■ KEY ■

L'28&-29 – 8.1 Solving Systems of Equations Graphically

Key Ideas

System of Linear-Quadratic Equations: A linear equation and a quadratic equation involving some variables. A graph of the system will involve a line and a parabola.

System of Quadratic-Quadratic Equations: Two quadratic equations involving the same variables. The graph involves two parabolas.

Any coordinate (x,y) that satisfies ***both*** equations in a Linear-Quadratic or Quadratic-Quadratic system is considered a solution.

Basic Rules:

- ***No*** points of intersection = No solution.
- ***One*** point of intersection = One solution.
- ***Two*** points of intersection = Two solutions.

Where the two graphs cross, those are your point(s) of intersection, which are your solution(s).

Forms of a Quadratic Equation	**Forms of a Linear Equation**
$y = ax^2 + bx + c$	$y = mx + b$
$y = a(x - h)^2 + k$	$Ax + By + C = 0$
	$(y - y_1) = m(x - x_1)$

■ NOTE: You can scroll up/down in table of values on calculator. ■

Part 1 – System of Linear-Linear (Math 10C Review)

Q1: Solve the system of equations graphically.
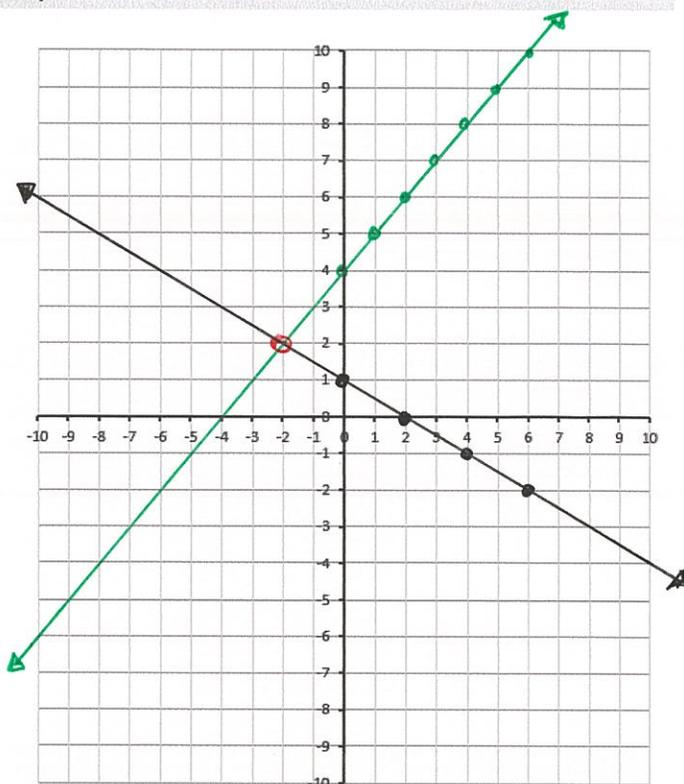
$$f(x) = -\frac{1}{2}x + 1$$

$$g(x) = x + 4$$

Verify using your calculator.

x	f(x)
0	1
1	0.5
2	0
3	-0.5
4	-1
5	-1.5
6	-2

x	g(x)
0	4
1	5
2	6
3	7
4	8
5	9
6	10

SCROLL

Soln is (-2, 2)

Part 2 – System of Linear-Quadratic (Vertex Form)

Q2: Solve the system of equations graphically.
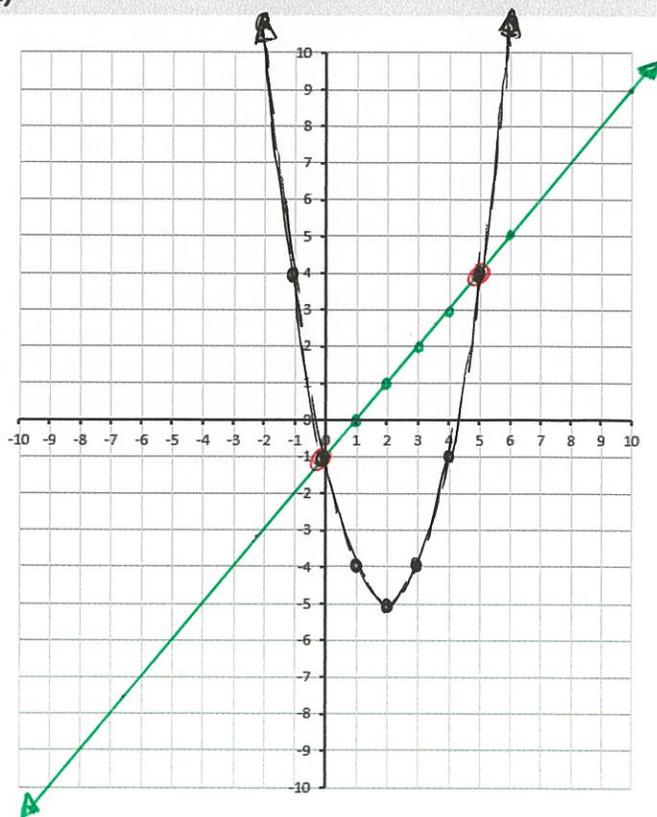
$$f(x) = 1(x - 2)^2 - 5$$

$$g(x) = x - 1$$

Verify using your calculator.

x	f(x)
0	-1
1	-4
2	-5
3	-4
4	-1
5	4
6	11

x	g(x)
0	-1
1	0
2	1
3	2
4	3
5	4
6	5

SCROLL

Solns are (0, -1) and (5, 4)

Key

Q3: Solve the system of equations graphically.

$$f(x) = -1(x+3)^2 + 6$$

$$g(x) = 2x + 9$$

Verify using your calculator.

x	f(x)
0	-3
1	-10
2	-19
3	-30
4	-43
5	-58
6	-75

x	g(x)
0	9
1	11
2	13
3	15
4	17
5	19
6	21

Scroll

Solns are $(-6, -3)$ and $(-2, 5)$
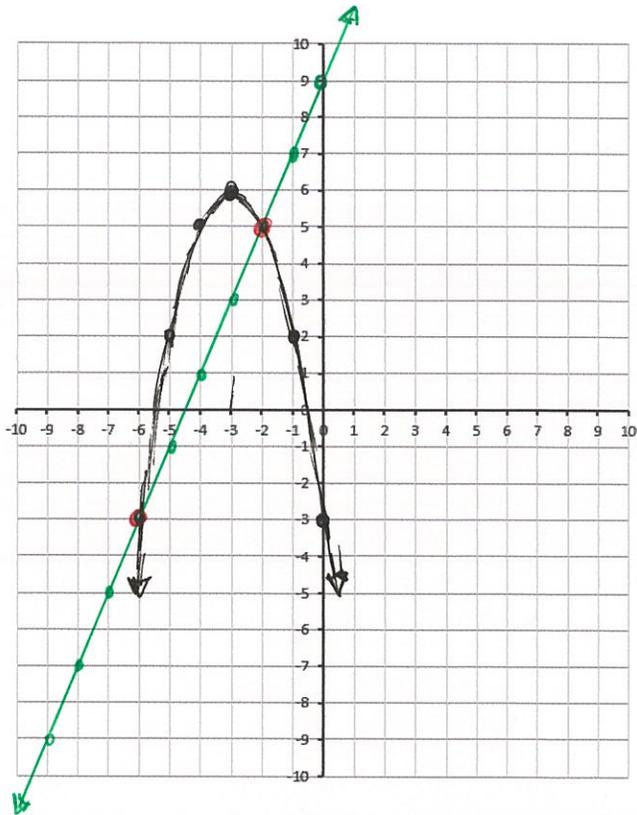
Q4: Solve the system of equations graphically.

$$f(x) = 2(x-7)^2 - 9$$

$$g(x) = -2x + 5$$

Verify using your calculator.

x	f(x)
0	89
1	63
2	41
3	23
4	9
5	-1
6	-7

x	g(x)
0	5
1	3
2	1
3	-1
4	-3
5	-5
6	-7

Scroll

Solns are $(6, -7)$ and $(7, -9)$
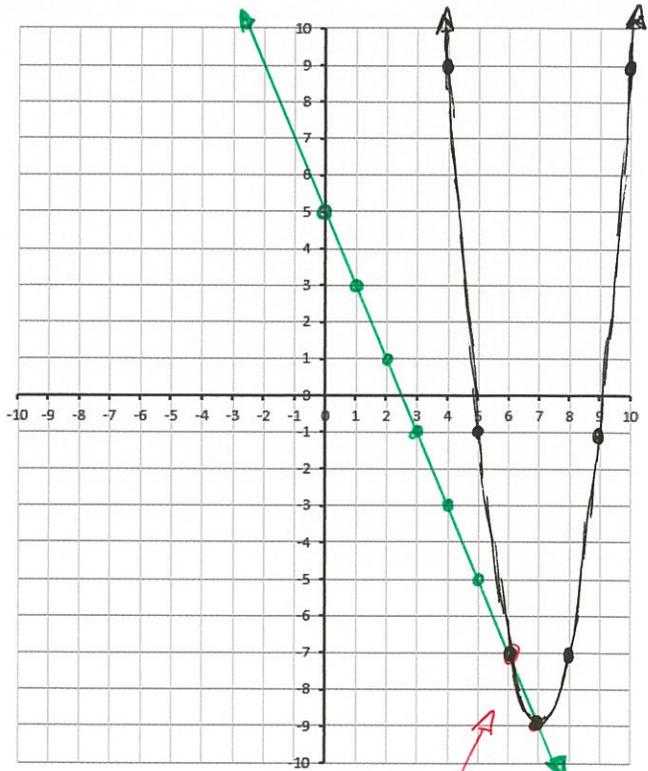
Zoom In
With Calculator

Part 3 – System of Linear-Quadratic (Standard Form)

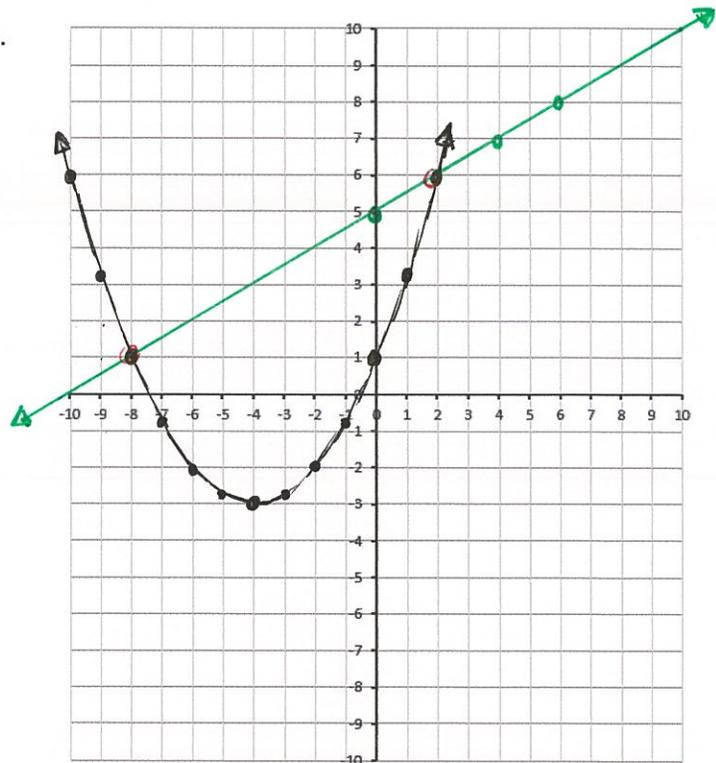**Q5:** Solve the system of equations graphically.

$$f(x) = \frac{1}{4}x^2 + 2x + 1$$

$$g(x) = \frac{1}{2}x + 5$$

Verify using your calculator.

x	f(x)
0	1
1	3.25
2	6
3	9.25
4	13
5	17.25
6	22

x	g(x)
0	5
1	5.5
2	6
3	6.5
4	7
5	7.5
6	8

Scroll

$$f(x) = \left(\tfrac{1}{4}x^2 + 2x\right) + 1$$
$$= \tfrac{1}{4}\left(x^2 + 8x\right) + 1$$
$$= \tfrac{1}{4}\left(x^2 + 4x + 4x\right) + 1$$
$$= \tfrac{1}{4}\left(x^2 + 4x + 4x + 16\right) + 1 - 4$$

$$\boxed{f(x) = \tfrac{1}{4}(x+4)^2 - 3}$$
$$\text{Vertex at } (-4, -3)$$

Soln is $(-8, 1)$ and $(2, 6)$

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Part 4 – System of Linear-Quadratic (Building the Equations)

Q6: A straight line passes through the points (-3,8) and (1,4).

$x_1 \ y_1 \qquad x_2 \ y_2$

A parabola has a vertex at (4,7) and passes through the point (6,3).

What are the solution(s) to this system of equations?

Verify using your calculator.

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{4 - 8}{1 - (-3)} = \dfrac{-4}{4} = -1$

$y = -1x + b \qquad$ Use $(1,4)$

$4 = -1(1) + b$

$4 = -1 + b$

$5 = b$

$\boxed{y = -1x + 5}$

$y = a(x-h)^2 + k$

$y = a(x-4)^2 + 7 \qquad$ Use $(6,3)$

$3 = a(6-4)^2 + 7$
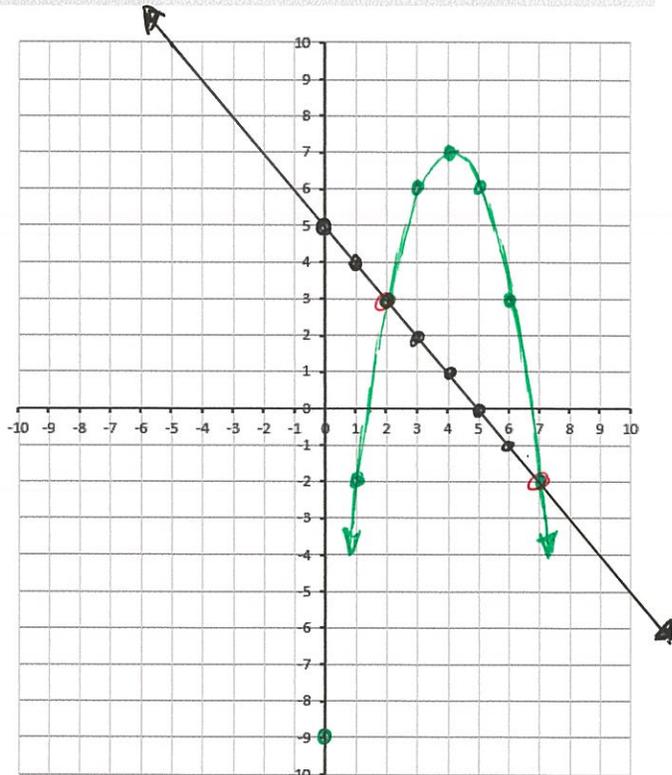
$3 = a(4) + 7$

$-4 = a(4)$

$a = -1$

$\boxed{y = -1(x-4)^2 + 7}$

x	$f(x) = -1(x-4)^2 + 7$
0	-9
1	-2
2	3
3	6
4	7
5	6
6	3

SCROLL

x	$g(x) = -1x + 5$
0	5
1	4
2	3
3	2
4	1
5	0
6	-1

SCROLL

Solns are $(2,3)$ and $(7,-2)$

Today's Assignment: *Pg435 #3,4ab,8,10,13*
Tomorrow's Assignment: *Pg435#4d,7,15*

KEY

Part 5 – System of Quadratic-Quadratic

Q7: Solve the system of equations graphically.
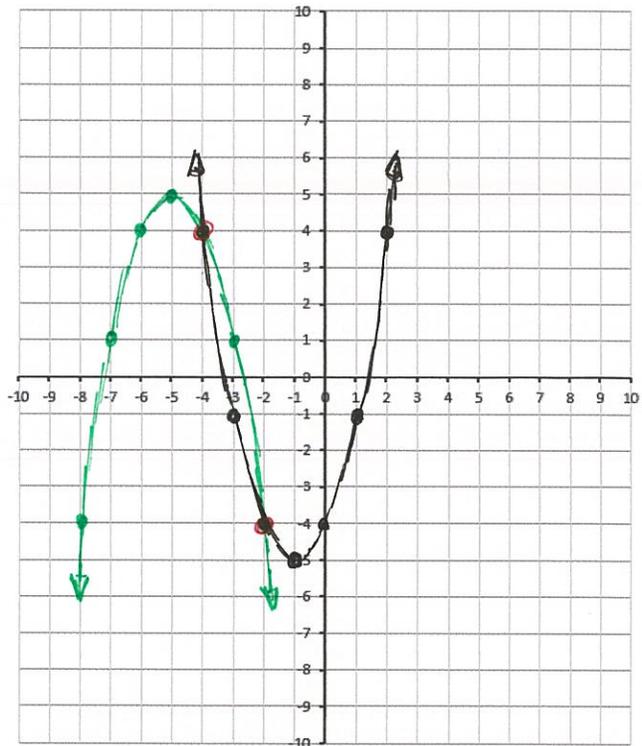
$$f(x) = 1(x+1)^2 - 5$$

$$g(x) = -1(x+5)^2 + 5$$

Verify using your calculator.

x	f(x)
0	-4
1	-1
2	4
3	11
4	20
5	31
6	44

x	g(x)
0	-20
1	-31
2	-44
3	-59
4	-76
5	-95
6	-116

SCROLL

Solns are (-4,4) and (-2,-4)

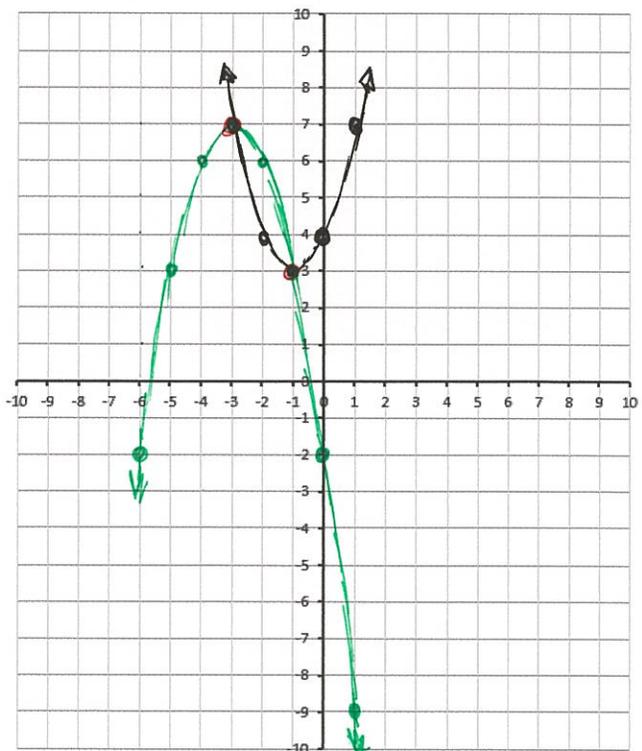**Q8:** Solve the system of equations graphically.

$$f(x) = 1(x+1)^2 + 3$$

$$g(x) = -1(x+3)^2 + 7$$

Verify using your calculator.

x	f(x)
0	4
1	7
2	12
3	19
4	28
5	39
6	52

x	g(x)
0	-2
1	-9
2	-18
3	-29
4	-42
5	-57
6	-74

SCROLL

Solns are (-3,7) and (-1,3)

Today's Assignment: *Pg435#4d,7,15*