Warm-Up 3/12/18

Name the form and characteristics you see just from looking at the equation:

1. $y = (x - 5)(x + 2)$
2. $y = x^2 + 5x - 10$
3. $y = -(x + 4)^2 + 6$
4. $y = x^2 - 7$

Agenda for Today 3/12/18

1. Warm-Up
2. I-respond drills
3. Day 11: Comparing Quadratic Functions (pages 46-48)
4. Class Work - Day 11
5. HW Review

I-Respond Drill 3/12/18

a=1 b=-10

1. Does the function $f(x) = x^2 - 10x + 18$ have a maximum or a minimum? What are its coordinates?

A. Maximum; (5, -7)
B. Minimum; (5, -7)
C. Maximum; (-5, -7)
D. Minimum; (-5, -7)

min

$x = \frac{-b}{2a} = \frac{-(-10)}{2(1)} = \frac{10}{2} = 5$

2. $y = -x^2 - 4x - 8$

a=-1 b=-4

max

What is the vertex of the function?

A. A minimum point, (-2, -12).
B. A maximum point, (-2, -12).
C. A minimum point, (-2, 4).
D. A maximum point, (-2, -4).

$x = \frac{-b}{2a} = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$

3.

Calculate the average rate of change of $f(x) = 4x^2 + 3x + 5$ between the input values of 2 and 5.

A. 93

B. 31

C. 7

D. 10

$f(2) = 27$ $(2, 27)$ x_1 y_1

$f(5) = 120$ $(5, 120)$ x_2 y_2

4.

How would you shift the parent function $y = x^2$ to graph the function $y = (x - 4)^2 + 5$?

A. The parent function would be shifted 4 units to the right and 5 units down.

B. The parent function would be shifted 4 units to the right and 5 units up.

C. The parent function would be shifted 5 units to the right and 4 units down.

D. The parent function would be shifted 5 units to the left and 4 units up.

5.

A manufacturer of jet engine harnesses has weekly production costs of $C = 0.25x^2 - 10x + 800$ where C is the total cost (in dollars) and x is the number of units produced. What is the average rate of change in the cost per unit as the manufacturer increases the weekly production from 500 to 600 units?

x_1 x_2

$f(500) = 58,300$
x_1 y_1

$f(600) = 84,800$
x_2 y_2

A. $583 per unit

B. $265 per unit

C. $848 per unit

D. $274 per unit

6.

What is the value of the function $f(x) = x^2 - 5x + 2$ evaluated at $x = 2$?

A. 16

B. 6

C. 2

D. -4

7.

Write the following function in vertex form: $f(x) = x^2 + 6x + 11$

A. $f(x) = (x+3)^2 + 2$

B. $f(x) = (x-3)^2 + 2$

C. $f(x) = (x+2)^2 + 3$

D. $f(x) = (x-3)^2 + 3$

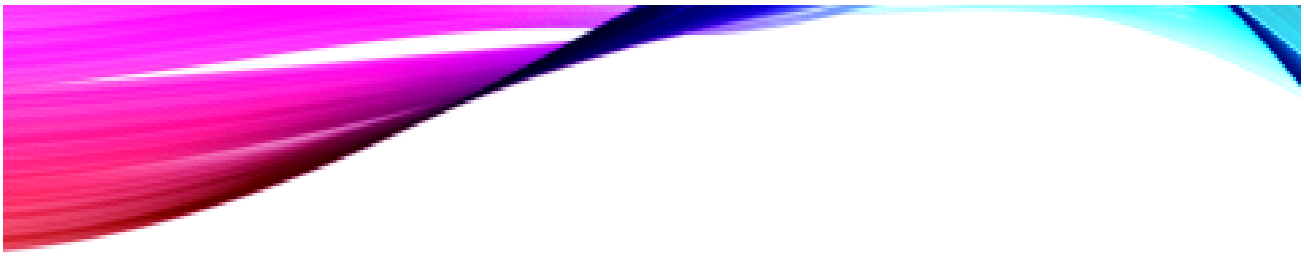
$a=1 \quad b=6$

$X = \frac{-b}{2a}$

$= \frac{-6}{2(1)} = \frac{-6}{2} = -3$

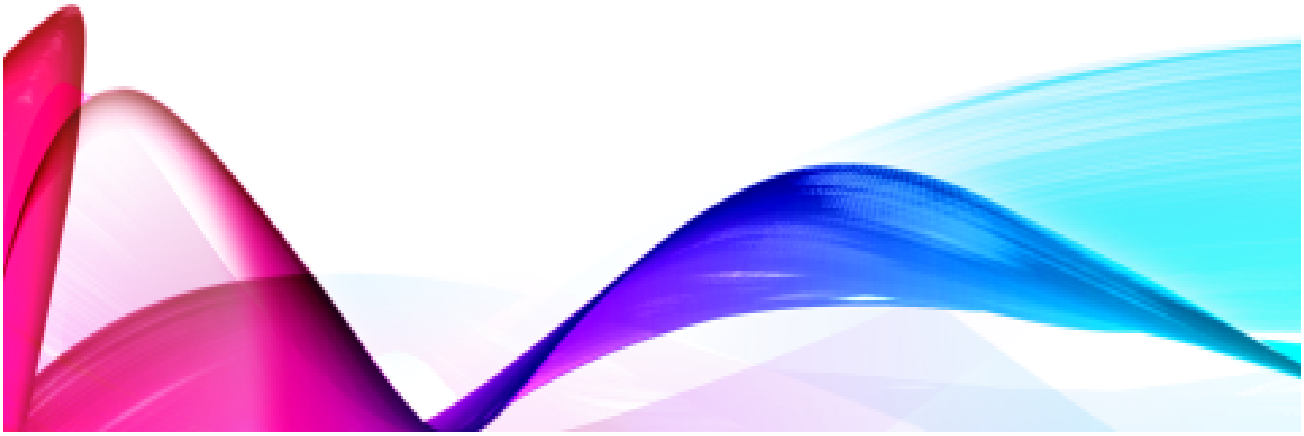
$(-3, 2)$

$f(-3) = (-3)^2 + 6(-3) + 11 = 2$



DAY 11: COMPARING QUADRATIC FUNCTIONS

Unit 3B: Quadratic Functions



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COMPARING

- When comparing quadratic functions, you will want to look at their different characteristics (such as the vertices, y-intercepts, zeros, etc).

- Most of the time, when you are asked to compare different quadratic functions, they will be in different representations (table, graphs, equations, or word problems).

Example 1

Example 1: Which quadratic function has the bigger y-intercept?

a. $y = x^2 + 4x + 7$

y-int: (0, 7)

b.

X	-4	-3	-2	-1	0	1
y	0	-1	0	3	8	15

y-int

Function (b) has the bigger y-intercept

Example 2: Which quadratic functions have an x-intercept at (3, 0)?

a. $y = (x + 3)(x + 1)$

x-int: $-3, -1$

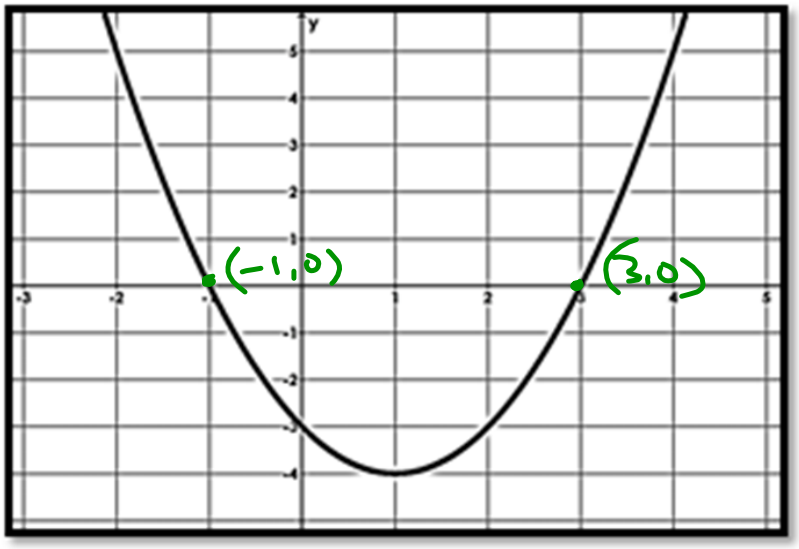
Example 2

Functions (b) and (c) have x-intercepts at (3,0).

b.

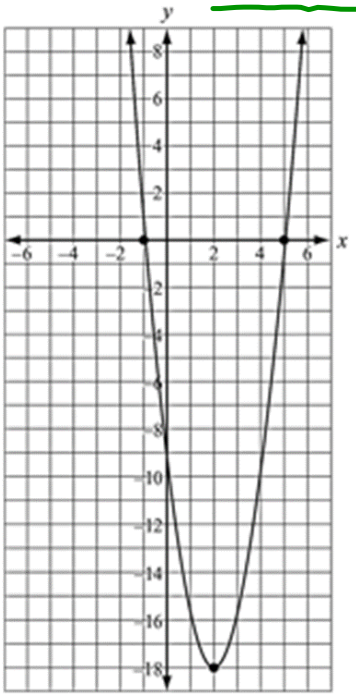
x	-1	0	1	2	3	4
y	8	3	0	-1	0	3

c.



Example 3

Example 3: This graph shows a function $f(x)$. Compare the graph of $f(x)$ to the graph of the function given by the equation $g(x) = 4x^2 + 6x - 18$. Which function has the lesser minimum value? How do you know?



$a = 4$ $b = 6$ ← y-value of vertex

$x = \frac{-b}{2a} = \frac{-6}{2(4)} = \frac{-6}{8} = -\frac{3}{4}$ or -0.75

$g(-0.75) = 4(-0.75)^2 + 6(-0.75) - 18$

Min-value of $g(x) = -20.25$

$g(x)$ has the lesser minimum value because $-20.25 < -18$.

Min-value

$y = -18$

Example 4

Example 4: Three students are shooting wads of paper with a rubber band, aiming for a trash can in the front of the room. The height of each student's paper wad, in feet, is given as a function of the time in seconds. Which student's paper wad flies the highest? *(Adopted from Walch Analytic Geometry)*

- The path of Alejandro's paper was is modeled by the equation $f(x) = -x^2 + 2x + 7$
- After 3 seconds, Connor's paper wad achieves a maximum height of 6.5 feet above the floor.
- Melissa's paper wad is estimated to reach the heights shown in the table below.

x	0	2	3	4
y	3	6	7	6

$y = 7$ vertex

$= 8$

$x = \frac{-2}{2(-1)} = \frac{-2}{-2} = 1$

$f(1) = -(1)^2 + 2(1) + 7$

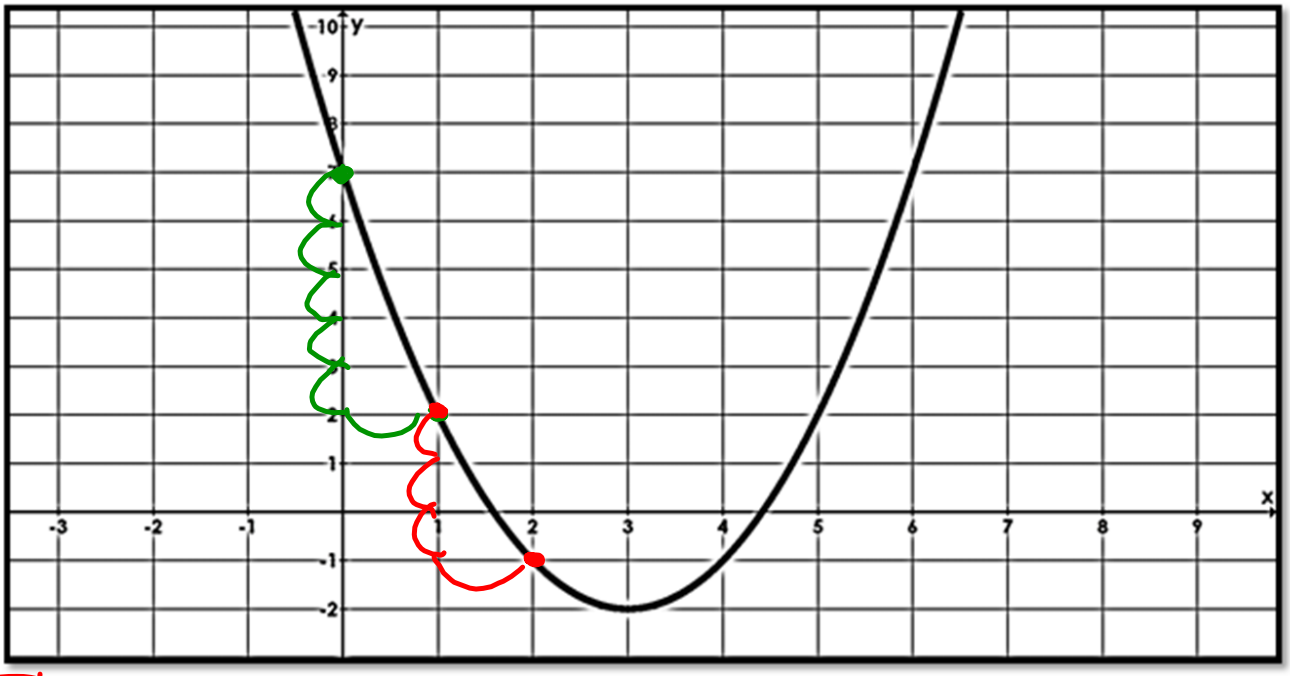
$-1 + 2 + 7$

$y = 8$

Example 5

AROC = -5

Example 5: For the function $g(x) = (x-3)^2 - 2$, is the average rate of change greater between $x = 0$ and $x = 1$ OR between $x = 1$ and $x = 2$? -3



The AROC of g(x) is greater between x=1 and x=2

Class Work Practice 3/12/18

Directions: Answer the following questions to comparing quadratic functions.

1. Which quadratic function has the bigger y-intercept? Explain why.

a. $y = -x^2 + 3x + 8$

b.

x	-4	-3	-2	-1	0	1
y	9	13	19	13	9	7

2. Which quadratic function has the smallest y-intercept? Explain why.

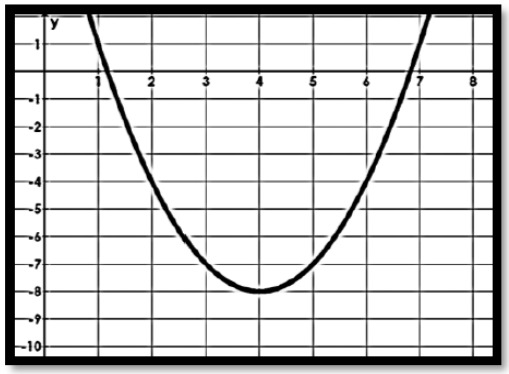
a. $y = x^2 + 4x - 12$ b. $y = (x + 3)(x - 3)$ c. $y = (x + 2)^2 - 13$

3. Which quadratic function has the lower minimum value? Explain why.

a.

x	-4	-3	-2	-1	0	1
y	0	-5	-8	-9	-8	-5

b.



4. Which quadratic function has the bigger minimum value? Explain why.

a. $y = (x + 4)^2 + 2$

b. $y = -(x + 3)(x + 1)$

c.

X	2	3	4	5	6
y	0	-1	0	3	8

5. Two seagulls dive into the ocean. The given functions represent the height of each seagull above the surface of the ocean as a function of the seagull's horizontal distance from a center buoy. For each set of functions, **determine which bird descends deeper into the ocean**. Support your answer with facts (work).

a.

First Seagull: $f(x) = 3(x-2)^2 - 5$

Second Seagull: $g(x) = \{(-8,0), (-6,-4), (-4,0)\}$

V = (2, -5)

V = (-6, -4)

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b.

First Seagull: $f(x) = 3x^2 - 12x + 7$

Second Seagull: $g(x) = \frac{1}{2}(x+2)^2 - 6$

---

c.

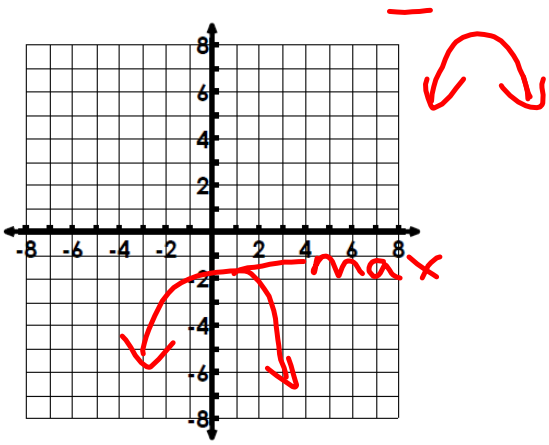
First Seagull: $f(x) = 2x^2 - 8x + 11$

Second Seagull:

x	-3	-1	1	3	5
g(x)	11	6	3	2	3

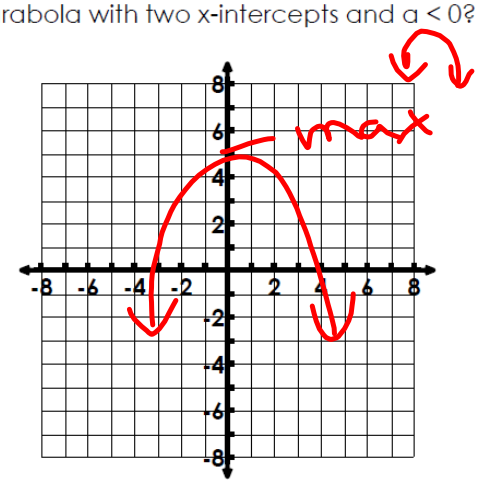
6. Which function has the lesser maximum value? Why?

A. Parabola with no x-intercepts and a < 0?



OR

B. Parabola with two x-intercepts and a < 0?



Use the graphs to help explain your answer.

HW Reviews 3/12/18

Day 10

2. A model rocket is launched straight upward. The path of the rocket is modeled by $h = -16t^2 + 200t$, where h represents the height of the rocket and t represents the time in seconds.

a. What is its maximum height?

$a = -16$ $b = 200$

y-value of vertex

$t = \frac{-b}{2a} = \frac{-200}{2(16)} = 6.25$

$h(6.25) = -16(6.25)^2 + 200(6.25)$

$= 625$ ft

b. Is it still in the air after 8 seconds? Explain why or why not.

$h = -16(8)^2 + 200(8)$

$h = 576$ ft Yes

c. Is it still in the air after 14 seconds? Explain why or why not.

$h(14) = -16(14)^2 + 200(14) =$

Work on all other HW assignments not yet turned in.