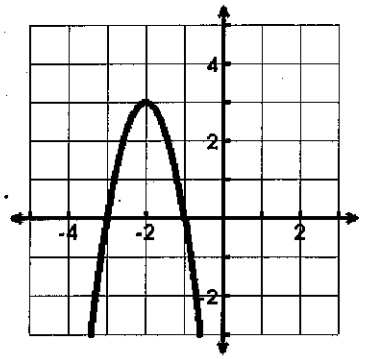
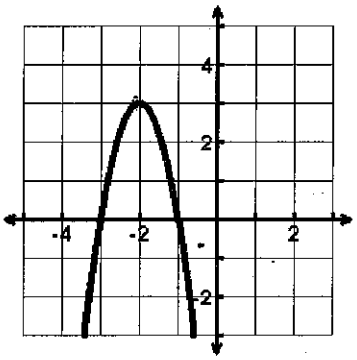
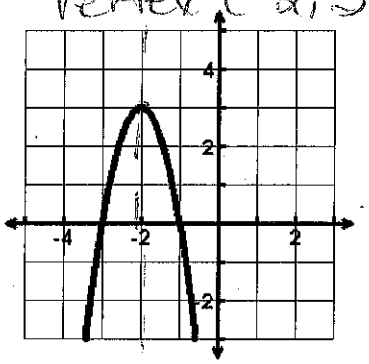
Algebra Quadratic Characteristics Name: _____

Vertex Form of a Quadratic: **Standard form of a Quadratic:**

Domain: All x – values that are represented on the graph. For quadratics always $(-\infty, \infty)$	**Notation** Inequality Notation: $-\infty < y < \infty$ Interval Notation: $(-\infty, \infty)$ *Bracket means "included" *Parenthesis means "not included) We can't include infinity with a bracket because it cannot be "plugged in" for an x-value	**Example:**  **Domain:** $(-\infty, \infty)$
Range: All y-values that are represented on the graph. For quadratics: *Identify Vertex* Is it a maximum or minimum? • The y –value of your vertex will tell you the highest or lowest point on the graph.	**Notation** Inequality Notation: $y \leq 3$ Interval notation: $(-\infty, 3]$	 **Range:** $(-\infty, 3]$
Axis of Symmetry: Identify Vertex: (h,k) Vertical line going through the vertex. It cuts the parabola in _____ *if the quadratic is in standard form, use $\frac{-b}{2a}$ to identify vertex	**Notation:** X = h if in vertex form X = $\frac{-b}{2a}$ if in standard form Coordinate pair that is at the maximum or minimum of your parabola if given a graph.	vertex $(-2, 3)$  **Axis of Symmetry:** $x = -2$
End Behavior: Where are the ends of the parabola pointing?	**If facing up** X→ ∞ y → ∞ X → -∞ Y → ∞	**If facing down** X→ ∞ y → $-\infty$ X → -∞ Y → $-\infty$

Algebra Quadratic Characteristics Name: _____

Intercepts

X-intercepts

Where the Graph Crosses the x – axis

Synonyms: roots, solutions

Y-intercept

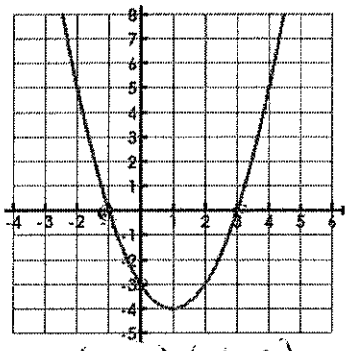
Where graph Crosses y –axis

Notation:

Coordinate Pair

$(x, 0)$

$(0, y)$



Solutions: $(3,0)(-1,0)$

Y-intercept: $(0, -3)$

Extrema

Highest or Lowest Point on graph.

"Maximum" or "Minimum"

For quadratics, always the vertex.

Rate of Change

Slope formula: $\frac{y_2 - y_1}{x_2 - x_1}$ or $\frac{\text{rise}}{\text{run}}$

Find slope between two Points

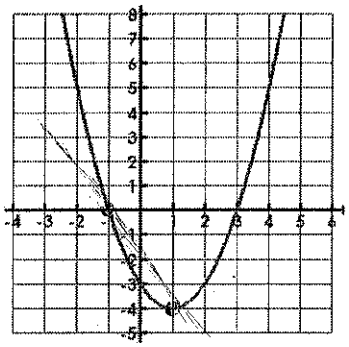
Notation:

Coordinate Pair:

State if Maximum or Minimum

Example: find rate of change between x=-1, and x=1

ROC = $\frac{4}{-2} = -2$



minimum

$(1, -4)$

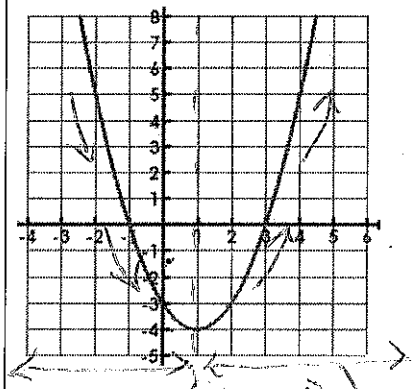
Interval of Increasing and Decreasing

We use the x – values to describe what's happening to the y-values

"look left and right to determine what's happening _____ and _____"

Notation:

Interval Notation:



Increasing: $(1, \infty)$

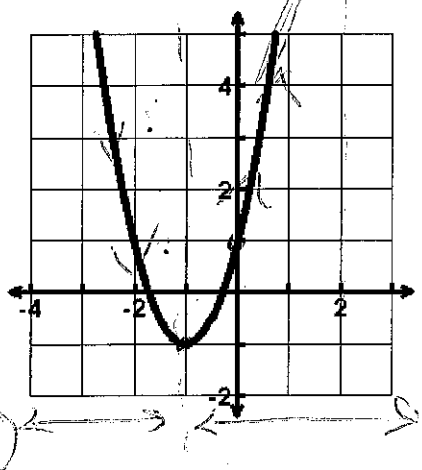
Decreasing: $(-\infty, 1)$

Algebra 1 Unit 3b – Graphing Quadratics

Name: _____ Date: _____

Characteristics of Functions

1. $f(x) = 2x^2 + 4x + 1$



a. Domain: $(-\infty, \infty)$ b. Range: $[-1, \infty)$

c. Extrema: $(-1, -1)$ min d. Axis of Sym: ~~$x=-1$~~

e. Increasing: $(-1, \infty)$ f. Decreasing: $(-\infty, -1)$

g. End Behavior: $x \to \infty, y \to \infty$ & $x \to -\infty, y \to \infty$

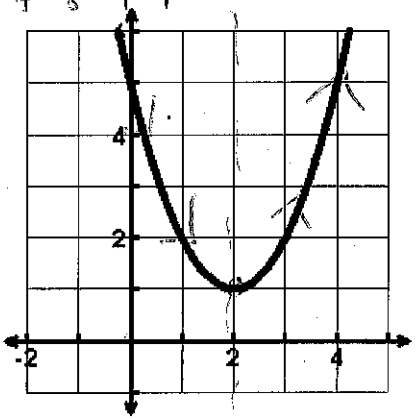
h. Average rate of change $0 \le x \le 2$

$(0, 1)$ $(2, 17)$ $m = \frac{17-1}{2-0} = \frac{16}{2} = 8$

$2(2)^2 + 4(2) + 1 =$

$8 + 8 + 1$

2. $f(x) = (x-2)^2 + 1$



a. Domain: $(-\infty, \infty)$ b. Range: $[1, \infty)$

c. Extrema: $(2, 1)$ min d. Axis of Sym: $x = 2$

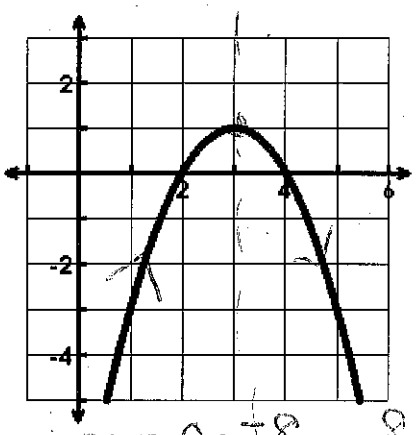
e. Increasing: $(2, \infty)$ f. Decreasing: $(-\infty, 2)$

g. End Behavior: $x \to \infty, y \to \infty$ & $x \to -\infty, y \to \infty$

h. Average rate of change $0 \le x \le 2$

$(0, 5)(2, 1)$ $m = \frac{1-5}{2-0} = \frac{-4}{2} = -2$

3. $f(x) = -(x-2)(x-4)$



a. Domain: $(-\infty, \infty)$ b. Range: $(-\infty, 1]$

c. Extrema: $(3, 1)$ max d. Axis of Sym: $x = 3$

e. Increasing: $(-\infty, 3)$ f. Decreasing: $(3, \infty)$

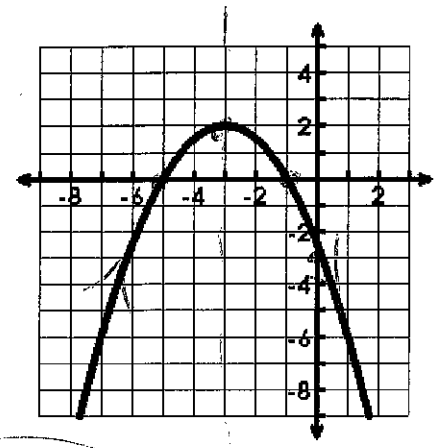
g. End Behavior: $x \to \infty, y \to -\infty$ & $x \to -\infty, y \to -\infty$

h. Average rate of change $0 \le x \le 2$

$(0, -8)$ $(2, 0)$ $m = \frac{0-(-8)}{2-0} = \frac{8}{2} = 4$

$-(0-2)(0-4) = -(-2)(-4) = -8$

4. This graph represents a quadratic function.



a. Extrema: (-3, 2) b. Axis of Sym: x = -3

c. Zeros: (-3, 0) (-1, 0) d. y-intercept: (0, -3)

e. Domain: (-∞, ∞) f. Range: (-∞, 2]

g. Increasing: (-∞, -3) h. Decreasing: (-3, ∞)

i. For the increasing interval, is the rate of change increasing or decreasing?

INC

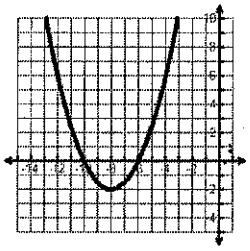
j. For the decreasing interval, is the rate of change increasing or decreasing?

5. The quadratic function $f(x)$ has these characteristics:

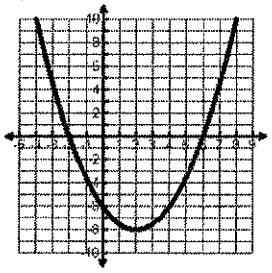
- The vertex is located at $(8, -2)$.
- The range is $-2 \le f(x) < \infty$. or $[-2, \infty)$

Which graph could be $f(x)$?

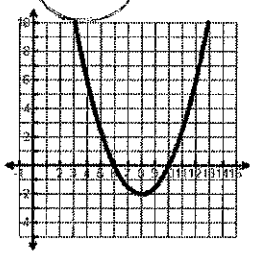
a)



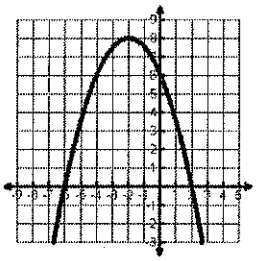
b)



c)



d)

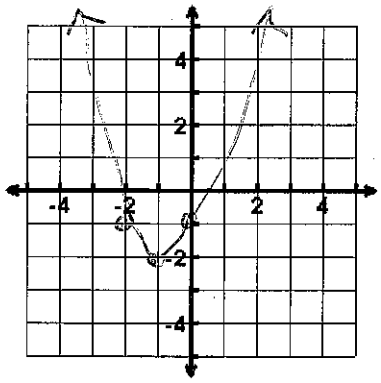


6. Use the information for a given quadratic function to sketch a picture of the function.

Domain: $-\infty < x < \infty$
Range: $y \ge -2$

Increasing: $-1 < x < \infty$
Decreasing: $-\infty < x < -1$

There is no stretch or shrink (a = 1)



Name: _____ Date: _____

Graphing Quadratic Equations

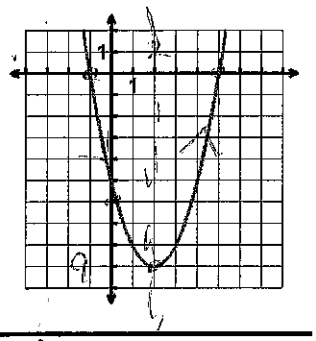
1. Domain: $(-\infty, \infty)$ Range: $[9, \infty)$

Vertex: $(2, 9)$ Extrema: $(2, 9)$

X intercept(s): $(-1, 0)(5, 0)$ min Y Intercept: $(0, -6)$

Increasing: $(2, \infty)$ Decreasing: $(-\infty, 2)$

Axis of Symmetry: $x = 2$



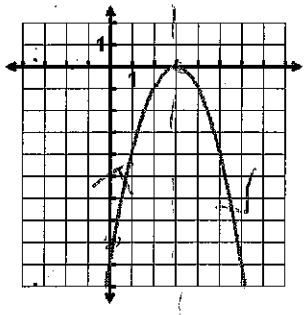
2. Domain: $(-\infty, \infty)$ Range: $(-\infty, 0]$

Vertex: $(3, 0)$ Extrema: $(3, 0)$

X intercept(s): — max Y Intercept: $(0, -8)$

Increasing: $(-\infty, 3)$ Decreasing: $(3, \infty)$

Axis of Symmetry: $x = 3$



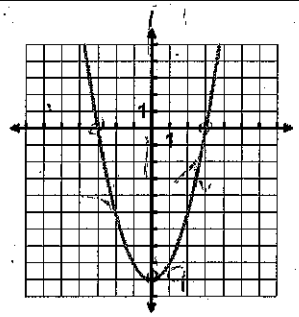
3. Domain: $(-\infty, \infty)$ Range: $[-9, \infty)$

Vertex: $(0, -9)$ Extrema: $(0, -9)$

X intercept(s): $(3, 0)(-3, 0)$ min Y Intercept: $(0, -9)$

Increasing: $(0, \infty)$ Decreasing: $(-\infty, 0)$

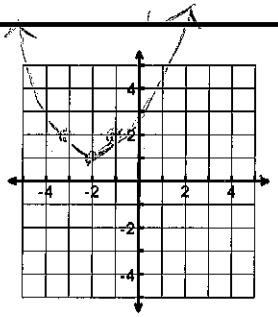
Axis of Symmetry: $x = 0$



Use the information to sketch a quadratic.

4. Domain: all real numbers
Range: $y \geq 1$

Increasing: $-2 < x < \infty$
Decreasing: $-\infty < x < -2$
There is no stretch or shrink (a = 1)



5. Domain: all real numbers
Vertex: $(1, 2)$

Increasing: $-\infty < x < 1$
Decreasing: $1 < x < \infty$
There is no stretch or shrink (a = 1)