

## Key Concept 5: Comparing Functions – Modeling and Transformations

### Sections

5A – Regression

5B – Graphs of Quadratics and Exponentials

5C – Comparing Functions

5D – Transformations

### 5B – Graphs of Quadratics and Exponentials

#### ❖ Vocabulary, Formulas, Theories:

- Quadratic Function:** a function where the degree (or largest exponent) is \_\_\_\_\_. The graph is a parabola that opens \_\_\_\_\_. The standard form of a quadratic function is written as \_\_\_\_\_ where \_\_\_\_\_.
- Vertex Form:** an algebraic representation of a parabola. It's written as \_\_\_\_\_ where \_\_\_\_\_ and the vertex is \_\_\_\_\_. That's when the parabola opens \_\_\_\_\_. If it opens \_\_\_\_\_, it's written as \_\_\_\_\_ where \_\_\_\_\_ and the vertex is \_\_\_\_\_.
- Exponential Function:** a function that has a variable as an \_\_\_\_\_. It takes the form: \_\_\_\_\_ where \_\_\_\_\_ and either  $b$  is between 0 and 1 or greater than 1. This is written algebraically as \_\_\_\_\_ or \_\_\_\_\_.
- Intercepts:** the x-intercept is the point where the graph crosses the \_\_\_\_\_ and the y-intercept is where the graph crosses the \_\_\_\_\_.

*Example*

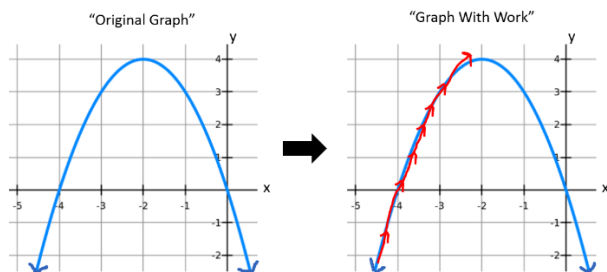
- End Behavior:** the direction of the vertical values (ex: \_\_\_\_\_) as the horizontal values (ex:  $x$  values) decrease (move left) and increase (move right).

*Example*

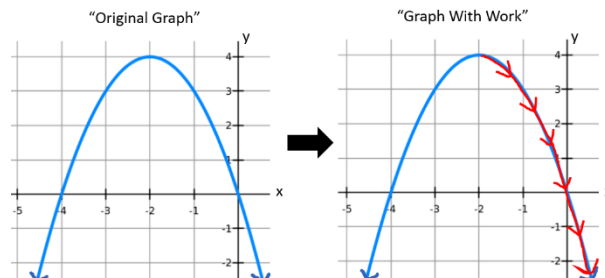
- **Increasing/Decreasing Intervals:** an interval represented by the \_\_\_\_\_ where the vertical y values are \_\_\_\_\_. See the example below:

y values are **increasing** from **negative infinity** to  **$x = -2$**

y values are **decreasing** from  **$x = -2$**  to **positive infinity**



Interval Notation:  $(-\infty, -2]$



Interval Notation:  $[-2, +\infty)$

- **System of Equations:** a set of two or more equations with more than one variable.
- **Solution to a System of Equations:** the solution(s) to a system of equations (a set of two or more equations) is represented on a graph by the intersection(s).

Graphs of functions have plenty of different key features. This section involves comparing key features between quadratics and exponentials. Before getting into example questions, let's review some terms. Watch the next video to gain familiarity with some of the key features that will be used.

📺 Video - ["Key Features of Graphs - Vocabulary" - MathontheWeb \(4:09\)](#)

The first key features that will be used is an intercept. An x-intercept is where the graph crosses the x-axis and a y-intercept is where the graph crosses the y-axis.

📺 Video - ["Intercepts - Example" - MathontheWeb \(3:33\)](#)

EX1) Identify the x-intercepts and y-intercept of the equation:  $y = x^2 + x - 20$ .

Some functions can be identified as increasing or decreasing. That often happens when dealing with exponential functions.

📺 Video - ["Increasing and Decreasing Functions - Example" - MathontheWeb \(2:04\)](#)

EX2) Determine whether the function is increasing or decreasing.

a.  $y = 2^{x-3}$

b.  $y = 3^{-x+1}$