \\ +3x + 1 &\quad\; +3x + 1 \end{aligned}$$

$$0 = x^2 + 8x + 11$$

Using Quadratic Formula

$a = 1$, $b = 8$, & $c = 11$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(8) \pm \sqrt{(8)^2 - 4(1)(11)}}{2(1)}$$

$$= \frac{-8 \pm \sqrt{64 - 44}}{2}$$

$$x = \frac{-8 \pm \sqrt{20}}{2}$$

note: $\sqrt{20} = \sqrt{4}\sqrt{5}$

$$= \frac{-8 \pm \sqrt{4}\sqrt{5}}{2}$$

$$= \frac{-8 \pm 2\sqrt{5}}{2}$$

divide the terms by 2

$$x = -4 \pm \sqrt{5}$$

$x_1 = -4 + \sqrt{5}$ ✓ $x_2 = -4 - \sqrt{5}$ ✓

Using Eq. 2 to find y:

$$y_1 = -3(-4 + \sqrt{5}) - 1$$

$$= 12 - 3\sqrt{5} - 1$$

$$y_1 = 11 - 3\sqrt{5} \checkmark$$

$$y_2 = -3(-4 - \sqrt{5}) - 1$$

$$= 12 + 3\sqrt{5} - 1$$

$$y_2 = 11 + 3\sqrt{5}$$

$$(-4 + \sqrt{5}, 11 - 3\sqrt{5}) \;\&\; (-4 - \sqrt{5}, 11 + 3\sqrt{5})$$

9.

$$\begin{cases} y = x^2 - x + 8 & \text{Eq. 1} \\ y = 2x - 2 & \text{Eq. 2} \end{cases}$$

Substitute Eq. 2 in Eq. 1

$$\begin{aligned} 2x - 2 &= x^2 - x + 8 \\ -2x + 2 &\quad\; -2x + 2 \end{aligned}$$

$$0 = x^2 - 3x + 10$$

Using Quadratic Formula

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(10)}}{2(1)}$$

$$= \frac{3 \pm \sqrt{9 - 40}}{2}$$

$$= \frac{3 \pm \sqrt{-31}}{2}$$

$$= \frac{3 \pm i\sqrt{31}}{2}$$

$$x = \frac{3}{2} \pm \frac{i\sqrt{31}}{2}$$

$$x_1 = \frac{3}{2} + \frac{i\sqrt{31}}{2}$$

$$y_1 = 2\left[\frac{3}{2} + \frac{i\sqrt{31}}{2}\right] - 2$$

$$= 3 + i\sqrt{31} - 2$$

$$y_1 = 1 + i\sqrt{31}$$

$$x_2 = \frac{3}{2} - \frac{i\sqrt{31}}{2}$$

$$y_2 = 2\left[\frac{3}{2} - \frac{i\sqrt{31}}{2}\right] - 2$$

$$= 3 - i\sqrt{31} - 2$$

$$y_2 = 1 - i\sqrt{31}$$

Solution:

$$\left(\frac{3}{2} + \frac{i\sqrt{31}}{2}, 1 + i\sqrt{31}\right) \;\&\; \left(\frac{3}{2} - \frac{i\sqrt{31}}{2}, 1 - i\sqrt{31}\right)$$

Simplify

10.

$(3-5i)^2$ $= (3-5i)(3-5i)$

$9 - 15i - 15i + 25i^2$

$9 - 30i + 25(-1)$

$9 - 30i - 25$

$-16 - 30i$

11.

$\sqrt{-8} + \sqrt{-18} + \sqrt{-9}$ $= i\sqrt{8} + i\sqrt{18} + i\sqrt{9}$

$i\sqrt{4}\sqrt{2} + i\sqrt{9}\sqrt{2} + 3i$

$2i\sqrt{2} + 3i\sqrt{2} + 3i$

$5i\sqrt{2} + 3i$

12.

181 pairs, odd so, negative 1

i^{363} $= i^{362} \cdot i$

$= (-1)i$

$= -1i$ or $-i$