

Essential Question: How do you identify characteristics of a function on a table or graph?

Thus far, we have learned two different forms in which quadratics can be presented. They are the ...

Standard Form: _____ and Intercept Form: _____

The last form of quadratics left for us to study is ... ***Vertex Form:** _____

If "a" is _____, the parabola opens _____. If "a" is _____, the parabola opens _____.

- The vertex is the point _____
- The axis of symmetry is the vertical line $x =$ _____; the AOS passes through the vertex.
- Make a table to find extra points to one side of the vertex and use the axis of symmetry to plot more points; plot at least 5 points.
- To graph, plot the vertex, other points, and axis of symmetry. Then connect with a smooth curve.

Example 1: Find the vertex of each quadratic. State if it is a maximum or minimum.

- a. $y = (x - 1)^2$ b. $y = -(x - 1)^2 + 3$ c. $y = 2(x + 1)^2 + 4$ d. $y = -5(x + 3)^2 - 14$

Example 2: Write an equation of a quadratic with the given vertex.

- a. (-3, 5) b. (5, 0) c. (7, -2)

Example 3: Graph $y = -(x - 5)^2 + 9$ Opens: _____

Vertex: _____ a = _____ Max / Min (Circle one)

AOS: _____ x - intercept(s): _____ y - intercept: _____

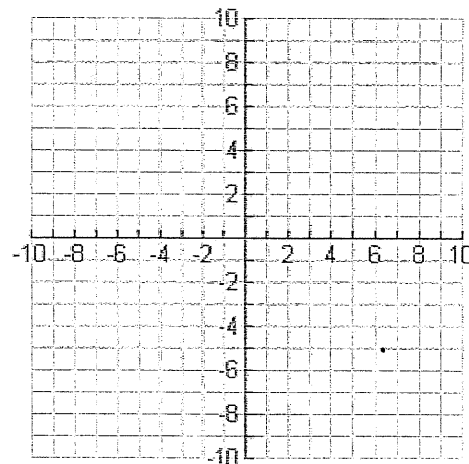
Domain: _____ Range: _____

Avg. Rate of Change [3, 5]: _____

End Behavior:

As $x \rightarrow \infty, f(x) \rightarrow$ _____ Increasing: _____ Positive: _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____ Decreasing: _____ Negative: _____



Example 4: Graph $y = 2(x + 4)^2 + 1$ Opens: _____

Vertex: _____ $a =$ _____ Max / Min (Circle one)

AOS: _____ x - intercept(s): _____ y - intercept: _____

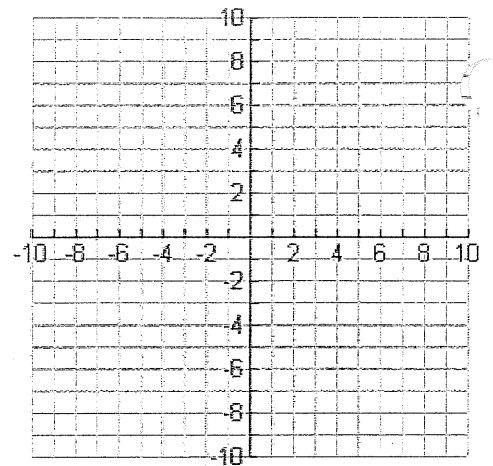
Domain: _____ Range: _____

Avg. Rate of Change $[-4, -2]$: _____

End Behavior:

As $x \rightarrow \infty, f(x) \rightarrow$ _____ Increasing: _____ Positive: _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____ Decreasing: _____ Negative: _____



Example 5: Graph $y = -(x - 2)^2$ Opens: _____

Vertex: _____ $a =$ _____ Max / Min (Circle one)

AOS: _____ x - intercept(s): _____ y - intercept: _____

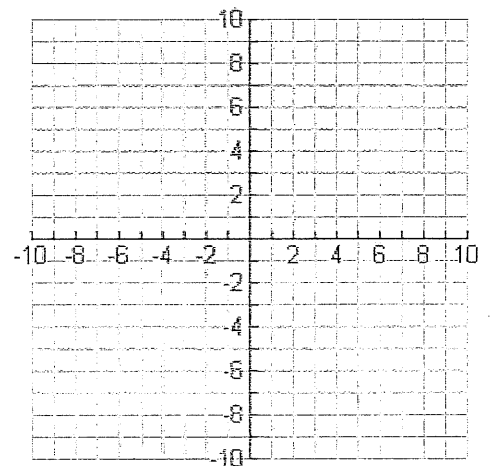
Domain: _____ Range: _____

Avg. Rate of Change $[-4, -2]$: _____

End Behavior:

As $x \rightarrow \infty, f(x) \rightarrow$ _____ Increasing: _____ Positive: _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____ Decreasing: _____ Negative: _____



CCGPS Analytic Geometry Worksheet: Graphing Quadratic Equations in Vertex Form

1. Graph $y = -2(x - 7)^2 + 8$ Opens: _____

Vertex: _____ $a =$ _____ Max / Min (Circle one)

AOS: _____ x - intercept(s): _____ y - intercept: _____

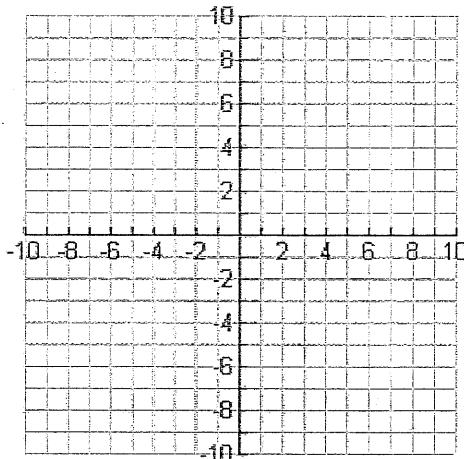
Domain: _____ Range: _____

Avg. Rate of Change [5, 7]: _____

End Behavior:

As $x \rightarrow \infty, f(x) \rightarrow$ _____ Increasing: _____ Positive: _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____ Decreasing: _____ Negative: _____



2. Graph $y = (x + 3)^2 + 2$ Opens: _____

Vertex: _____ $a =$ _____ Max / Min (Circle one)

AOS: _____ x - intercept(s): _____ y - intercept: _____

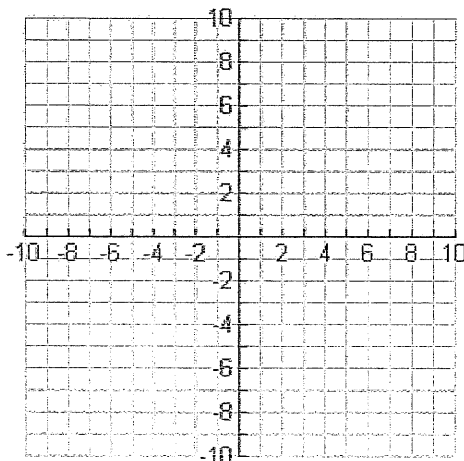
Domain: _____ Range: _____

Avg. Rate of Change [-3, -1]: _____

End Behavior:

As $x \rightarrow \infty, f(x) \rightarrow$ _____ Increasing: _____ Positive: _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____ Decreasing: _____ Negative: _____



3. Graph $y = -(x - 2)^2 + 5$ Opens: _____

Vertex: _____ $a =$ _____ Max / Min (Circle one)

AOS: _____ x - intercept(s): _____ y - intercept: _____

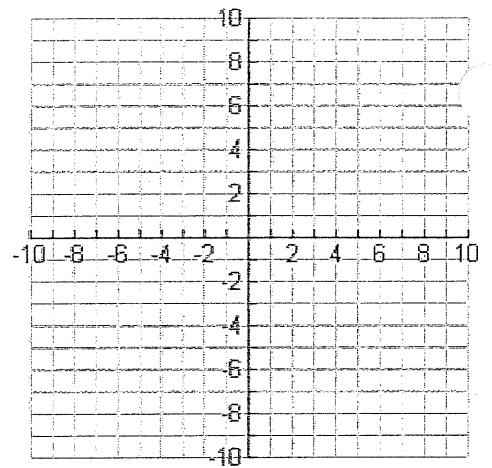
Domain: _____ Range: _____

Avg. Rate of Change $[2, 4]$: _____

End Behavior:

As $x \rightarrow \infty, f(x) \rightarrow$ _____ Increasing: _____ Positive: _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____ Decreasing: _____ Negative: _____



4. Graph $y = 2(x + 5)^2$ Opens: _____

Vertex: _____ $a =$ _____ Max / Min (Circle one)

AOS: _____ x - intercept(s): _____ y - intercept: _____

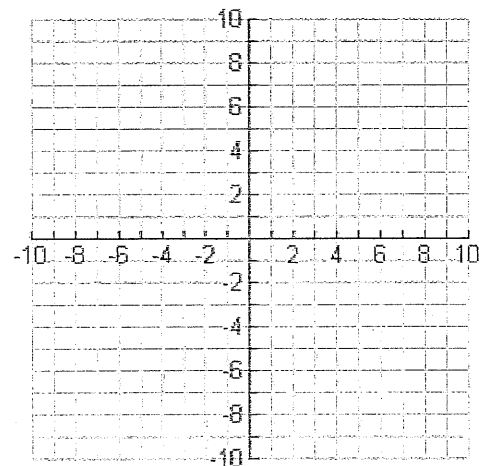
Domain: _____ Range: _____

Avg. Rate of Change $[-7, -6]$: _____

End Behavior:

As $x \rightarrow \infty, f(x) \rightarrow$ _____ Increasing: _____ Positive: _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____ Decreasing: _____ Negative: _____



Key

Essential Question: How do you identify characteristics of a function on a table or graph?

Thus far, we have learned two different forms in which quadratics can be presented. They are the ...

Standard Form: $y = ax^2 + bx + c$ and Intercept Form: $y = a(x-p)(x-q)$

The last form of quadratics left for us to study is ... ***Vertex Form:** $y = a(x-h)^2 + k$

If "a" is positive the parabola opens up. If "a" is negative, the parabola opens down.

- The vertex is the point (h, k)
- The axis of symmetry is the vertical line $x = h$; the AOS passes through the vertex.
- Make a table to find extra points to one side of the vertex and use the axis of symmetry to plot more points; plot at least 5 points.
- To graph, plot the vertex, other points, and axis of symmetry. Then connect with a smooth curve.

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

Example 1: Find the vertex of each quadratic. State if it is a maximum or minimum.

- a. $y = (x-1)^2 + 0$ b. $y = -(x-1)^2 + 3$ c. $y = 2(x+1)^2 + 4$ d. $y = -5(x+3)^2 - 14$

$V(1, 0)$ $V(1, 3)$ $V(-1, 4)$ $V(-3, -14)$

Example 2: Write an equation of a quadratic with the given vertex.

- a. $(-3, 5)$ b. $(5, 0)$ c. $(7, -2)$
- $y = (x+3)^2 + 5$ $y = (x-5)^2$ $y = (x-7)^2 - 2$

Example 3: Graph $y = -(x-5)^2 + 9$ Opens: down

Vertex: $(5, 9)$ $a = -1$ (Max) Min (Circle one)

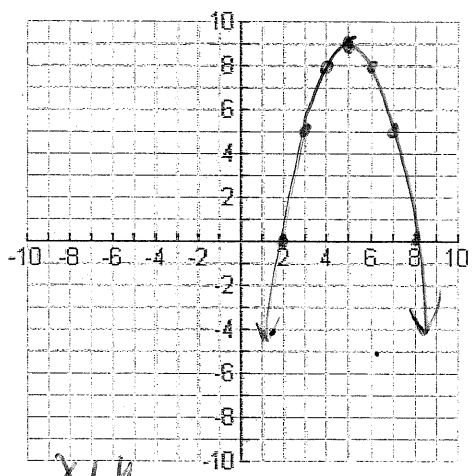
AOS: $x = 5$ x-intercept(s): $(2, 0)$ $(8, 0)$ y-intercept: $(0, -16)$

Domain: $(-\infty, \infty)$ Range: $(-\infty, 9]$

Avg. Rate of Change $[3, 5]$: 2

End Behavior:
As $x \rightarrow \infty, f(x) \rightarrow -\infty$ Increasing: $(-\infty, 5)$ Positive: $(2, 8)$

As $x \rightarrow -\infty, f(x) \rightarrow -\infty$ Decreasing: $(5, \infty)$ Negative: $(-\infty, 2)$ $(8, \infty)$



x	y
3	5
4	8
5	9
6	8
7	5

x	y
8	0
2	0
0	-16

Example 4: Graph $y = 2(x + 4)^2 - 2$ Opens: up

Vertex: $(-4, -2)$ $a = 2$ Max / (Min) (Circle one)

AOS: $x = -4$ x-intercept(s): $(-3, 0)$ $(-5, 0)$ y-intercept: $(0, 30)$

Domain: $(-\infty, \infty)$ Range: $[-2, \infty)$

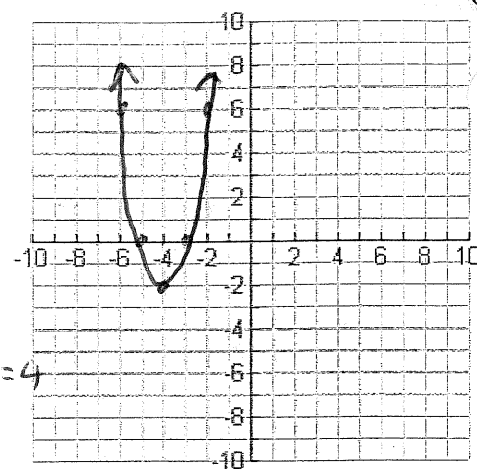
Avg. Rate of Change $[-4, -2]$: 4 $(-4, -2)$ $(-2, 6)$ $\frac{-2 - 6}{-4 + 2} = \frac{-8}{-2} = 4$

End Behavior:

As $x \rightarrow \infty, f(x) \rightarrow +\infty$ Increasing: $(-4, \infty)$ Positive: $(-\infty, -5) \cup (-3, \infty)$

As $x \rightarrow -\infty, f(x) \rightarrow +\infty$ Decreasing: $(-\infty, -4)$ Negative: $(-5, -3)$

x	y
-6	6
-5	0
-4	-2
-3	0
-2	6



Example 5: Graph $y = -(x - 2)^2$ Opens: down

Vertex: $(2, 0)$ $a = -1$ (Max) / Min (Circle one)

AOS: $x = 2$ x-intercept(s): $(2, 0)$ y-intercept: $(0, -4)$

Domain: $(-\infty, \infty)$ Range: $(-\infty, 0]$

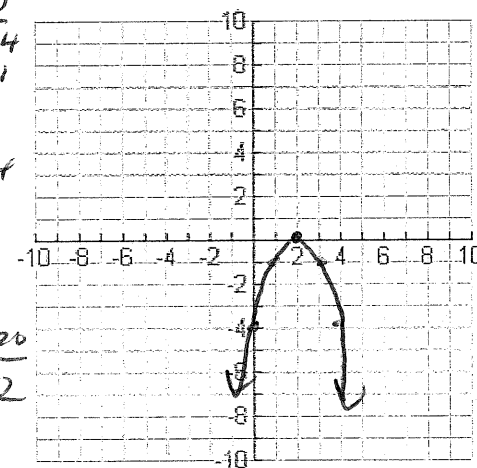
Avg. Rate of Change $[-4, -2]$: 10 $(-4, -36)$ $(-2, -16)$ $\frac{-36 + 16}{-4 + 2} = \frac{-20}{-2} = 10$

End Behavior:

As $x \rightarrow \infty, f(x) \rightarrow -\infty$ Increasing: $(-\infty, 2)$ Positive: none

As $x \rightarrow -\infty, f(x) \rightarrow -\infty$ Decreasing: $(2, \infty)$ Negative: $(-\infty, 2) \cup (2, \infty)$

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



1. Graph $y = -2(x - 7)^2 + 8$ Opens: down

Vertex: (7, 8) $a = -2$ (Max) / (Min) (Circle one)

AOS: $x = 7$ x-intercept(s): (5, 0) (9, 0) y-intercept: (0, -10)

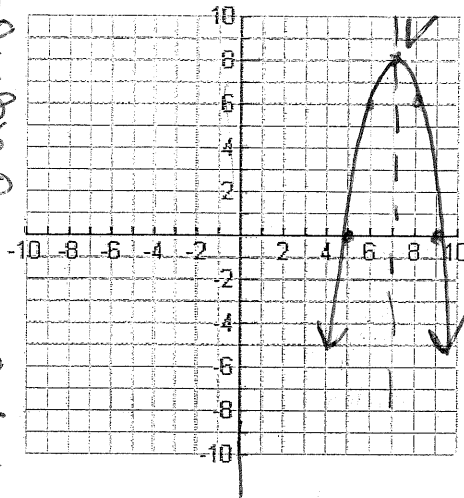
Domain: $(-\infty, \infty)$ Range: $(-\infty, 8]$

Find slope $(5, 0)$ $(7, 8)$ $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 8}{5 - 7} = \frac{-8}{-2} = 4$

End Behavior: As $x \rightarrow \infty, f(x) \rightarrow -\infty$ Increasing: $(-\infty, 7)$ Positive: _____

As $x \rightarrow -\infty, f(x) \rightarrow -\infty$ Decreasing: $(7, \infty)$ Negative: _____

x	y
5	0
6	6
7	8
8	6
9	0



x +

2. Graph $y = (x + 3)^2 + 2$ Opens: up

Vertex: (-3, 2) $a = 1$ Max / (Min) (Circle one)

AOS: $x = -3$ x-intercept(s): none y-intercept: (0, 11)

Domain: $(-\infty, \infty)$ Range: $[2, \infty)$

slope $(-3, 2)$ $(-1, 6)$ $\frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 2}{-1 - (-3)} = \frac{4}{2} = 2$

End Behavior: As $x \rightarrow \infty, f(x) \rightarrow +\infty$ Increasing: $(-3, \infty)$ Positive: $(-\infty, \infty)$

As $x \rightarrow -\infty, f(x) \rightarrow +\infty$ Decreasing: $(-\infty, -3)$ Negative: none

x	y
-5	6
-4	3
-3	2
-2	3
-1	6
0	11

