KEY

Math 20-1

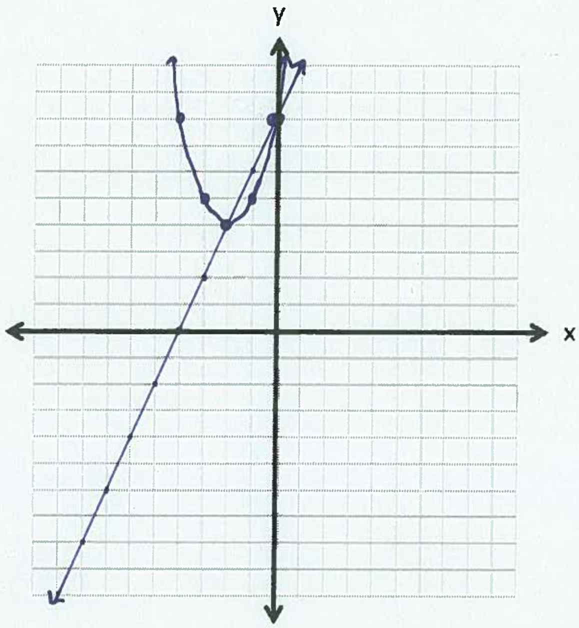
Lxx – Worksheet – 8.1 Solving Systems of Equations Graphically

Part 1 – Easy Questions

Graph the following relations, and determine the solution(s) to the system of equations:

$f(x) = (x+2)^2 + 4$

$g(x) = 2x + 8$

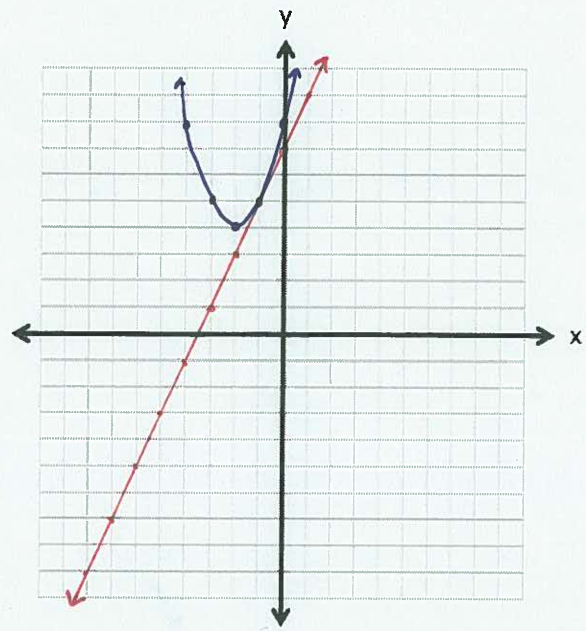


x	f(x)
-4	8
-3	5
-2	4
-1	5
0	8

Solutions are (-2,4) and (0,8)

$f(x) = (x+2)^2 + 4$

$g(x) = 2x + 7$

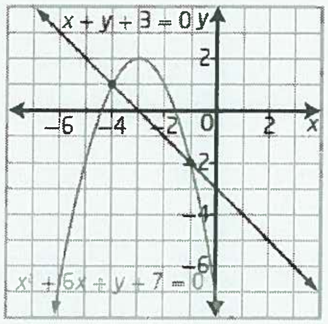


Solution is (-1,5)

Part 2 – Textbook Questions

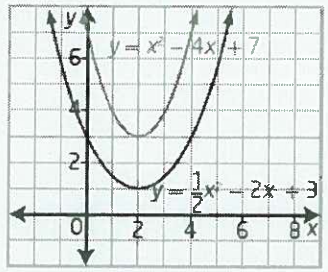
Pg 435 #3: What type of system of equations in represented in each graph? Give solution(s) to the system.

a)



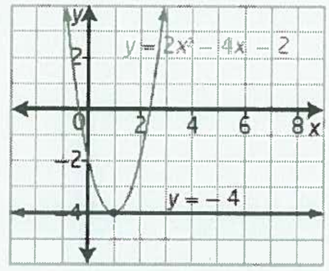
Linear - Quadratic
Solutions at $(-4, 1)$ and $(-1, -2)$

b)



Quadratic - Quadratic
No solutions

c)

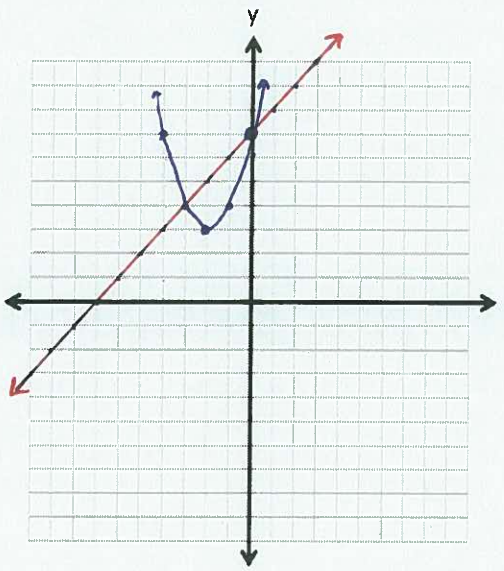


Linear - Quadratic
Solution at $(1, -4)$

Pg 435 #4a: Solve each system by graphing. Verify your solutions.

$$y = x + 7$$

$$y = (x + 2)^2 + 3$$



x	$y = (x+2)^2 + 3$
-5	12
-4	7
-3	4
-2	3
-1	4
0	7
1	12

Solns at $(-3, 4)$ and $(0, 7)$

VERIFY $(-3, 4)$

$y = (-3) + 7$
$y = 4$ Yep!

$y = (-3+2)^2 + 3$
$= 1 + 3$
$= 4$ Yep!

VERIFY $(0, 7)$

$y = (0) + 7$
$= 7$ Yep!

$y = (0+2)^2 + 3$
$= 4 + 3$
$= 7$ Yep!

KEY

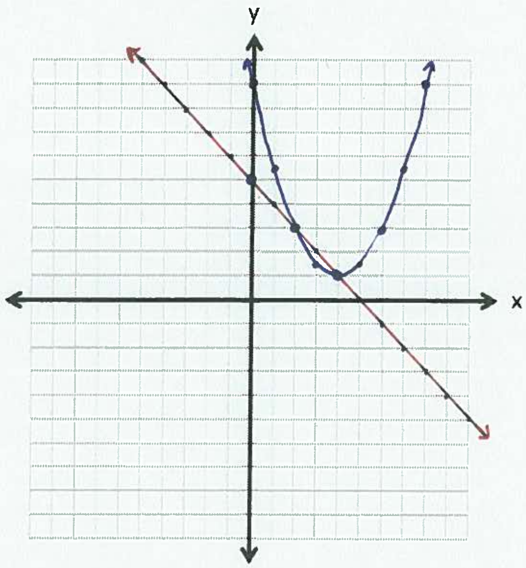
Pg 435 #4b: Solve each system by graphing. Verify your solutions.

$f(x) = -x + 5$

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

x	g(x)
0	9
1	5.5
2	3
3	1.5
4	1
5	1.5
6	3
7	5.5
8	9

Solns at (2,3) and (4,1)



VERIFY (2,3)

$f(2) = -(2) + 5$
$= 3$ Yep!

$g(2) = \frac{1}{2}(2-4)^2 + 1$
$= \frac{1}{2}(4) + 1$
$= 3$ Yep!

VERIFY (4,1)

$f(4) = -(4) + 5$
$= 1$ Yep!

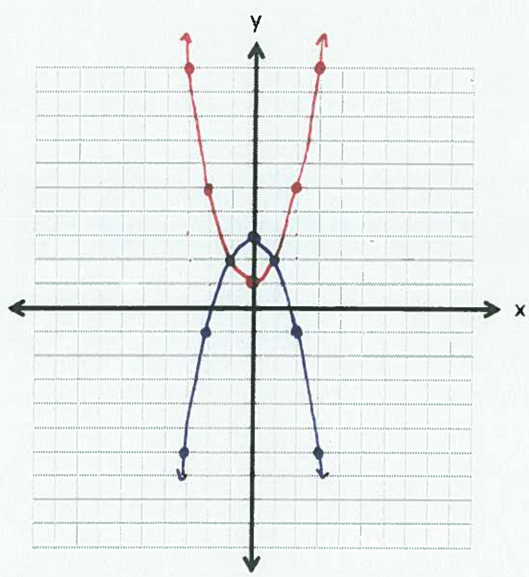
$g(4) = \frac{1}{2}(4-4)^2 + 1$
$= 1$ Yep!

Pg 435 #4d: Solve each system by graphing. Verify your solutions.

$x^2 + y - 3 = 0 \Rightarrow y = -x^2 + 3$

$x^2 - y + 1 = 0 \Rightarrow y = x^2 + 1$

Solns at (-1,2) and (1,2)



VERIFY (-1,2)

$y = -(-1)^2 + 3$
$= -1 + 3$
$= 2$ Yep!

$y = (-1)^2 + 1$
$= 1 + 1$
$= 2$ Yep!

VERIFY (1,2)

$y = -(1)^2 + 3$
$= -1 + 3$
$= 2$ Yep!

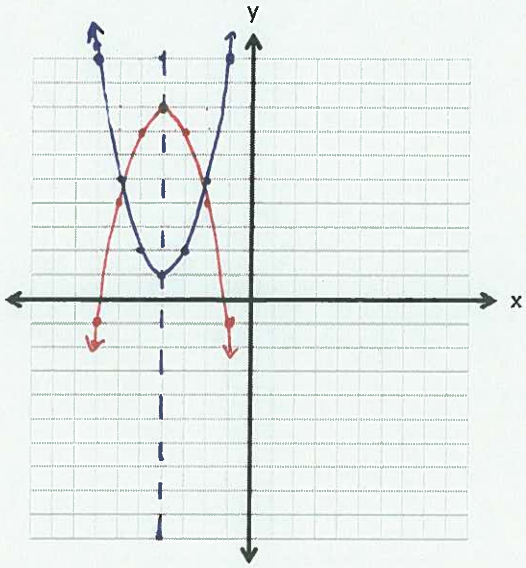
$y = (1)^2 + 1$
$= 1 + 1$
$= 2$ Yep!

Math 20-1

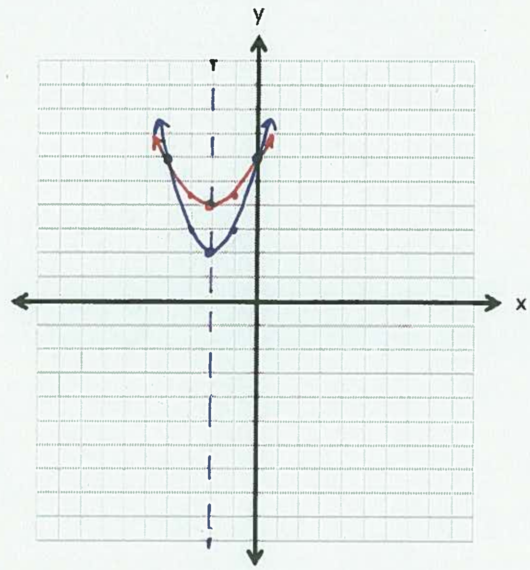
KEY

Pg 435 #7: For each situation, sketch a graph to represent a system of quadratic-quadratic equations with two real solutions, so that the two parabolas have

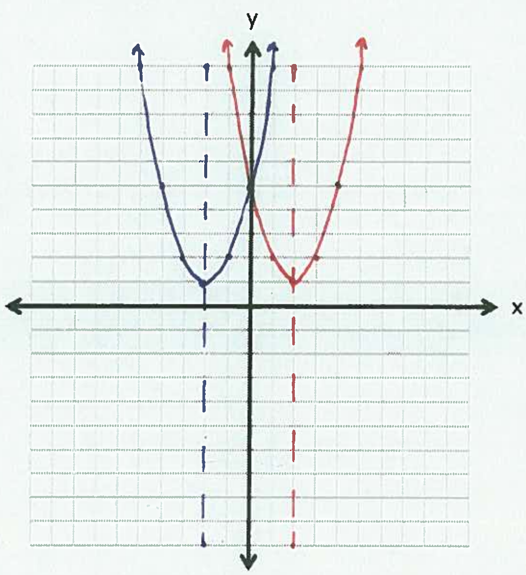
a. The same axis of symmetry



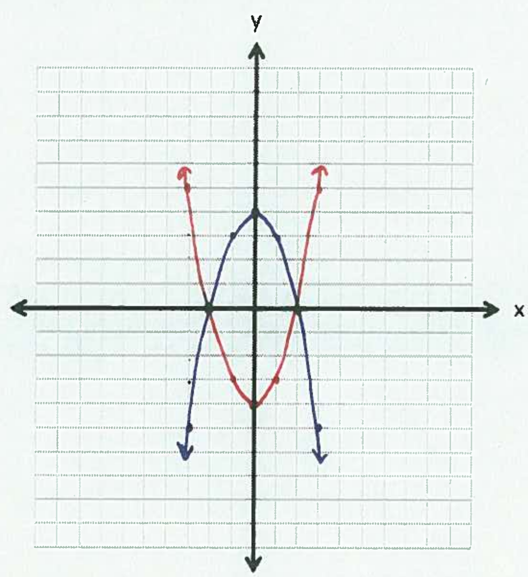
b. The same axis of symmetry and the same y-intercept



b. Different axis of symmetry but the same y-intercept



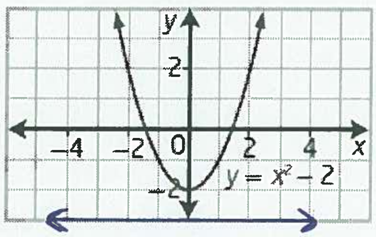
d. The same x-intercepts



Math 20-1 KEY

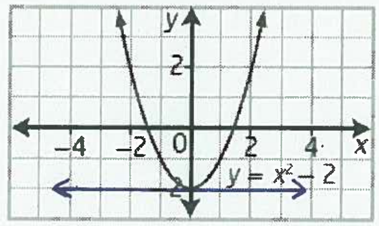
Pg 435 #8: Given the graph of a quadratic function as shown, determine the equation of a line such that the quadratic function and the line form a system that has

a. No real solution



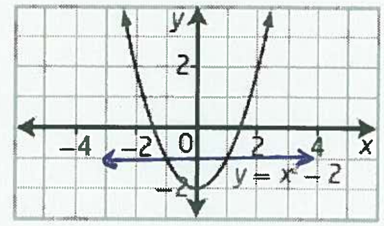
$y = -3$

b. One real solution



$y = -2$

c. Two real solutions

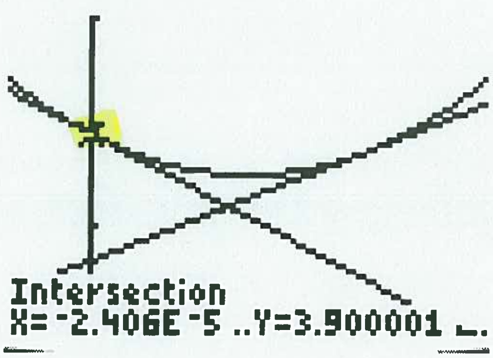


$y = -1$

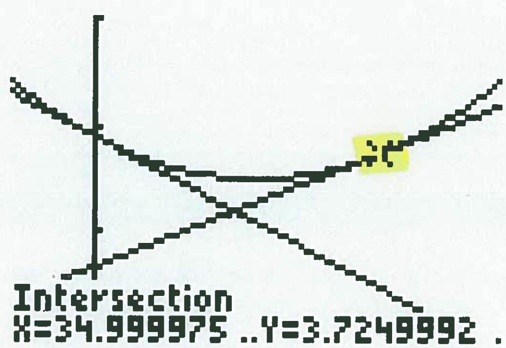
Pg 435 #10: Vertical curves are used in the construction of roller coasters. One downward-sloping grade line, modelled by the equation $y = -0.04x + 3.9$, is followed by an upward-sloping grade line modlled by the equation $y = 0.03x + 2.675$. The vertical curve between the two lines is modelled by the equation $y = 0.001x^2 - 0.04x + 3.9$. Determine the coordinates of the beginning and the end of the curve.

HINT: Graph all three lines using your calculator.

Graphed Domain: [-10,50]
Graphed Range: [2,5]



(0, 3.9)



(35, 3.725)

Math 20-1

KEY

Pg 435 #13: The sum of two integers is 21. Fifteen less than double the square of the smaller integer gives the larger integer.

Let x = smaller integer.

a. Model this information with a system of equations.
b. Solve the system graphically. Interpret the solution.
c. Verify your solution.

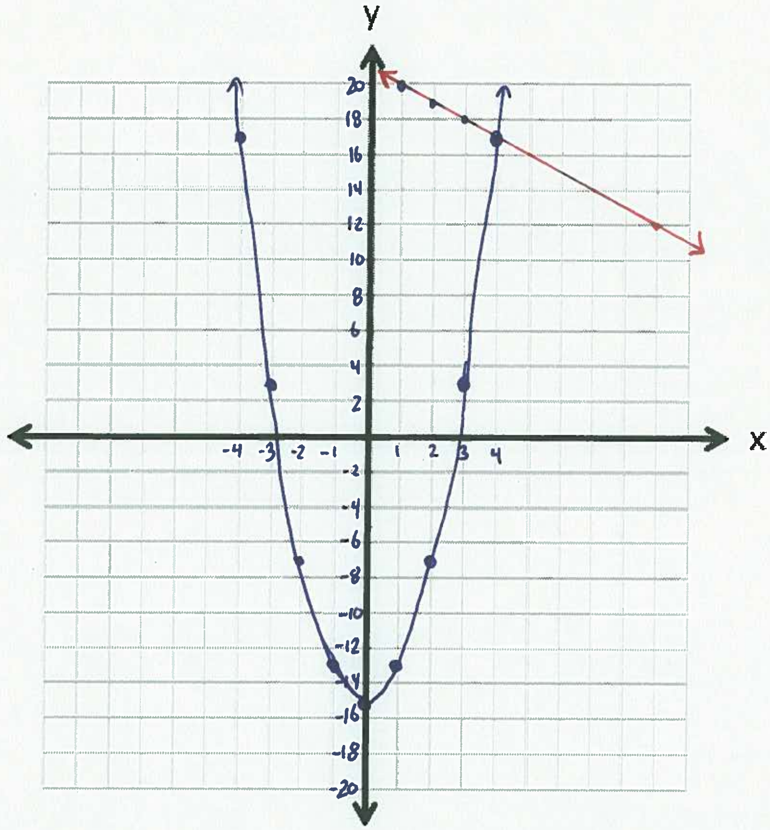
$x + y = 21 \Rightarrow y = -x + 21$

$y = 2x^2 - 15$

Let $f(x) = -x + 21$

$g(x) = 2x^2 - 15$

x	$f(x)$	$g(x)$
-4	25	17
-3	24	3
-2	23	-7
-1	22	-13
0	21	-15
1	20	-13
2	19	-7
3	18	3
4	17	17



Solns are (4,17) from graph, and (-4.5, 25.5) from Calculator's graph.

Not integers.

So $x = 4$, $y = 17$.

Math 20-1

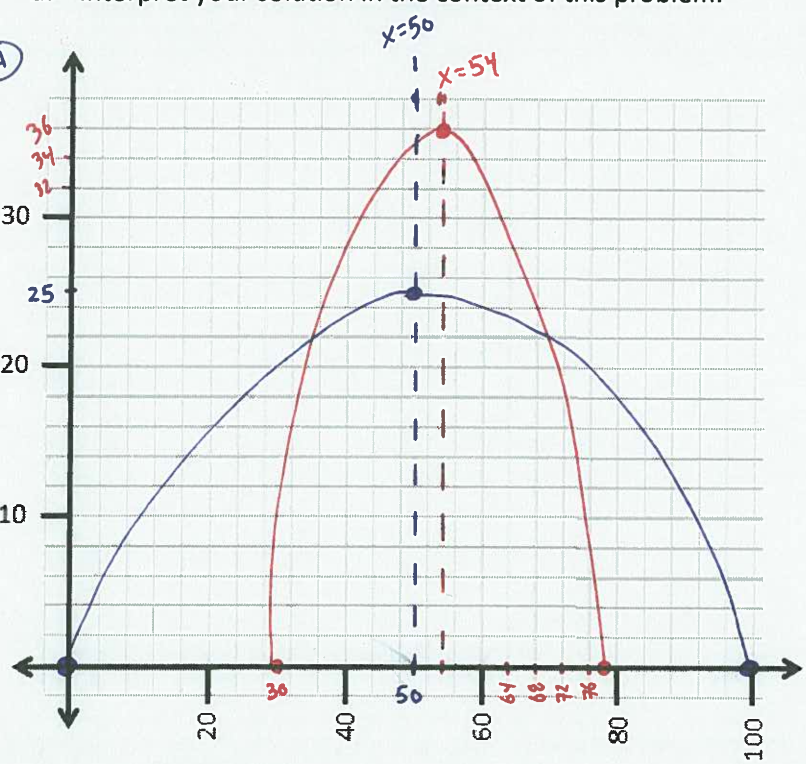
KEY

Pg 435 #15: A frog jumps to catch a grasshopper. The frog reaches a maximum height of 25 cm and travels a horizontal distance of 100 cm. A grasshopper, located 30cm in front of the frog, starts to jump at the same time as the frog. The grasshopper reaches a maximum height of 36cm and travels a horizontal distance of 48 cm. The frog and the grasshopper both jump in the same direction.

a. Consider the frog's starting position to be at the origin of a coordinate grid. Draw a diagram to model the given information.
b. Determine a quadratic equation to model the frog's height compared to the horizontal distance it travelled and a quadratic equation to model the grasshopper's height compared to the horizontal distance it travelled.
c. Solve the system of two equations.
d. Interpret your solution in the context of this problem.

BLUE = FROG
RED = GRASSHOPPER

A



B

FROG

$f(x) = a(x-50)^2 + 25$

Use $(0,0)$

$0 = a(0-50)^2 + 25$

$-25 = a(2500)$

$a = -0.01$

$f(x) = -0.01(x-50)^2 + 25$

GRASSHOPPER

$g(x) = a(x-54)^2 + 36$

Use $(30,0)$

$0 = a(30-54)^2 + 36$

$-36 = a(576)$

$a = -0.0625$

$g(x) = -0.0625(x-54)^2 + 36$

C Solving solution.

i From T.I. Calculator, solns are $(40.16, 24.03)$ and $(69.36, 21.25)$.

ii From my graph, solns are $(34, 21)$ and $(70, 21)$

The T.I. Calculator is much more accurate.

D The frog intercepts the grasshopper at both a horizontal distance of 40.16cm and a horizontal distance of 69.36cm.