Algebra 1 Name: Key 2/4/20
Unit 11 Quiz 1 REVIEW Date:

1) Describe the transformation(s) on the parent function, $f(x) = x^2$, given in the function $f(x) = -(x+3)^2$?

a=neg h=-3 left & ref.

a) Reflect across the x-axis and translate right 3

b) Reflect across the x-axis and translate left 3

c) Reflect across the x-axis and translate up 3

d) Reflect across the x-axis and translate down 3

2) Describe the transformation(s) on the parent function, $f(x) = x^2$, given in the function $f(x) = 2(x-4)^2$?

Stretch right 4

a) Translate up 2 and right 4

b) Translate up 2 and left 4

c) Stretch by a factor of 2 and translate right 4

d) Stretch by a factor of 2 and translate left 4

3) Write a function that represents the parent function, $y = x^2$, after it has been translated 7 down and 3 left.

K=-7 h=-3

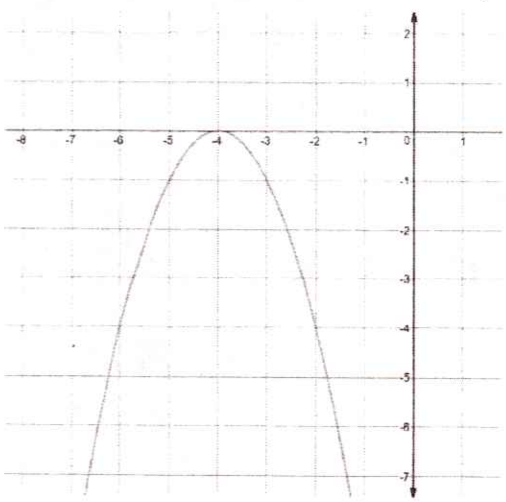
a) $y = (x-7)^2 + 3$

b) $y = (x-3)^2 + 7$

c) $y = (x+7)^2 - 3$

d) $y = (x+3)^2 - 7$

4) Which equation models the function graphed below? *(Assume that the funciton has not been stretched or shrunk.)*



a) $y = (x+4)^2 - 1$

b) $y = (x-4)^2 + 1$

c) $y = -(x+4)^2$

d) $y = -(x-4)^2$

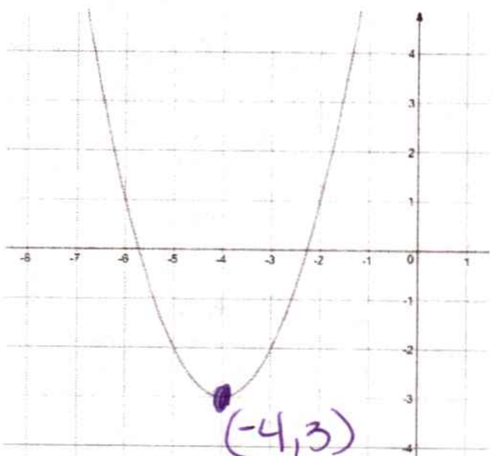
8

h=-10 k=-3

5) Identify the vertex of $g(x) = (x + 10)^2 - 3$.

a) $(-3, -10)$ b) $(-3, 10)$ c) $(10, -3)$ d) $(-10, -3)$

6) Identify the vertex of the parabola. Then give the minimum or maximum value of the function.



(-4,3)
minimum

a) The vertex is (-4, -3) and the minimum is ~~-4~~.

b) The vertex is (-4, -3) and the ~~maximum~~ is ~~-4~~.

c) The vertex is (-4, -3) and the ~~maximum~~ is -3.

d) The vertex is (-4, -3) and the minimum is -3.

a=-

7) Does the quadratic function $y = -x^2 - 5x - 6$ open up or open down? Explain.

a) Since a is negative, the parabola opens down.

b) Since a is negative, the parabola ope~~ns up.~~

c) Since a is ~~positive,~~ the parabola opens down.

d) Since a is ~~positive~~, the parabola ope~~ns up.~~

8) Match the equivalent characteristics of a quadratic function which opens down.

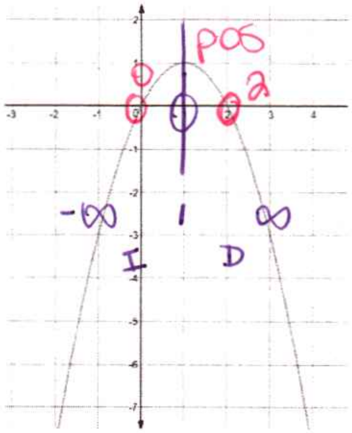
C x-intercept a) maximum point

A vertex b) y-coordinate of the vertex

B maximum value c) zero

9

9) The function $f(x) = -x^2 + 2x$ is graphed below.



pos
$(0,2)$
neg
$(-\infty,0)$
neg
$(2,\infty)$

I: $(-\infty,1)$
D: $(1,\infty)$

Based on the graph, which statements are true? Select **all** that apply.

a) The function is **decreasing** on the interval $(\cancel{-\infty}, 1)$.

b) The function is **decreasing** on the interval $(1, \infty)$.

c) The function is **increasing** on the interval $(-\infty, 1)$.

d) The function is **increasing** on the interval $(1, \cancel{\infty})$.

e) The function is **positive** on the interval $(-\infty, 0)$.

f) The function is **negative** on the interval $(-\infty, 0)$.

g) The function is **positive** on the interval $(0, 2)$.

h) The function is **negative** on the interval $(\cancel{0,} 2)$.

10) Which function below has a vertical **shrink**?

a) $y = \cancel{\frac{6}{5}}(x+2)^2$

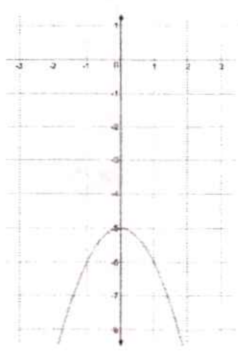
b) $y = 0.5x^2 + 3$

c) $y = -\cancel{\frac{10}{3}}x^2 - 4$

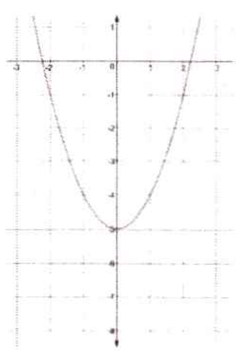
d) $y = \cancel{4}.5(x-2)^2$

11) Which graph represents the function $y = -x^2 + 5$? up 5

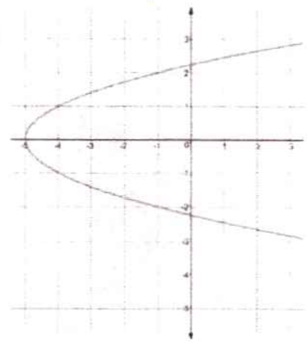
a)



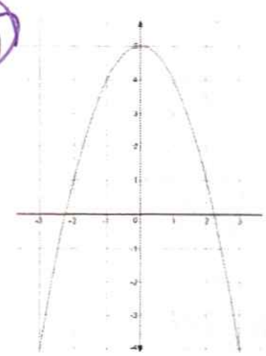
b)



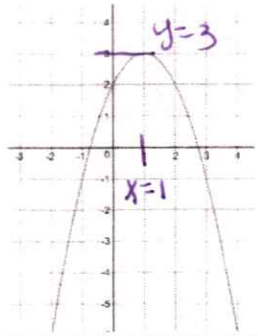
c)



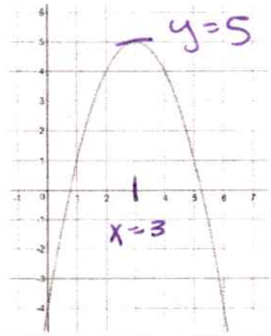
d)



12) Match each graph with the correct equation for its axis of symmetry and its maximum OR minimum value.



Axis of Symmetry	C
Max / Min (circle one) value	e



Axis of Symmetry	A
Max / Min (circle one) value	g

a) $x = 3$

b) $x = -3$

c) $x = 1$

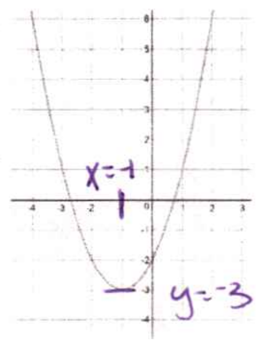
d) $x = -1$

e) $y = 3$

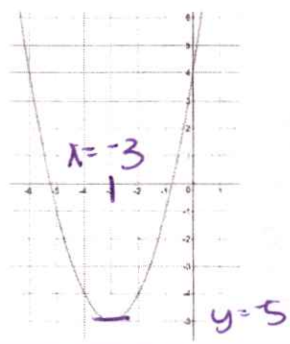
f) $y = -3$

g) $y = 5$

h) $y = -5$

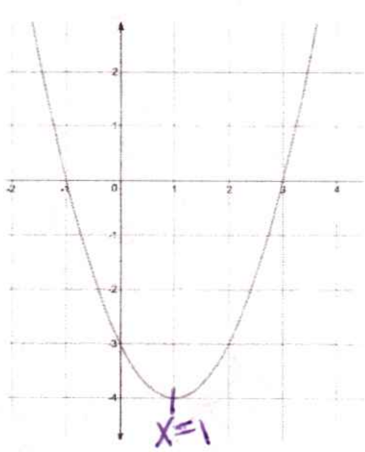


Axis of Symmetry	D
Max / Min (circle one) value	f



Axis of Symmetry	B
Max / Min (circle one) value	h

13) True / False: Determine whether each statement is true or false for the parabola graphed below.



T / F The equation of the axis of symmetry is $x = 1$.

T / F The parabola has a maximum point.
min.

T / F The vertex is $(-1, -4)$.
$(1, -4)$

T / F The parabola has two x-intercepts.
$(-1, 0)$ $(3, 0)$

T / F The y-intercept is (0, 0).
$(0, -3)$

T / F The parabola is negative on the interval $(-1, 3)$.

T / F The zeros of the function are $x = -1$ and $x = 3$

11

Day 8 – Comparing Vertex and Standard Forms

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

+ ∪ / - ∩ | $a > 1$ Stretch | + left / - right | + up / - down

$a < 1$ Shrink

Standard Form: $y = ax^2 + bx + c$

+ ∪ / - ∩ | y-int.

Stretch Shrink

Which of the following functions opens down? (check all that apply)

- $y = -2(x+1)^2 + 3$
- $y = -x^2 + 4$
- $y = (x-4)^2 + 1$
- $y = \frac{1}{2}x^2 + 2x + 8$
- $y = -x^2 - 5x + 6$

Which of the following has a y-intercept of 4? (check all that apply)

- $y = -x^2 + 4$
- $y = x^2 + 4x + 5$
- $y = (x+4)^2 + 4 \rightarrow x^2+8x+20$
- $y = x^2 + 9x + 4$
- $y = (x-2)^2 + 4 \rightarrow x^2-4x+8$

Which of the following has a vertical stretch? (check all that apply)

- $y = -2(x+1)^2 + 3$
- $y = \frac{1}{2}x^2 + 2x + 8$
- $y = 4x^2 + 4$
- $y = x^2 + 4x + 5$
- $y = \frac{5}{2}(x-4)^2 + 1$

*Can you determine the **y-intercept** of a function simply by looking at the **vertex form** of its equation?

*Can you determine the **vertex** of a function simply by looking at the **standard form** of its equation?

*Can you determine whether a function has a **horizontal shift** simply by looking at the **standard form** of its equation?

Converting from Vertex ⇒Standard Form

Ex 1: Convert to standard form: $y = 2(x+1)^2 - 4$

1) Expand the $(\ )^2 \Rightarrow (\ )(\ )$, multiply and add x-terms

2) Distribute a, if necessary

3) Combine like terms

DONE!

$2(x+1)(x+1)-4$

$2(x^2+1x+1x+1)-4$

$2(x^2+2x+1)-4$

$2x^2+4x+2-4$

$\boxed{2x^2+4x-2}$

You Try: Convert to STANDARD FORM.

a) $y = (x-3)^2 + 10$

$(x-3)(x-3) + 10$

$x^2 - 3x - 3x + 9 + 10$

$\boxed{y = x^2 - 6x + 19}$

Direction of opening: up

Vertex: (3, 10)

AOS: $x = 3$

y-intercept: (0, 10)

b) $y = -3(x+5)^2 - 7$

$-3(x+5)(x+5) - 7$

$-3(x^2 + 5x + 5x + 25) - 7$

$-3(x^2 + 10x + 25) - 7$

$-3x^2 - 30x - 75 - 7$

$\boxed{y = -3x^2 - 30x - 82}$

Direction of opening: down

Vertex: (-5, -7)

AOS: $x = -5$

y-intercept: (0, -82)

Converting from Standard ⇒ Vertex Form

Ex 2: Convert to vertex form: $y = x^2 + 4x + 1$

1) Determine values for a, b, and c.

2) Use $x = \frac{-b}{2a}$ to find the x-coordinate of the vertex, then substitute x-value into the original equation to find the y-coordinate of the vertex, (h, k).

3) Substitute a, h, and k, into: $y = a(x-h)^2 + k$

DON'T FORGET THAT THE **SIGN WITH h** IN THE EQUATION WILL BE **OPPOSITE!**

① $a = 1 \quad b = 4 \quad c = 1$

② $x = \frac{-4}{2(1)} \rightarrow -2 = h$

$(-2)^2 + 4(-2) + 1 \rightarrow -3 = k$

③ $a = 1$, $h = -2$, $k = -3$

$y = 1(x - -2)^2 - 3$

$\boxed{y = (x+2)^2 - 3}$

You Try: Convert to vertex form: $y = x^2 + 6x + 3$

$a = 1$, $b = 6$, $c = 3$

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

$(-3)^2 + 6(-3) + 3 \rightarrow -6$

$\boxed{y = (x+3)^2 - 6}$

Unit 11 Day 8 Practice Name________________________

1. Convert to standard form: $y = 2(x+2)^2 - 6$

$2(x+2)(x+2) - 6$

$2(x^2+2x+2x+4) - 6$

$2(x^2+4x+4) - 6$

$y = 2x^2 + 8x + 8 - 6$

$\boxed{y = 2x^2 + 8x + 2}$

2. What is the extreme of the function $y = -2x^2 + x - 3$, and why?

a. Minimum, because a is negative.
b. Minimum, because a is ~~pos~~itive.
c. Maximum, because a is negative.
d. Maximum, because a is ~~pos~~itive.

3. What is the equation of the axis of symmetry for the function $y = x^2 + 6x + 6$.

$a = 1$ $b = 6$ $x = \frac{-6}{2(1)} \rightarrow \frac{-6}{2} \rightarrow -3$

4. Which graph best represents the function $y = x^2 + 6x + 6$. a = pos c = 6

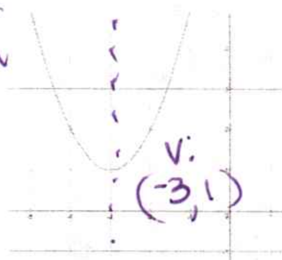
$x = \frac{-6}{2(1)} \rightarrow -3$

AOS: $x = -3$

$(-3)^2 + 6(-3) + 6$

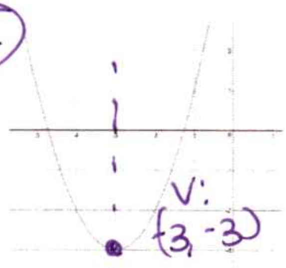
$y = -3$

V$(-3,-3)$

a.


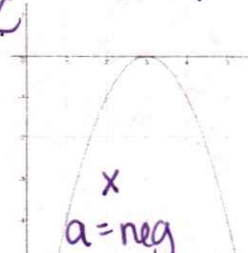
V: $(-3,1)$

$x = -3$

b.


V: $(3,-3)$

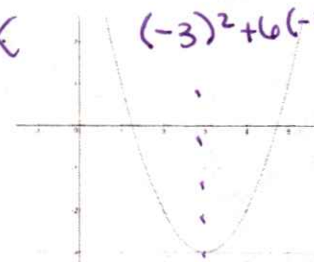
$x = -3$

c.


x

a = neg

b = neg #

d.


$x = 3$

5. What are the coordinates of the vertex of the function $y = x^2 - 8x + 2$?

a. (-8, 2) b. (8, 2) c. (4, -14) d. (-4, 50)

$x = \frac{8}{2(1)} \rightarrow 4$ $(4)^2 - 8(4) + 2$

6. What are the coordinates of the vertex of the function $y = (x+3)^2 - 4$?

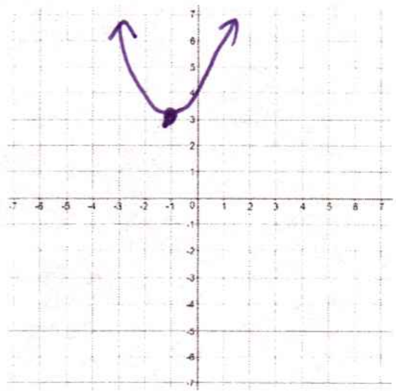
$h = -3$ $k = -4$

a. (3, -4) b. (-3, -4) d. (-4, 3) d. (4, -3)

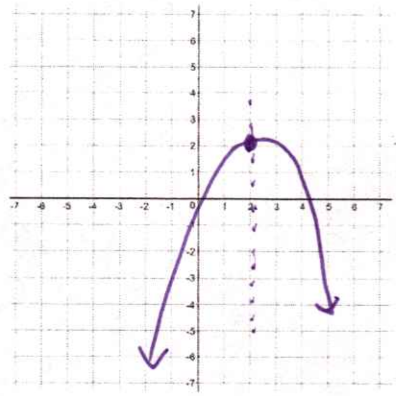
Unit 11 Day 8 Practice Answers will vary Name ____________________

Sketch a quadratic function with each of the following characteristics:

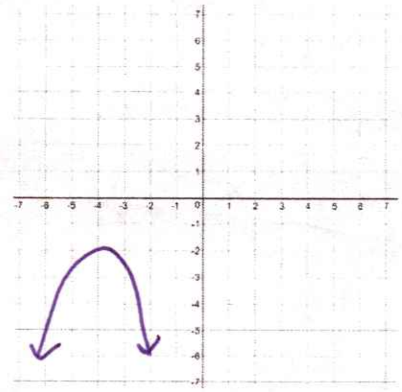
7. Vertex at (-1, 3)



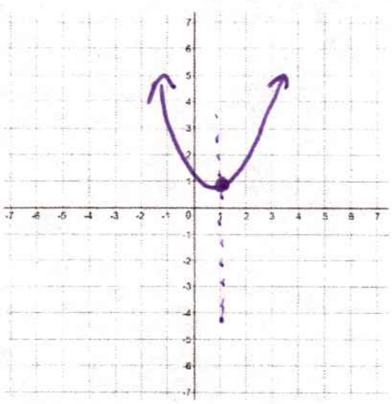
8. Interval of increase (-∞, 2)



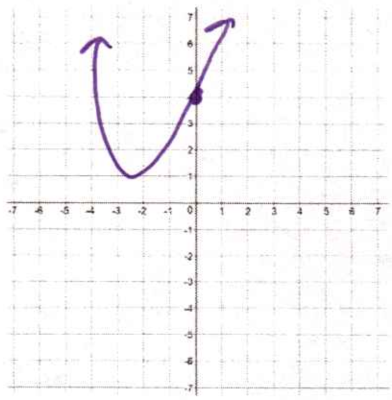
9. No x-intercepts



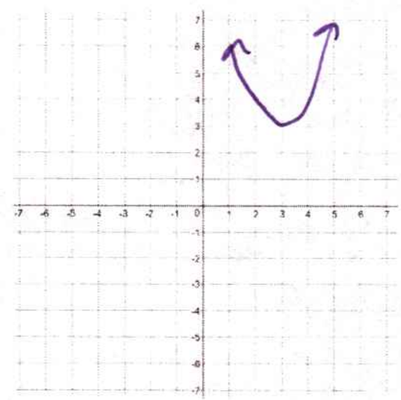
10. Axis of symmetry $x = 1$



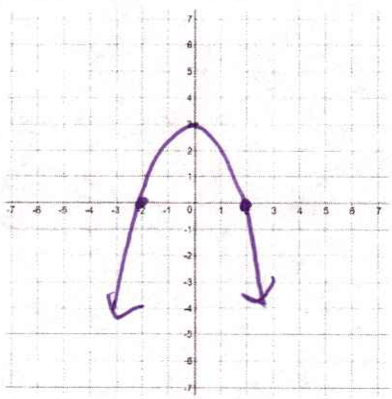
11. y-intercept (0, 4)



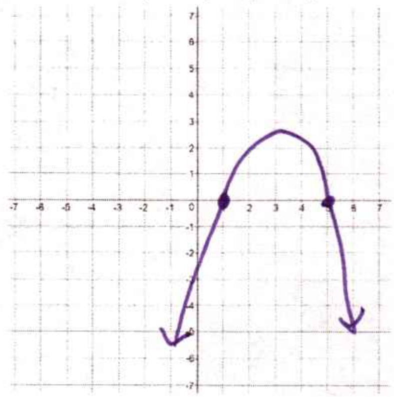
12. Range (3, ∞)



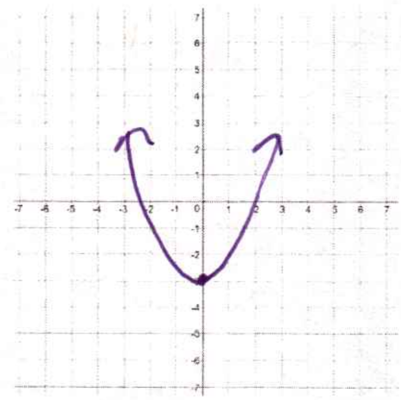
13. Positive interval (-2, 2)



14. Negative interval $(-\infty, 1) \cup (5, \infty)$



15. Minimum point (0, -3)



Day 9.5 – Converting Between Forms

Name: ______________________

Practice Assignment

Date: ____________ **Block:** ______

Directions: Convert from intercept form to standard form. Then name the y-intercept.

a. y = (x – 3)(x + 4)

$x^2+4x-3x-12$

x^2+x-12

Form: $y=x^2+x-12$

Y-int: (0,-12)

b. y = -(x – 1)(x – 5)

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

$-x^2+5x+1x-5$

$-x^2+6x-5$

Form: $y=-x^2+6x-5$

Y-int: (0,-5)

c. y = 2(x + 5)(x + 1)

$2(x+5)(x+1)$

$2(x^2+x+5x+5)$

$2(x^2+6x+5)$

$2x^2+12x+10$

Form: $y=2x^2+12x+10$

Y-int: (0,10)

Directions: Convert from vertex form to standard form. Then name the y-intercept.

a. y = (x + 5)² – 2

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

$x^2+10x+25-2$

$x^2+10x+23$

Form: $y=x^2+10x+23$

Y-int: (0,23)

b. y = -(x – 2)² + 6

$-(x-2)(x-2)+6$

$-(x^2-4x+4)+6$

$-x^2+4x-4+6$

$-x^2+4x+2$

Form: $y=-x^2+4x+2$

Y-int: (0,2)

c. y = -3(x – 1)² + 4

$-3(x-1)(x-1)+4$

$-3(x^2-2x+1)+4$

$-3x^2+6x-3+4$

$-3x^2+6x+1$

Form: $y=-3x+6x+1$

Y-int: (0,1)

Directions: Convert from standard form to intercept form. Then name the x-intercepts.

a. y = x² + 2x – 15

a=1
b=2
c=-15

-15, -3, 5, 2

$(x-3)(x+5)$

Form: $y=(x-3)(x+5)$

X-int: (3,0)(-5,0)

b. y = x² – 5x – 14

a=1
b=-5
c=-14

-14, -7, 2, -5

$(x-7)(x+2)$

Form: $y=(x-7)(x+2)$

X-int: (7,0), (-2,0)

c. y = -x² + 3x + 4

a=-1
b=3
c=4

-4, -4, 1, -3

Form: $y=-(x-4)(x+1)$

X-int: (4,0)(-1,0)

Directions: Convert from standard form to vertex form. Then name the vertex.

a. $y = x^2 - 10x + 27$

$a=1$
$b=-10$
$c=27$

$x = \frac{10}{2(1)} \to 5$

$(5)^2 - 10(5) + 27 \to 2$

Form: $y=(x-5)^2+2$

Vertex: $(5,2)$

b. $y = -x^2 + 6x - 8$

$a=-1$
$b=6$
$c=-8$

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

$y = -(3)^2 + 6(3) - 8 \to 1$

Form: $y = -(x-3)^2+1$

Vertex: $(3,1)$

c. $y = -2x^2 - 24x - 75$

$a=-2$
$b=-24$
$c=-75$

$x = \frac{24}{2(-2)} \to -6$

$y = -2(-6)^2 - 24(-6) - 75 \to -3$

Form: $y = -2(x+6)^2 - 3$

Vertex: $(-6,-3)$

Directions: Convert from intercept form to vertex form. Then name the vertex.

a. $y = (x - 6)(x - 2)$

$x^2 - 2x - 6x + 12$

$x^2 - 8x + 12$

$x = \frac{8}{2(1)} \to 4$

$(4-6)(4-2)$
$-2 \cdot 2$

Form: $y = (x-4)^2 - 4$

Vertex: $(4,-4)$

b. $y = -(x - 5)(x - 3)$

$-(x^2 - 3x - 5x + 15)$

$-(x^2 - 8x + 15)$

$-x^2 + 8x - 15$

$x = \frac{-8}{2(-1)} \to 4$

$-(4)^2 + 8(4) - 15 \to 1$

Form: $y = -(x-4)^2 + 1$

Vertex: $(4, 1)$

c. $y = \frac{1}{2}(x - 2)(x + 6)$

$\frac{1}{2}(x^2 + 6x - 2x - 12)$

$\frac{1}{2}(x^2 + 4x - 12)$

$\frac{1}{2}x^2 + 2x - 6$

$x = \frac{-2}{2(.5)} \to -2$

$\frac{1}{2}(-2)^2 + 2(-2) - 6 \to -8$

Form: $y = \frac{1}{2}(x+2)^2 - 8$

Vertex: $(-2,-8)$

Day 9 – Different Forms of Quadratics
Practice Assignment

Name: ______________________

Date: ____________ **Block:** ______

Directions: For the table below, identify each characteristic that can be EASILY determined from looking at the equation (requires no calculations). You will not fill in answers for every box. *

Equation	Graph Opens	Vertex	X-Intercepts	Y-Intercept
1. $y = (x + 4)^2 - 5$ vertex	a → pos up	h=-4 k=-5 (-4,-5)		
2. $y = -2(x + 3)(x - 2)$ intercept	a → neg down		(-3, 0) (2, 0)	
3. $y = -x^2 + 3$ standard/vertex	down	h=0 k=3 (0,3)		(0,3)
4. $y = x^2 + 5x - 14$ Standard	up			(0, -14)
5. $y = -(x + 1)^2$ vertex/intercept	down	h=-1 k=0 (-1, 0)	(-1, 0)	
6. $y = (x - 7)(x + 5)$ intercept	up		(7, 0) (-5, 0)	
7. $y = x^2 + 8x + 12$ Standard	up			(0, 12)
8. $y = -2(x - 3)^2 + 1$ vertex	down	h=3 k=1 (3,1)		

Convert the following equations to the specific form and give the additional characteristics you can determine from the new form.

Equation 1 to standard:	Equation 4 to factored:	Equation 6 to standard:	Equation 7 to vertex:
$y = (x+4)^2 - 5$ $(x+4)(x+4) - 5$ $x^2+4x+4x+16-5$ $\boxed{x^2+8x+11 = y}$	$y = x^2+5x-14$ $a=1$ $b=5$ $c=-14$ -14, 7, -2, 5 $\frac{7}{1}$ $\frac{-2}{1}$ $\boxed{y = (x+7)(x-2)}$	$y = (x-7)(x+5)$ $= x^2+5x-7x-35$ $\boxed{y = x^2-2x-35}$	$y = x^2+8x+12$ $a=1$ $b=8$ $c=12$ $x = \frac{-8}{2(1)} \to -4$ $y = (-4)^2+8(-4)+12$ $y = -4$ V: (-4, -4) $\boxed{y = (x+4)^2 - 4}$

Review: Identify the form each quadratic equation is in. Then graph the equations by calculating the vertex and creating an xy chart.

9. Graph $y = (x - 4)(x + 2)$

Form: intercept

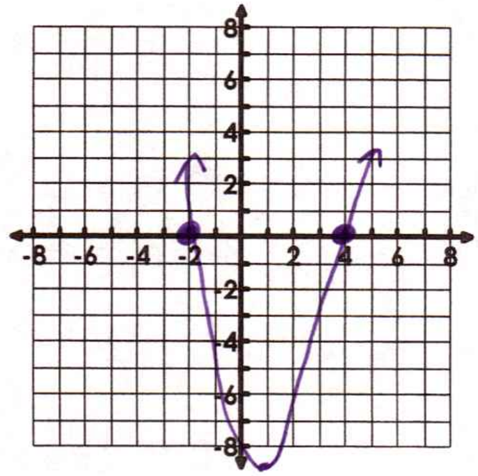
a = positive

x-int : (4,0) & (-2,0)

$x^2 + 2x - 4x - 8$

$x^2 - 2x - 8$ $\quad (1)^2 - 2(1) - 8 \rightarrow -9$

$x = \frac{2}{2(1)} \rightarrow 1$ $\quad$ V: (1,-9)



10. Graph $y = x^2 + 4x - 5$

Form: Standard

a=1 b=4 c=-5

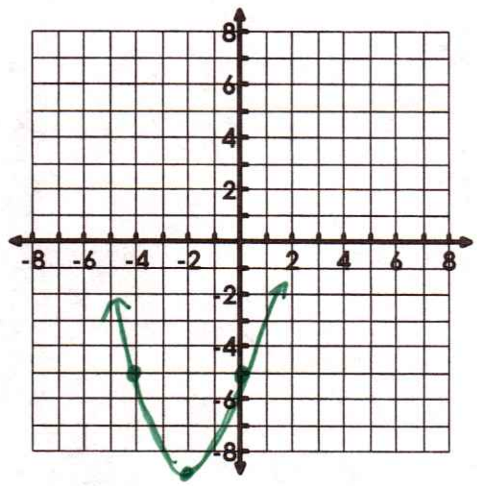
$x = \frac{-4}{2(1)} \rightarrow -2$

$y = (-2)^2 + 4(-2) - 5$

$y = -9$

V: (-2,-9)

y-int : (0,-5)



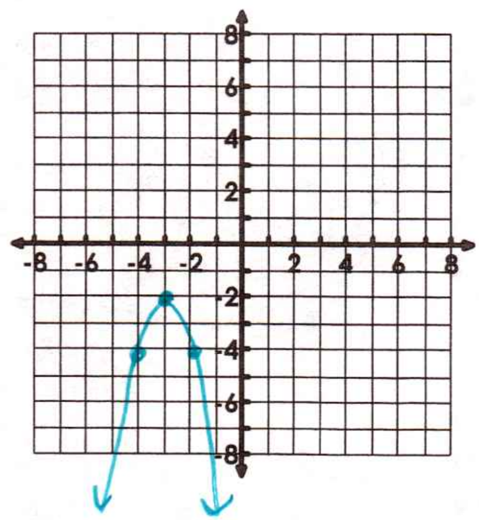
11. Graph $y = -2(x + 3)^2 - 2$

Form: vertex

h=-3

k=-2 $\quad$ V: (-3,-2)

a=-2



Review of Finding Slope

Practice Assignment

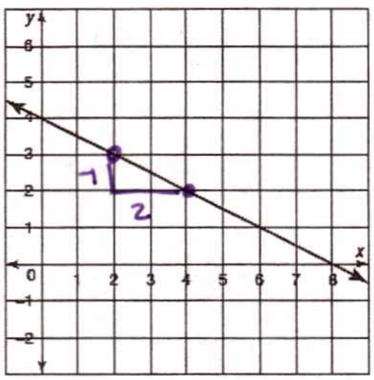
Name: ____________________

Date: ____________ **Block:** _____

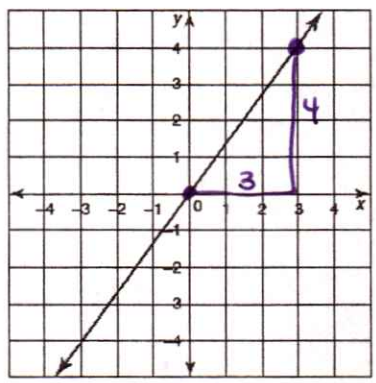
SLOPE is: $\frac{\Delta y \text{ (change in y)}}{\Delta x \text{ (change in x)}}$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $\frac{\text{Rise}}{\text{Run}}$

1. Calculate the slope and y-intercept from each graph.

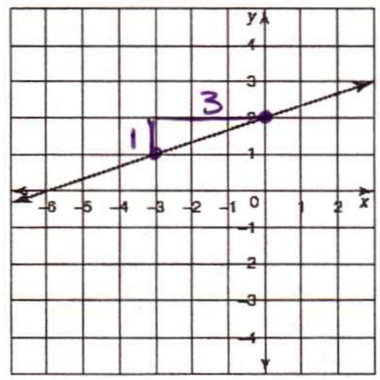
A. Slope = $\frac{-1}{2}$



B. Slope = $4/3$



C. Slope = $\frac{1}{3}$



2. Calculate the slope/rate of change from the table.

A. Pick any 2 points

x	y
−2 x_1	y_1 8
0 x_2	y_2 0
2	−8
4	−16

$\frac{0-8}{0-2} \rightarrow \boxed{-4}$

B.

x	y
−10 x_1	y_2 50
−2 x_2	y_2 10
4	−20
14	−70

$\frac{10-50}{-2-{}^{-}10} \rightarrow \boxed{-5}$

3. Calculate the slope from a set a points.

a. $\overset{x_1}{(-1}, \overset{y_1}{-24)}$ & $\overset{x_2}{(2}, \overset{y_2}{48)}$

$\frac{48-{}^{-}24}{2-{}^{-}1} \rightarrow \boxed{24}$

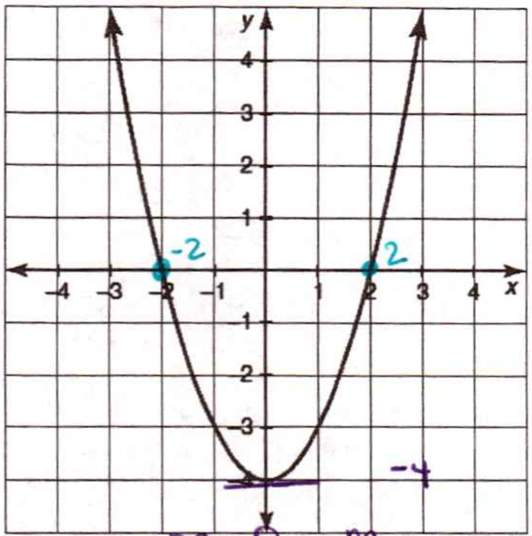
b. (4, -20) & (-10, 50)

$\frac{50-{}^{-}20}{{}^{-}10-4} \rightarrow \boxed{-5}$

20

More Practice with Characteristics: Name the characteristics for each graph given

8.



- ∞ D 0 I ∞

Domain: $(-\infty, \infty)$ **Range:** $(-4, \infty)$

Vertex: $(0, -4)$ **Axis of Sym.** $x = 0$

Y-Intercept: $(0, -4)$ **Zeroes:** $x = -2$ $x = 2$

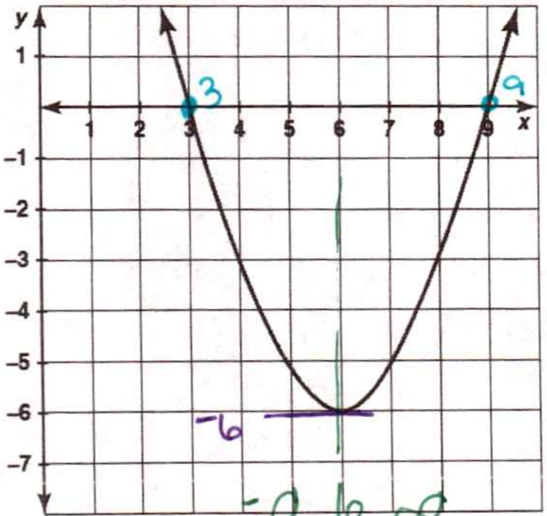
Extrema: min **Max/Min Value:** $y = -4$

Int of Inc: $(0, \infty)$ **Int of Dec:** $(-\infty, 0)$

Positive: $(-\infty, -2)$ & $(2, \infty)$ **Negative:** $(-2, 2)$

End Behavior: As $x \to -\infty$, $f(x) \to$ ∞. As $x \to \infty$, $f(x) \to$ ∞

9.



-∞ 6 ∞

Domain: $(-\infty, \infty)$ **Range:** $(-6, \infty)$

Vertex: $(6, -6)$ **Axis of Sym.** $x = 6$

Y-Intercept: ______ **Zeroes:** $x = 3$, $x = 9$

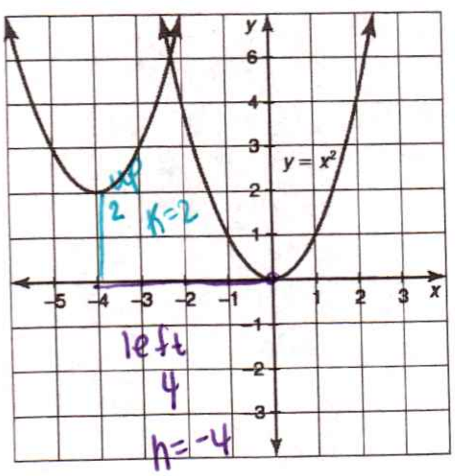
Extrema: min **Max/Min Value:** $y = -6$

Int of Inc: $(6, \infty)$ **Int of Dec:** $(-\infty, 6)$

Positive: $(-\infty, 3)$ $(9, \infty)$ **Negative:** $(3, 9)$

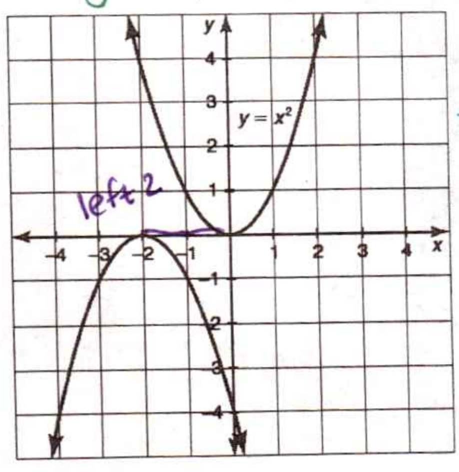
End Behavior: As $x \to -\infty$, $f(x) \to$ ∞. As $x \to \infty$, $f(x) \to$ ∞

10. Describe the transformations from the parent function $y = x^2$ to the second graph. Then write the equation of the transformed graph.



$h = -4$
$k = 2$
$\boxed{y = (x+4)^2 + 2}$

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



$h = -2$
$k = 0$

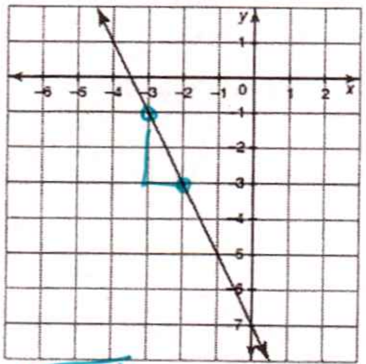
21

Day 10: Average Rate of Change

Review: Find the slope (average rate of change) for the following problems:

a.

c. (-9, 5) & (-3, 1)



$\boxed{-2}$

x	y
3 x_1	y_1 27
5 x_2	y_2 45
7	63
9	81

$\frac{45-27}{5-3} \rightarrow \boxed{9}$

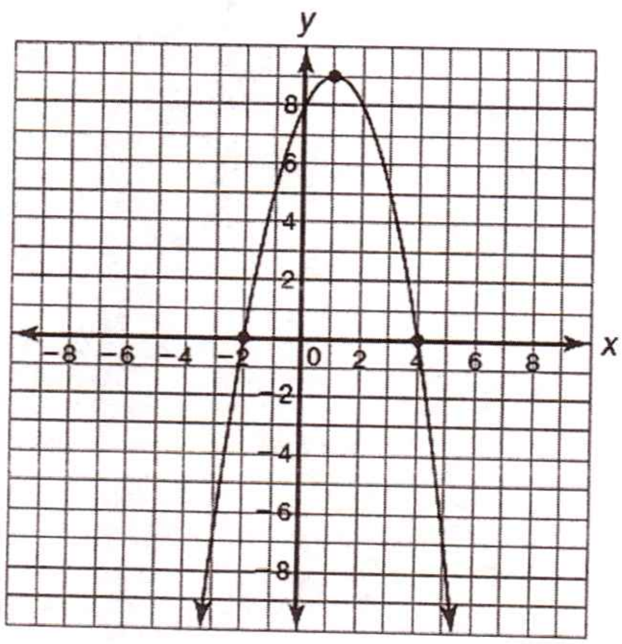
b.

$(-9,5)\ (-3,1)$

$\frac{1-5}{-3-(-9)} \rightarrow \boxed{\frac{-2}{3}}$

When you calculate the slope of linear function, its slope is ALWAYS ______________________.

Investigating the "Slope" of a Quadratic Function



The graph of $y = -x^2 + 2x + 8$ is given. Fill in the table of values on the right. Then determine the slope from one point to the next point.

X	Y
-3	-7
-2	0
-1	5
0	8
1	9
2	8
3	5
4	0
5	-7

What do you notice about the rate of change as you go from one point to the next?

What do you notice if you find the difference of all the slopes?

First versus Second Differences

Quadratic Functions have **constant second differences.** Second differences can be calculated by finding the rate of change with the first differences. Linear functions have **constant first differences.** Since quadratic functions do not have constant first differences, they do not have a slope that remains constant for the entire graph of a parabola.

a. $y = 2x$ ________________

x	y
−3	-6
−2	-4
−1	-2
0	0
1	2
2	4
3	6

First Differences
+2
+2
+2
+2
+2
+2

Second Differences

b. $y = 2x^2$ ________________

x	y
−3	18
−2	8
−1	2
0	0
1	2
2	8
3	18

First Differences
-10
-6
-2
2
6
10

Second Differences
+4
+4
+4
+4
+4

Therefore, you are never asked to find the slope of a quadratic function, but rather the **average rate of change** on a given interval. The average rate of change of a quadratic function will be different for each interval you are asked to find, just like in your investigation problem.

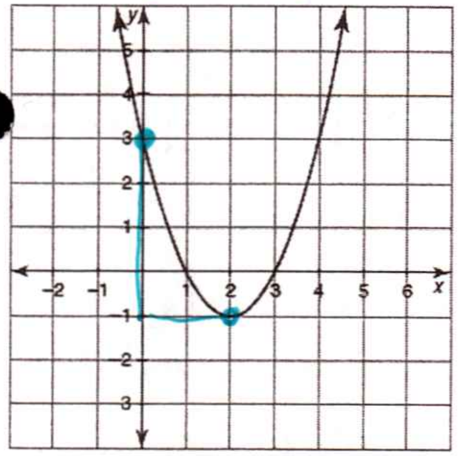
Practice: For the problems below, find the average rate of change for the given intervals:

Calculate average rate of change on interval **0 ≤ x ≤ 2.**

Graps on next page

Calculate average rate of change on interval **0 ≤ x ≤ 3.**

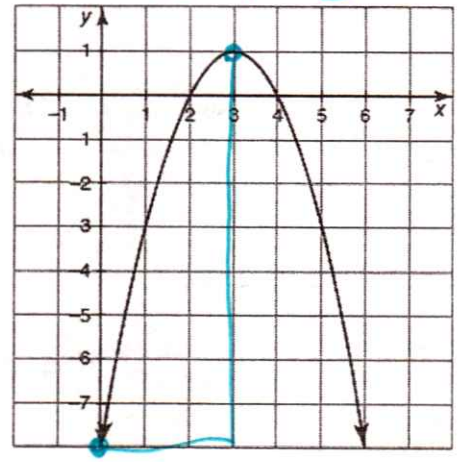
$0 \le x \le 2$



$(0,3)$ $(2,-1)$

$\frac{-4}{2} \to \boxed{-2}$

$0 \le x \le 3$



$\frac{9}{3} \to \boxed{3}$

Average Rate of Change without a Graph

If you are asked to calculate the average rate of change on an interval without a graph, you will have to come up with two points to calculate the slope.

You will get your two points by taking the bounds of your interval and substitute those x-values into your equation to find the y-values. Then use the slope formula to calculate the slope.

Remember slope is: $\frac{rise}{run}$ or $\frac{y_2 - y_1}{x_2 - x_1}$

Practice: Calculate the average rate of change of the function $y = (x - 4)^2$ on the given intervals:

$1 \le x \le 3$

$y = (x-4)^2$

$(1-4)^2$ $(3-4)^2$

$(1,9)$ $(3,1)$

$\frac{1-9}{3-1} \to \boxed{-4}$

$-2 \le x \le 2$

$(-2-4)^2$ $(2-4)^2$

$(-2,36)$ $(2,4)$

$\frac{4-36}{2--2} \to \boxed{-8}$

Practice: Calculate the average rate of change of the function $y = x^2 + 4x - 12$ on the given intervals:

$-2 \le x \le 4$

$x^2+4x-12$

$(-2)^2+4(-2)-12 \to -16$

$(4)^2+4(4)-12 \to 20$

$(-2,-16)$ $(4,20)$

$\frac{20--16}{4--2} \to \boxed{6}$

$-3 \le x \le -6$

$x^2+4x-12$

$(-3)^2+4(-3)-12 \to -15$

$(-6)^2+4(-6)-12 \to 0$

$(-3,-15)$ $(-6,0)$

$\frac{0--15}{-6--3} \to \boxed{-5}$

Day 10 – Average Rate of Change

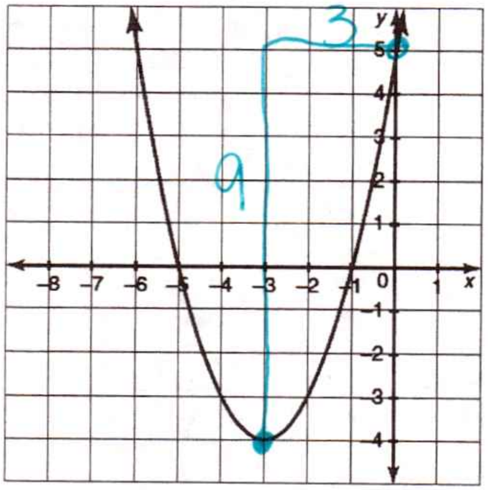
Name:________________________

Practice Assignment

Date:________________ Block:________

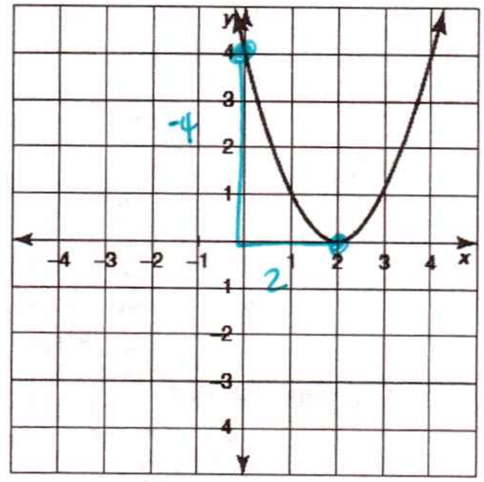
Find the average rate of change for the given intervals:

1. $-3 \le x \le 0$



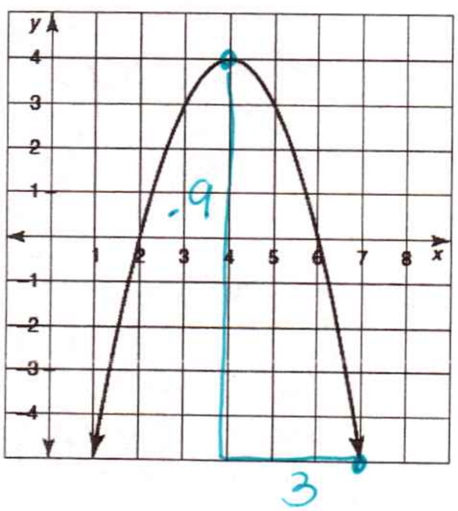
$\frac{9}{3} \to \boxed{3}$

2. $0 \le x \le 2$



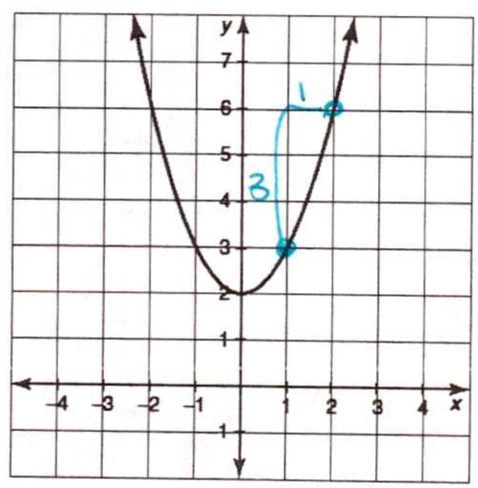
$\frac{-4}{2} \to \boxed{-2}$

3. $4 \le x \le 7$



$\frac{-9}{3} \to \boxed{-3}$

4. $1 \le x \le 2$



$\frac{3}{1} \to \boxed{3}$

Find the average rate of change for the given equations on the given intervals:

5. $y = x^2 - 4x + 6$; $2 \le x \le 4$

$(2)^2 - 4(2) + 6 \to -2$

$(4)^2 - 4(4) + 6 \to 6$

$(2,-2)\ (4,6)$

$\frac{6-2}{4-2} \to \boxed{4}$

6. $y = x^2 - 4x + 1$; $-1 \le x \le 2$

$(-1)^2 - 4(-1) + 1 \to 6$

$(2)^2 - 4(2) + 1 \to -3$

$(-1,6)\ (2,-3)$

$\frac{-3-6}{2--1} \to \boxed{-3}$

7. $y = -x^2 - 6x - 10$; $-7 \le x \le -3$

$-(-7)^2 - 6(-7) - 10 \to -17$

$-(-3)^2 - 6(-3) - 10 \to -1$

$(-7,-17)\ (-3,-1)$

$\frac{-1--17}{-3--7} \to \boxed{4}$

Algebra 1 | Unit 8: Quadratic Functions | Practice

Day 12 – Comparing Quadratic Functions
Practice Assignment

Name: ____________________
Date: ______________ **Block:** ________

Directions: Answer the following questions to comparing quadratic functions.

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

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

$c=8$

$\boxed{0,8}$

b.

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

$\boxed{0,9}$

$\boxed{\text{B is bigger}}$

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

a. $y = x^2 + 4x - 12$

C: $(0,-12)$

↓

Smallest

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

$x^2 - 3x + 3x - 9$

$x^2 - 9$

C: $(0,-9)$

c. $y = (x + 2)^2 - 13$

$(x+2)(x+2) - 13$

$x^2 + 4x + 4 - 13$

$x^2 + 4x - 9$

C: $(0,-9)$

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

look for vertex

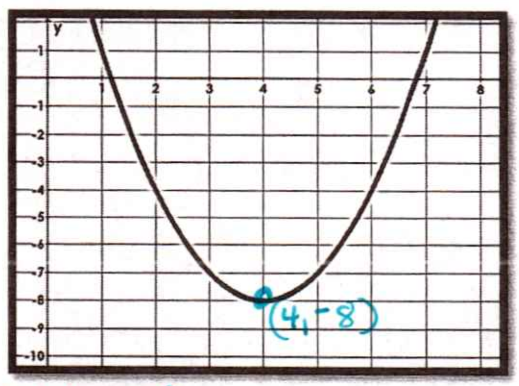
a.

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

V: $(-1,-9)$

$\boxed{\text{smallest}}$ → $y = -9$

b.



V: $(4,-8)$

$y = -8$

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

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

V: $(-4,2)$

$y = 2$

↑

$\boxed{\text{biggest}}$

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

$-(x^2 + x + 3x + 3)$

$-(x^2 + 4x + 3)$

$-x^2 - 4x - 3$

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

$-(-2+3)(-2+1) \rightarrow 1$

V: $(-2,1)$

$y = 1$

c.

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

V: $(3,-1)$

$y = -1$

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

$\downarrow$ vertex

$3(x-2)(x-2)-5$

$3(x^2-4x+4)-5$

$3x^2-12x+12-5$

$3x^2-12x+7$

$x = \frac{12}{3(2)} \rightarrow 2$

$3(2-2)^2-5 \rightarrow -5$

V: (2, -5)

$\boxed{\text{goes deeper in ocean}}$

---

b.

First Seagull: $f(x) = 3x^2 - 12x + 7 \rightarrow \frac{12}{2(3)} \rightarrow 2$ $\quad 3(2)^2-12(2)+7 \rightarrow -5$

V: (2, -5)

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

$\downarrow$

$(-2, -6) \leftarrow \boxed{\text{deeper in ocean}}$

---

c.

First Seagull: $f(x) = 2x^2 - 8x + 11 \rightarrow \frac{8}{2(2)} \rightarrow 2$ $\quad 2(2)^2-8(2)+11 \rightarrow 3$

V: (2, 3)

$\uparrow$

$\boxed{\text{deeper in ocean}}$

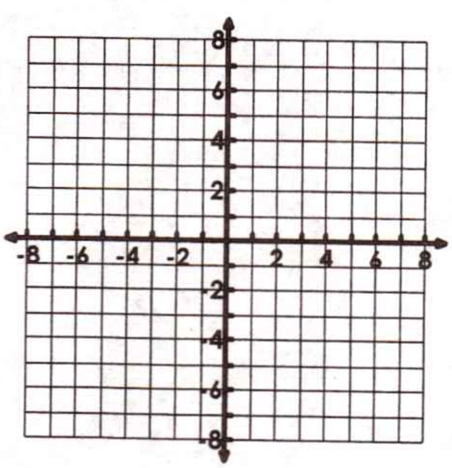
Second Seagull:

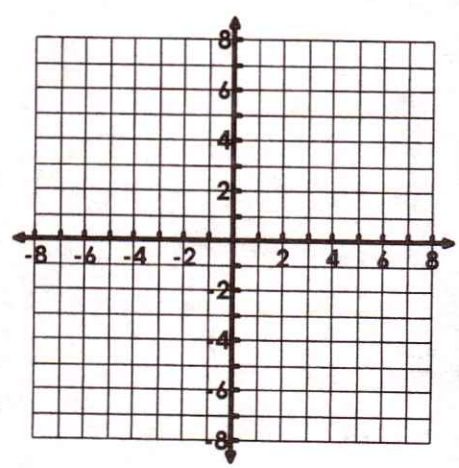
x	-3	-1	1	3	5
g(x)	11	6	3	2	3

vertex

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.