11 PRECAL

Unit 6: Booklet 1

Equations and Inequalities

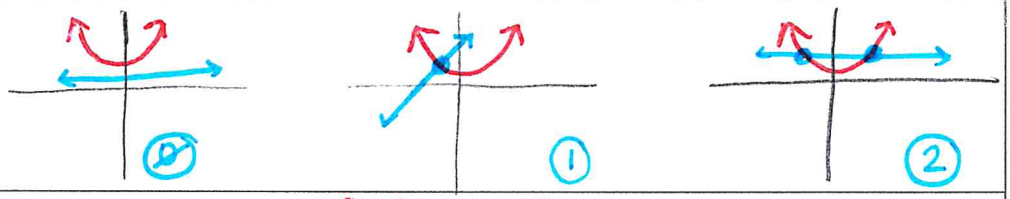
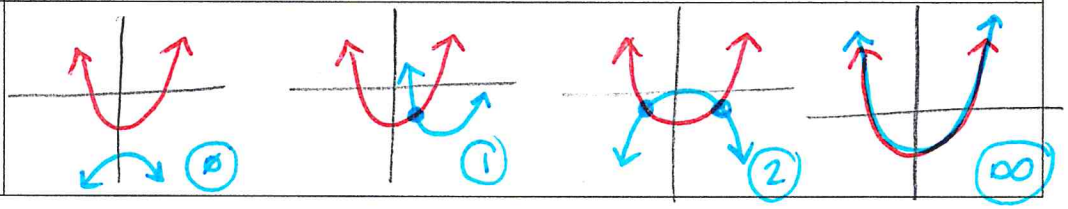
May 26th - June 2nd

NAME: answers

U6:L1 Solving Systems of Equations Graphically

Complete the following lesson with help from pages 424 -434 of your textbook or from notes online at

Answer page 424-425 questions by investigating the graph on page 424 of your textbook:

1	(6,6) Quantity = 600 @ Price = $6
2	yes! (7,12) Orange quadratic meets green quadratic.
3	Decrease. The line slopes downwards
4a	① marginal Revenue @ Marginal Cost. ② Demand @ Avg. Total Cost. ③ Demand @ Marginal Cost.
4b	
5a	average Total Cost @ marginal Cost. (7,12)
5b	

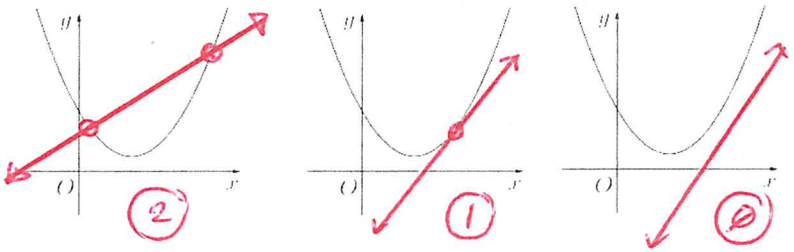
A system of **linear-quadratic** equations is: a Linear equation and quadratic equation that share variables. (LINE and PARABOLA)

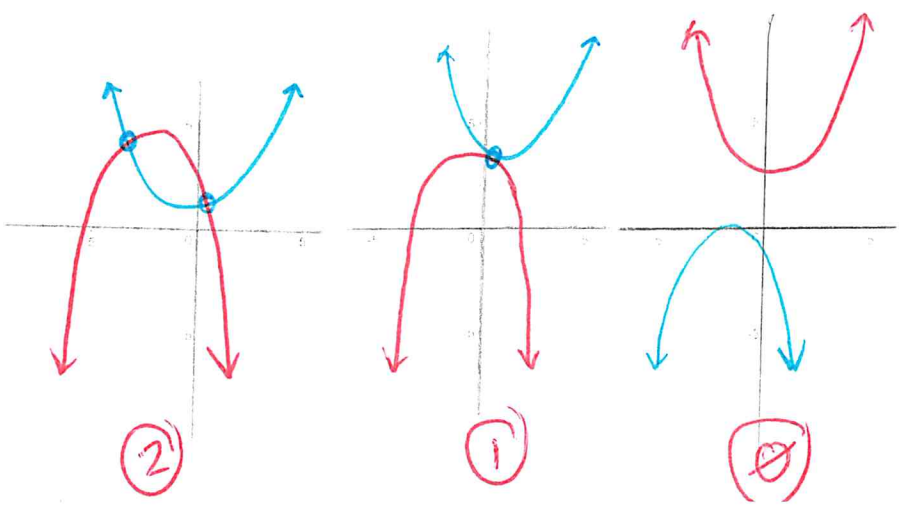
A system of **quadratic-quadratic** equations is: two quadratic equations involving the same variables (two parabolas)

Any ordered pair (x, y) that satisfies both equations in a system of linear-quadratic or quadratic-quadratic equations is a SOLUTION of the system.

The possibilities of solutions are:

- ONE solution
- TWO solutions
- ZERO solutions.



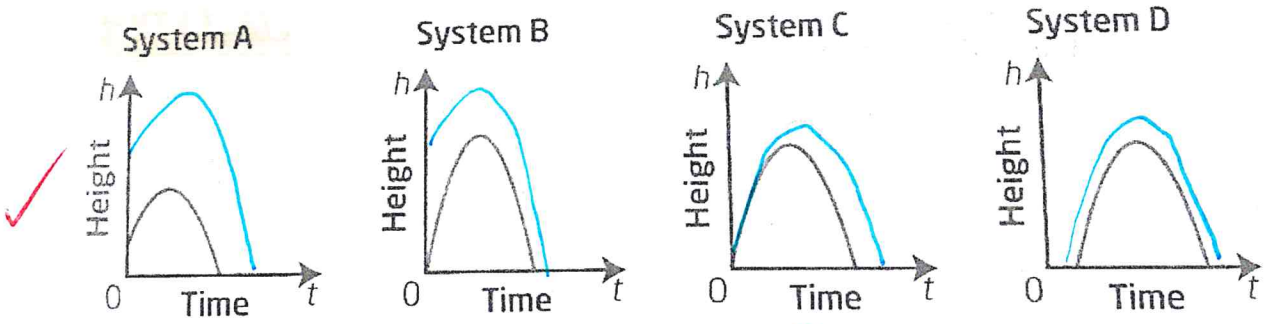


Quadratic-Quadratic systems can also have INFINITE solutions if it is the **same** quadratic.

Example:

1. Two divers start their dives at the same time. One diver jumps from a 1-m springboard and the other jumps from a 3-m springboard. Their heights above the water are plotted over time.

Which graph could model this scenario? Explain your answer:



✓

1m has larger jump than 3m

starting @ same heights

not starting at different heights.

Linear Equation Formula (grade 9)

Solving Linear-Quadratic Equations

Solve the following graphically:

$4x - y + 3 = 0$

$2x^2 + 8x - y + 3 = 0$

① Put in $y = mx + b$ form:

$4x + 3 = y$

$y = 4x + 3$

Quadratic Function: $y = ax^2 + bx + c$

① Put into

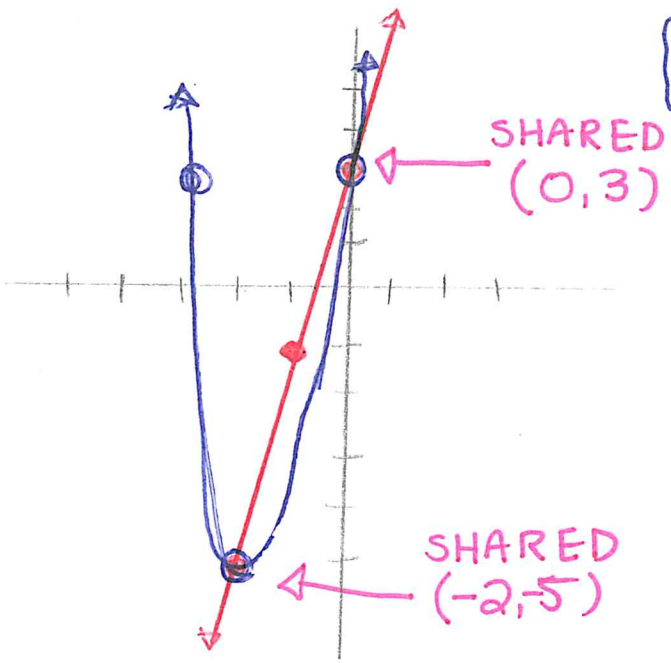
$2x^2 + 8x + 3 = y$

$y = 2x^2 + 8x + 3$

② Plot points on Graph
- create table of values & graph OR
- use Desmos ☺ (Plot 2 graphs by typing in the 2 equations - different colors will appear)

$y = 4x + 3$

x	y
-2	-5
-1	-1
0	3
1	7
2	11



$y = 2x^2 + 8x + 3$

x	y
0	3
-2	-5
-4	3

Verify your solutions:

PLUG + CHUG

(0,3)

$y = 4x + 3$

$3 = 4(0) + 3$

$3 = 3$ ✓

(-2,-5)

$y = 4x + 3$

$-5 = 4(-2) + 3$

$-5 = -8 + 3$

$-5 = -5$ ✓

(0,3)

$y = 2x^2 + 8x + 3$

$3 = 2(0)^2 + 8(0) + 3$

$3 = 0 + 0 + 3$

$3 = 3$ ✓

(-2,-5)

$y = 2x^2 + 8x + 3$

$-5 = 2(-2)^2 + 8(-2) + 3$

$-5 = 2(4) + (-16) + 3$

$-5 = 8 - 16 + 3$

$-5 = -8 + 3$

$-5 = -5$ ✓

Solving Quadratic-Quadratic Equations

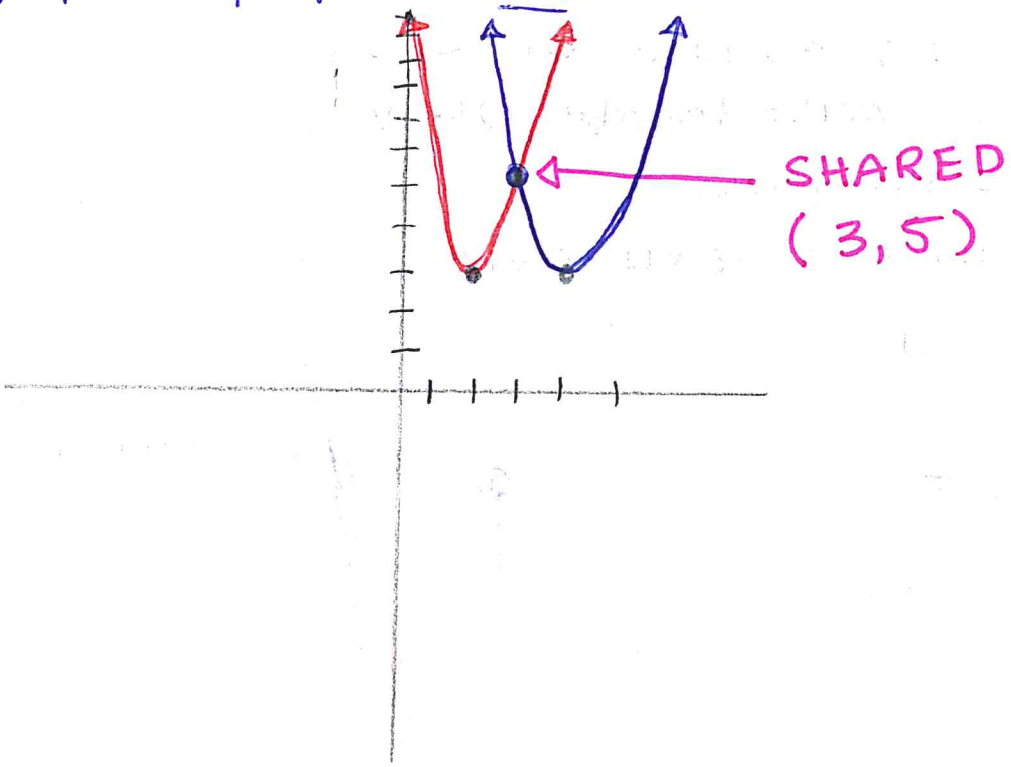
① $y = ax^2 + bx + c$ form:

Solve the following graphically:

$2x^2 - 16x - y = -35$ → $2x^2 - 16x + 35 = y$ → $y = 2x^2 - 16x + 35$

$2x^2 - 8x - y = -11$ → $2x^2 - 8x + 11 = y$ → $y = 2x^2 - 8x + 11$

② Graph w/ pen + paper OR Desmos!



Verify your solutions:

(3, 5)

$y = 2x^2 - 16x + 35$

$5 = 2(3)^2 - 16(3) + 35$

$5 = 2(9) - 48 + 35$

$5 = 18 - 48 + 35$

$5 = 5$ ✓

(3, 5)

$y = 2x^2 - 8x + 11$

$5 = 2(3)^2 - 8(3) + 11$

$5 = 2(9) - 24 + 11$

$5 = 18 - 24 + 11$

$5 = 5$ ✓

PRACTICE: Page 435 Questions 1, 2, 3, 4a, 5a

U6:L2 Solving Systems of Equations Algebraically

Complete the following lesson with help from pages 440 -451 of your textbook or from notes online at

Remember, that systems of linear and quadratic equations can have **zero, one, two or infinite solutions.**

You can also solve these systems algebraically, instead of graphically.

There are two options of how to do this:

- **WITH SUBSTITUTION METHOD**
- **WITH ELIMINATION METHOD**

Substitution Example:

Solve the following system of equations:

$5x - y = 10$

$x^2 + x - 2y = 0$

STEP ONE: USE SUBSTITUTION

$5x - y = 10$

$y = 5x - 10$ ① Rearrange to $y = mx + b$ form

② Sub $5x - 10$ into the quadratic equation as "y"

$x^2 + x - 2y = 0$

$x^2 + x - 2(5x - 10) = 0$

$x^2 + x - 10x + 20 = 0$

$x^2 - 9x + 20 = 0$

③ Solve by factoring

$x^2 - 9x + 20 = 0$

$(x - 4)(x - 5) = 0$

$x = 4$ OR $x = 5$

④ Sub answers back into linear equation to find "y"

$x = 4$

$y = 5(4) - 10$

$y = 20 - 10$

$y = 10$

$(4, 10)$

$x = 5$

$y = 5(5) - 10$

$y = 25 - 10$

$y = 15$

$(5, 15)$

STEP TWO: VERIFY

$(4,10)$

$y = 5x - 10$

$0 = 5(4) - 10$

$0 = 20 - 10$

$0 = 10$ ✓

$(5,15)$

$y = 5x - 10$

$15 = 5(5) - 10$

$15 = 25 - 10$

$15 = 15$ ✓

$(4,10)$

$x^2 + x - 2y = 0$

$4^2 + 4 - 2(10) = 0$

$16 + 4 - 20 = 0$

$20 - 20 = 0$

$0 = 0$ ✓

$(5,15)$

$x^2 + x - 2y = 0$

$5^2 + 5 - 2(15) = 0$

$25 + 5 - 30 = 0$

$30 - 30 = 0$

$0 = 0$ ✓

Elimination Example:

Solve the following system of equations:

$5x - y = 10$

$x^2 + x - 2y = 0$

STEP ONE: USE ELIMINATION

① Line Up terms w/ Same Degrees (exponents)

$5x - y = 10$ ①

$x^2 + x - 2y = 0$ ②

② In order to ELIMINATE the "y"s multiply ① by -2

$(5x - y) \cdot -2 = (10) \cdot -2$

$-10x + 2y = -20$

$-10x + 2y = -20$

$+ \; x^2 + x - 2y = 0$

③ Add to Eliminate "y" values

$x^2 - 9x = -20$

④ Solve by factoring

$x^2 - 9x + 20 = 0$

$(x-4)(x-5) = 0$

$x = 4$ or $x = 5$

⑤ Plug & Chug for "y"

$5x - y = 10$

$5(4) - y = 10$

$20 - 10 = y$

$10 = y$

(4, 10)

$5x - y = 10$

$5(5) - y = 10$

$25 - 10 = y$

$15 = y$

(5, 15)

STEP TWO: VERIFY

same way as last example with SUBSTITUTION. ☺

Example 2:

Solve the following system of equations:

$6x^2 - x - y = -1$
$4x^2 - 4x - y = -6$

} Both have single "y" term so use ELIMINATION

$-\ 6x^2 - x - y = -1$
$\quad 4x^2 - 4x - y = -6$

} ⊖ subtract to eliminate "y"

$2x^2 + 3x = 5$

Solve quadratic

$2x^2 + 3x - 5 = 0$

$2x^2 - 2x + 5x - 5 = 0$

$2x(x-1) + 5(x-1) = 0$

$(2x+5)(x-1) = 0$

$2x + 5 = 0$ or $x - 1 = 0$

$2x = -5$ $\quad x = 1$

$x = -5/2$

Plug & chug to find "y"

① $6x^2 - x - y = -1$

$6x^2 - x + 1 = y$

$6(-5/2)^2 - (-5/2) + 1 = y$

$6(25/4) + 5/2 + 1 = y$

$\frac{75}{4} + \frac{5}{2} + \frac{4}{4} = y$

$\frac{75 + 10 + 4}{4} = y$

$\frac{89}{4} = y$

$22\frac{1}{4} = y$

$(-5/2, 22\frac{1}{4})$

② $6x^2 - x + 1 = y$

$6(1)^2 - 1 + 1 = y$

$6 = y$

$(1, 6)$

Verify: $(-5/2, 22\frac{1}{4})$

$4x^2 - 4x - y = -6$

$4(-5/2)^2 - 4(-5/2) - (22\frac{1}{4}) = -6$

$4(25/4) + 20/2 - 22\frac{1}{4} = -6$

$25 + 10 - 22\frac{1}{4} = -6$

$12.75 \neq -6$ EXTRANEOUS

$(1, 6)$

$4x^2 - 4x - y = -6$

$4(1)^2 - 4(1) - 6 = -6$

$4 - 4 - 6 = -6$

$-6 = -6$ ✓

PRACTICE: Page 451 Questions 1, 2, 3a, 3c, 4a, 4c