

$$y = [x]$$

$$y = \frac{3x}{x-1}$$

$$y = \begin{cases} x+1 & \text{when } x < 0 \\ 2x & \text{when } x > 0 \end{cases}$$

$$y = mx + b$$

$$y = ax^5 + bx^4 + cx^3 + dx^2 + ex + f$$

# Functions

$$y = |x|$$

$$y = \sin x$$

$$y = \sqrt{x}$$

$$y = ax^2 + bx + c$$

## 7-1A Graphing Exponential Functions $y = a \cdot b^x$

- graph exponential growth & decay functions
- F.IF.7e, F.IF.8b

**KeyConcept** Parent Function of Exponential Growth Functions

Parent Functions:  $f(x) = b^x, b > 1$   $b^0 = 1$  (0,1)  $f(x) = b^x, b > 1$

Type of graph: continuous, one-to-one, and increasing

Domain: all real numbers

Range: all positive real numbers

Asymptote: x-axis

Intercept: (0, 1)

**KeyConcept** Parent Function of Exponential Decay Functions

Parent Functions:  $f(x) = b^x, 0 < b < 1$  Model

Type of graph: continuous, one-to-one, and decreasing

Domain: all real numbers

Range: positive real numbers

Asymptote: x-axis

Intercept: (0, 1)

**KeyConcept Transformations of Exponential Functions**

$$f(x) = ab^{x-h} + k$$

**$h$  – Horizontal Translation**

$h$  units right if  $h$  is positive  
 $|h|$  units left if  $h$  is negative

**$k$  – Vertical Translation**

$k$  units up if  $k$  is positive  
 $|k|$  units down if  $k$  is negative

**$a$  – Orientation and Shape**

If  $a < 0$ , the graph is reflected in the  $x$ -axis.

If  $|a| > 1$ , the graph is stretched vertically.  
 If  $0 < |a| < 1$ , the graph is compressed vertically.

transformations are the same for both exponential growth and decay functions.

Sketch the following exponential functions. Describe the transformation in the 2nd function. Determine whether the function represents growth or decay.  *$b=3$  growth*

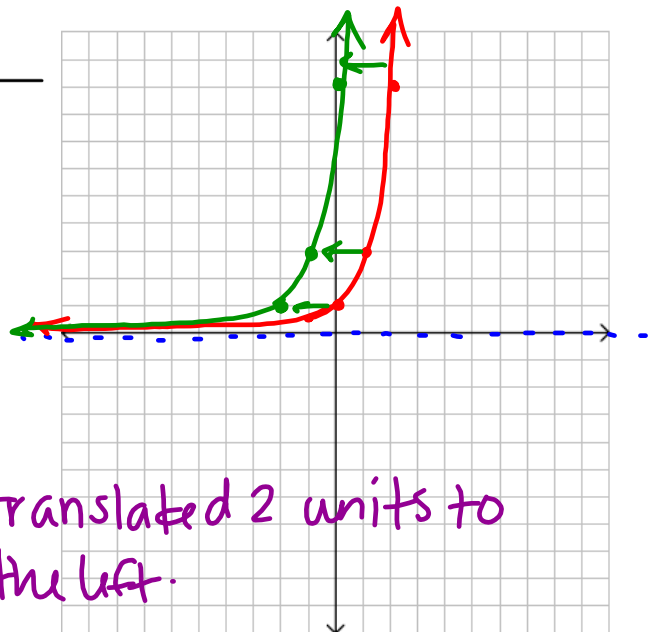
1.  $y = 3^x$

*$y = 3^{-1}$   
 $y = \frac{1}{3}$*

x	y
-1	$\frac{1}{3}$
0	1
1	3
2	9

2.  $y = 3^{x+2}$   *$h=-2$*

x	y
-1	3
0	9
1	27



*translated 2 units to the left.*

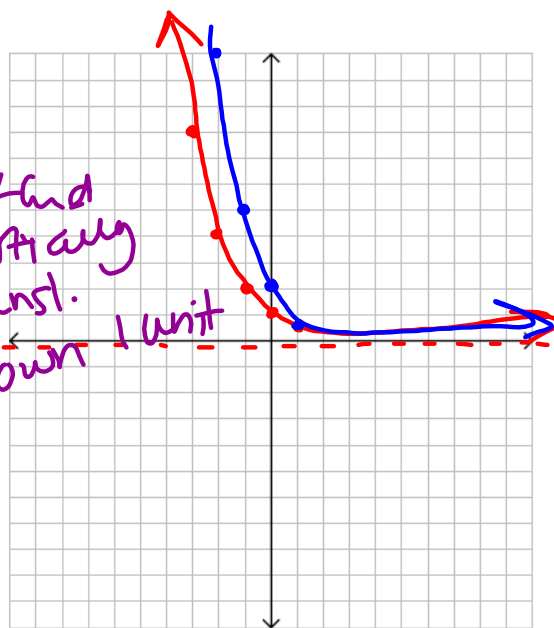
Sketch the following exponential functions. Describe the transformation in the 2nd function. Determine whether the function represents growth or decay.

3.  $y = (\frac{1}{2})^x$   
*decay*  $b = \frac{1}{2}$

$(\frac{1}{2})^{-1} = 2$   
 $(\frac{1}{2})^{-2} = 2^2$

x	y
0	1
1	$\frac{1}{2}$
-1	2
-2	4
-3	8

*Stretch and vertically trans. down 1 unit*



4.  $y = 3(\frac{1}{2})^x - 1$

x	y
0	2
1	$\frac{1}{2}$
-1	5
-2	11

*3(1) - 1 = 2*  
*3(1/2) - 1 = 1.5 - 1 = 0.5*  
*3(2) - 1 = 6 - 1 = 5*  
*3(4) - 1 = 12 - 1 = 11*

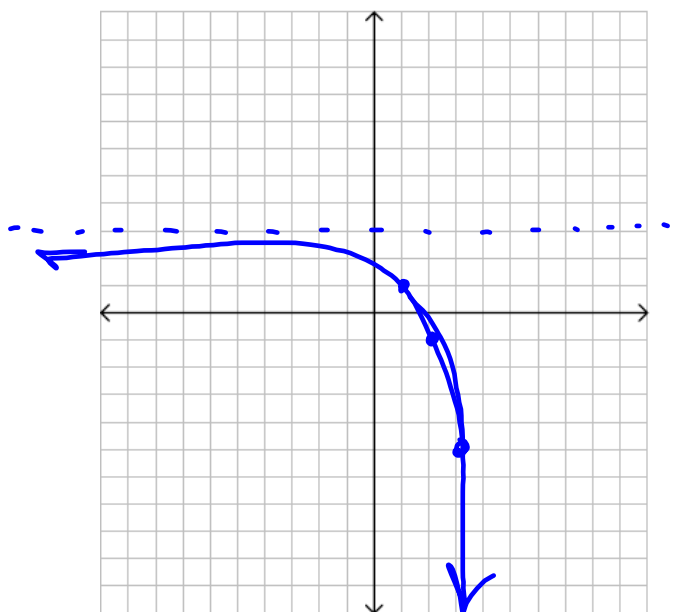
Sketch the following exponential functions. Describe the transformation in the 2nd function. Determine whether the function represents growth or decay.

5.  ~~$y = (2)^x$~~

*growth*

x	y
1	1
2	-1
3	-5

6.  $y = -2(2)^{x-1} + 3$



## Lesson Summary

Determine whether the graph of function  $y = 2^{x-3} + 1$  represents growth or decay.

## Practice Problem

Describe the transformation of the function  $y = 2^{x-3} + 1$ .

## Attachments

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10-1A Key.notebook