Algebra 1: 11.2 – 11.6 **Name** Answer Key **Period** ______
Guided Notes for Quadratic Functions

DOMAIN AND RANGE

Domain	$\Rightarrow$	Range
All possible x-values		All possible y-values
Independent		Dependent (on x)

Domain for the Graph: All Real Numbers

Range for the Graph: If the parabola opens UP, then write $y \geq y$-value of Absolute MIN $y \geq 4$

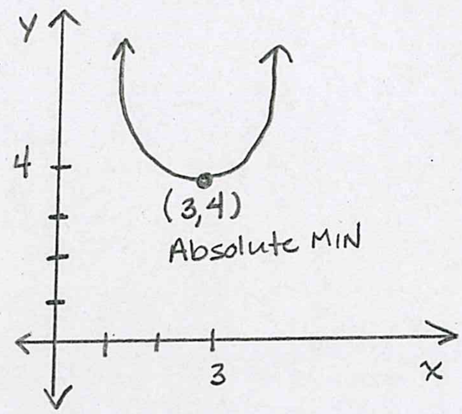
or

If the parabola opens DOWN, then write $y \leq y$-value of Absolute MAX $y \leq 5$

Domain for the Problem: $0 \leq x \leq x$-value of 2nd zero (or x-intercept) $0 \leq x \leq 9$

Range of the Problem: $0 \leq y \leq y$-value of Absolute MAX

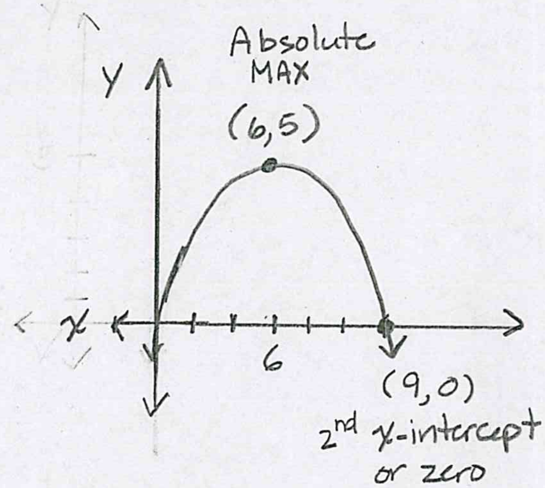
$0 \leq y \leq 5$



CALCULATING 1ST AND 2ND DIFFERENCES

Subtract successive y-values.

x	y	difference of y-values
-2	-4	
		-1 + 4 = 3
-1	-1	
		2 + 1 = 3
0	2	
		5 − 2 = 3
1	5	
		8 − 5 = 3
2	8	



Linear Functions

1st Differences are constant/the same numbers.

2nd Differences are zero (0).

Quadratic Functions

1st Differences are different numbers.

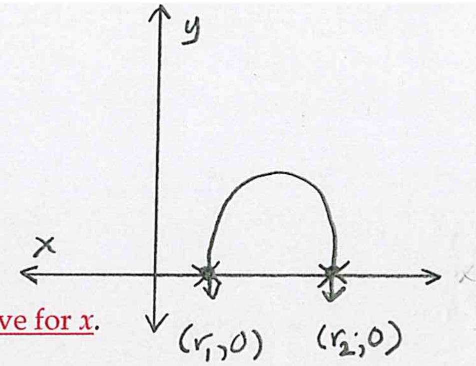
2nd Differences are constant/the same numbers.

PARABOLAS – THE GRAPH OF A QUADRATIC FUNCTION

Open UP ($\cup$) if the leading coefficient (# in front of x^2) is positive (+). $f(x) = ax^2 + bx + c$

Open DOWN ($\cap$) if the leading coefficient (# in front of x^2) is negative (-). $f(x) = -ax^2 + bx + c$

X-INTERCEPT(S) OR ZEROS



Point(s) (x, y) where the <u>y-value = 0.</u>

Written as $(r_1, 0)$ and $(r_2, 0)$, where r_1 and r_2 are the x-intercepts.

For a Graph, it is the point(s) where the parabola <u>crosses the x-axis</u>.

For a Quadratic Function in Factored Form, <u>set each expression for $x = 0$ and solve for x</u>.

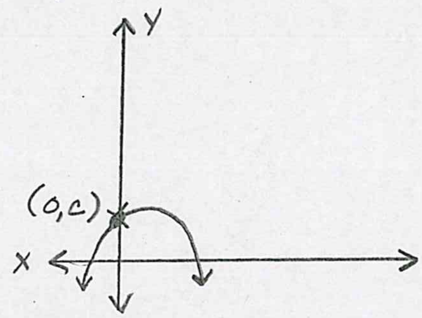
For example, $f(x) = 3(2x - 8)(x + 7)$

$2x - 8 = 0 \qquad x + 7 = 0$

$x = 4 \qquad x = -7$

The x-intercepts are $(4, 0)$ and $(-7, 0)$.

Y-INTERCEPT



Point (x, y) where the <u>x-value = 0.</u>

Written as $(0, c)$

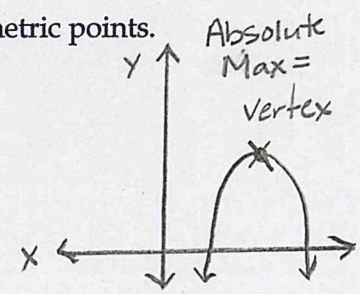
For a Graph, it is the point where the parabola <u>crosses the y-axis</u>.

For a Quadratic Function, <u>plug 0 in for x and solve for y</u>.

The y-intercept is usually the <u>constant (c)</u> in the standard form of a quadratic function – $f(x) = ax^2 + bx + c$.

VERTEX

<u>HIGHEST/LOWEST point on a parabola</u>, midway between the x-intercepts or 2 symmetric points.



Written as (x, y).

Absolute Maximum = <u>HIGHEST point when the parabola opens DOWN (∩).</u>

Absolute Minimum = <u>LOWEST point when the parabola opens UP (∪).</u>

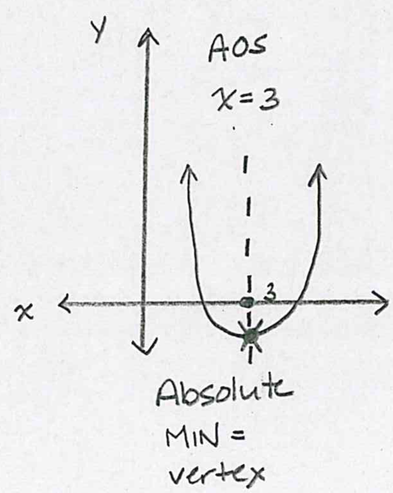
To Find the Vertex,

On a Graph, identify the x- and y-coordinates of the highest or lowest point.

For a Quadratic Function in Standard Form - $f(x) = ax^2 + bx + c$, <u>plug in the axis of symmetry for x and solve for y.</u>

For a Quadratic Function in Vertex Form – $f(x) = a(x - h)^2 + k$, <u>h is the x-coordinate and k is the y-coordinate of the vertex, i.e. (h, k).</u>

AXIS OF SYMMETRY (AOS)



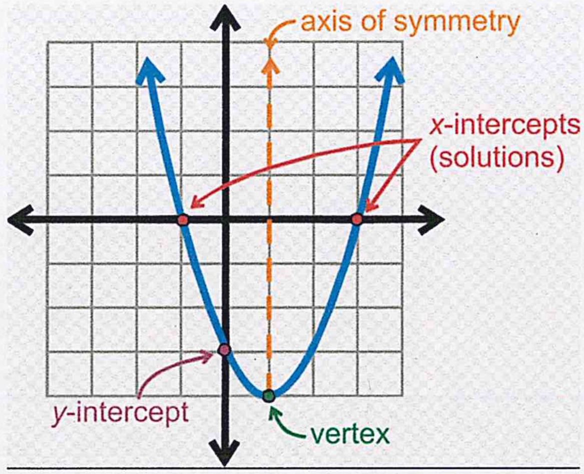
<u>Vertical line that divides the parabola into 2 equal halves or mirror images.</u>

Written as x = the x-coordinate of the vertex.

To Find the Axis of Symmetry…

On a Graph, <u>x-coordinate of the vertex (highest/lowest point)</u>.

Given the x-intercepts or 2 symmetric points, <u>add the x-coordinates and divide by 2</u>.



THREE FORMS OF A QUADRATIC FUNCTION

1. **Standard Form –** $f(x) = ax^2 + bx + c$

   Key Characteristics:

   a is + means the parabola opens UP/a is – means the parabola opens DOWN

   y-intercept is $(0, c)$

2. **Factored Form –** $f(x) = a(x - r_1)(x - r_2)$

   Key Characteristics:

   a is + means the parabola opens UP/a is – means the parabola opens DOWN

   Zeros or x-intercepts are $(r_1, 0)$ and $(r_2, 0)$

3. **Vertex Form –** $f(x) = a(x - h)^2 + k$

   sign change

   Key Characteristics:

   a is + means the parabola opens UP/a is – means the parabola opens DOWN

   Vertex is (h, k)