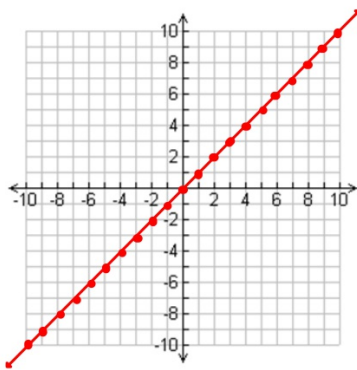


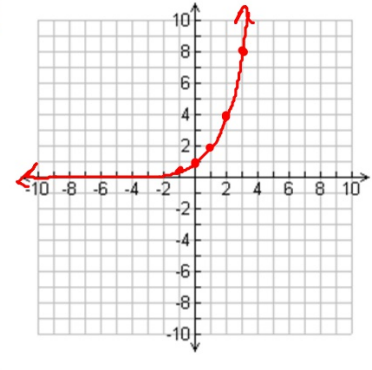
Bellwork

Graph each of the following functions:

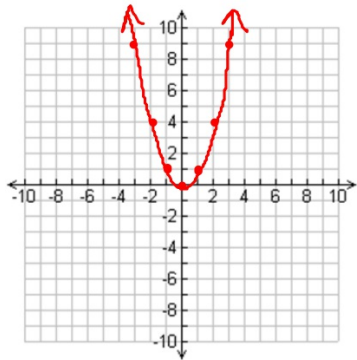
1. $y = x$



2. $y = 2^x$



3. $y = x^2$



Transformations

Transformation:

The process of sliding, flipping, turning a function while still maintaining its original shape.

What we are transforming:

1. Linear Parent Function
2. Exponential Parent Function
3. Quadratic Parent Function

Parent Function:

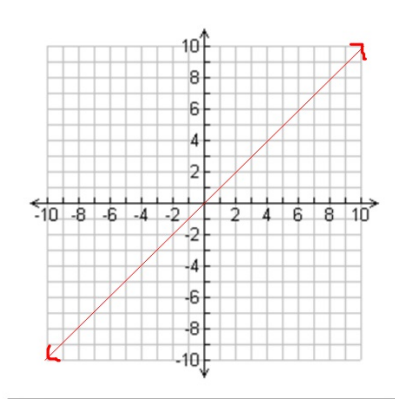
The most basic function of it's type.

Linear Parent Function

Parent Function:

$$y = x$$

Graph of the Parent Function:



Linear Transformations

What are we dealing with in this class?

1. Reflections over the x-axis.
2. Shifts up or down.

Procedure:

1. To reflect over the x-axis you just have to change the sign in front of the x term.
2. To shift up, you add to the end of the function.
3. To shift down, you subtract to the end of the function.

Examples

Rewrite the given equation applying the given transformation:

1. $y = 2x$ reflected across the x-axis and shifted up 9 units.

$$y = -2x + 9$$

2. $y = 9x$ shifted down 1 unit.

$$y = 9x - 1$$

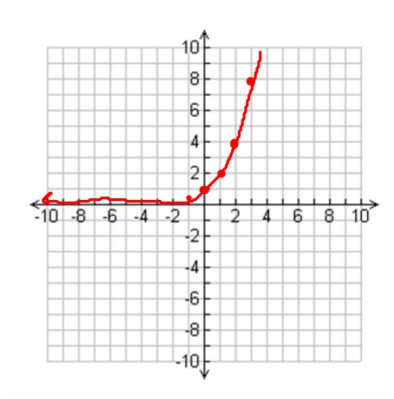
Exponential Parent Function

Parent Function:

$$y = b^x$$

Graph of the Parent Function:

Let's graph
 $y = (2)^x$



Exponential Transformations

What are we dealing with in this class?

1. Horizontal shifts
2. Vertical Shifts

Equation to remember:

$$y = ab^{x-h} + k$$

Procedure:

1. Horizontal shifts go in for h
(OPPOSITE SIGNS)
2. Vertical shifts go in for k (SAME SIGN)

Examples

Rewrite the given equation applying the given transformation:

1. $y = -2(3)^x$ translated 9 units right.

$$y = -2(3)^{x-9}$$

2. $y = 8(5)^x$ translated 7 units down.

$$y = 8(5)^x - 7$$

3. $y = -11(8)^x$ translated 4 units up and 6 units to the left.

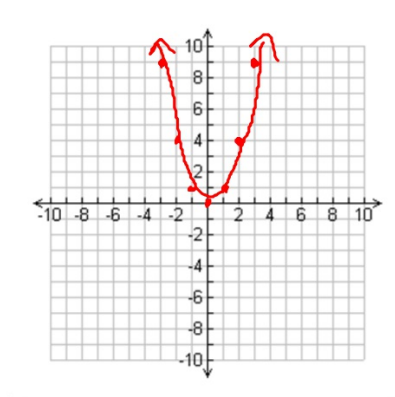
$$y = -11(8)^{x+6} + 4$$

Quadratic Parent Function

Parent Function:

$$y = x^2$$

Graph of the Parent Function:



Quadratic Transformations

What are we dealing with in this class?

1. Horizontal shifts
2. Vertical Shifts

Equation to remember:

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

Procedure:

1. Horizontal shifts go in for h
(OPPOSITE SIGNS)
2. Vertical shifts go in for k (SAME SIGN)

Examples

Rewrite the given equation applying the given transformation:

1. $y = -3x^2$ translated 8 units to the left.

$$y = -3(x + 8)^2$$

2. $y = 7x^2$ translated 15 units down.

$$y = 7x^2 - 15$$

3. $y = -17x^2$ translated 6 units to the right and 24 units up.

$$y = -17(x - 6)^2 + 24$$