

Today's Learning Goal(s):

Date: _____

By the end of the class, I will be able to:

- a) graph exponential functions using transformations.

Last day's work: pp. 214-215 A – H

p. 216 #1, 2

4.6 Transformations of Exponential Functions

Date: Apr 12/17

Recall: $y = af(k(x-d))+c$

A new Parent Function

$$y = b^x$$

Same rules apply.

**don't forget to factor k out of $(kx - d)$

Features:

Horizontal Asymptote

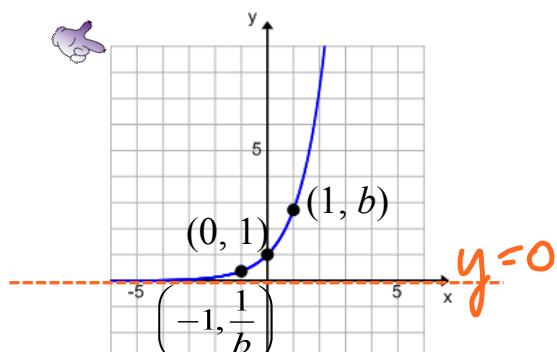
$$y = 0$$

Domain

$$\{x \in \mathbb{R}\}$$

Range

$$\{y \in \mathbb{R} | y > 0\}$$



If $b > 1$, it is a growth function.

If $0 < b < 1$, it is a decay function.

Ex.1 Sketch the following. Given $f(x) = 2^x$

$$y = 2^x$$

$$y = f(x) - 3$$

$$y = 2^x - 3$$

$$y = f(x + 2)$$

$$y = 2^{x+2}$$

$$y = 3f(x)$$

$$y = 3(2^x)$$

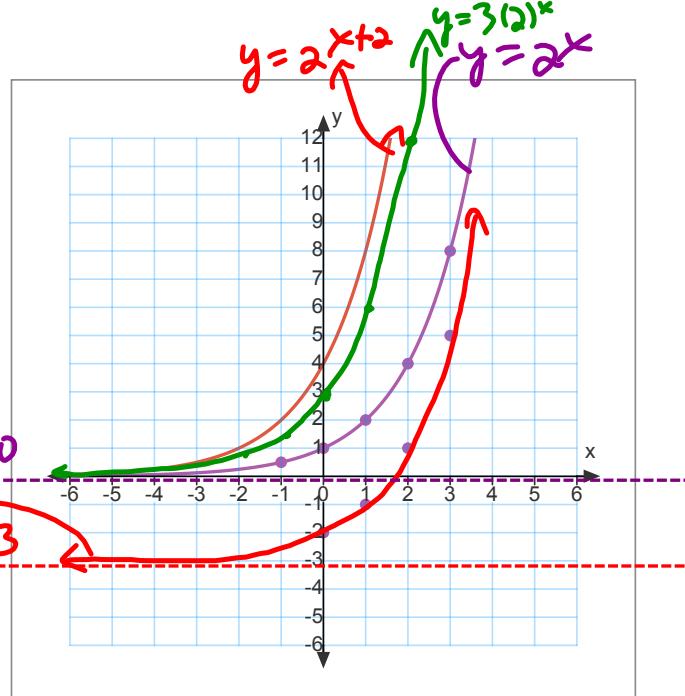
$$(x, y) \quad (x, 3y)$$

$$(0, 1)$$

$$(0, 3)$$

$$(1, 2)$$

$$(1, 6)$$



Ex.2 Exponential Functions:

Name the base function and describe the transformations on each graph.

a) $f(x) = 2^{x-4} + 3$

base 2 function

ht. 4 units right

vt. 3 units up

b) $g(x) = \frac{1}{3}(4^{x-2}) - 1$

base 4

V.C. by a factor of $\frac{1}{3}$

ht. 2 units right

vt 1 unit down

c) $f(x) = \frac{1}{2}(5^{3x-9}) - 2$

$= \frac{1}{2}(5^{3(x-3)}) - 2$

base 5

V.C by a factor of $\frac{1}{2}$

vt 2 units down

h.t. 3 units right

h.c. by a factor of $\frac{1}{3}$

d) $g(x) = -2(3^{-2x-4}) + 1$

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

base function is $y=3^x$

vertical stretch by a factor of 2

reflection in the x -axishorizontal compression by a factor of $\frac{1}{2}$
reflection in the y -axishorizontal translation 2 units left
vertical translation 1 unit up

Ex.3 Sketch the graph of $y = -2(4^{x-3}) - 1$.

State the domain and range, and the y-intercept of the graph.

$$(x, y) \rightarrow (x+3, -2y-1)$$

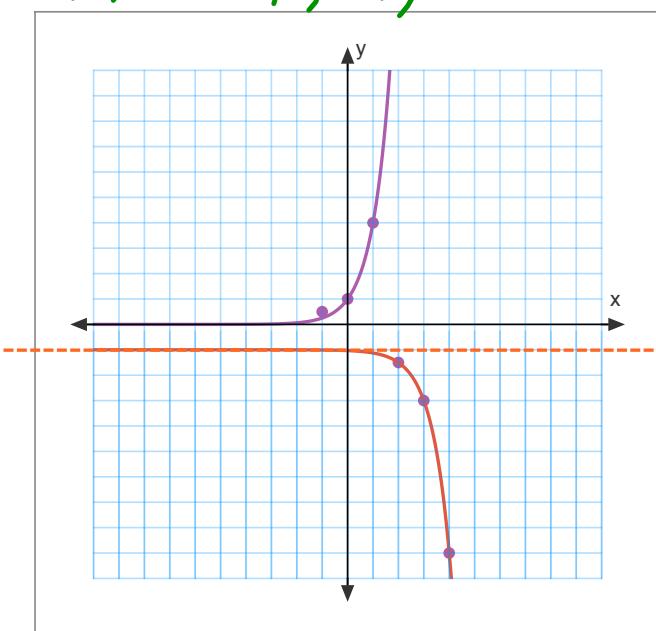
$$(0, 1) \rightarrow (3, -3)$$

$$(1, 4) \rightarrow (4, -9)$$

$$y = (4^x)$$

x	y
-1	$\frac{1}{4}$
0	1
1	4

$\Rightarrow (2, -\frac{3}{2})$



$$y = -1$$

x	y
2	$-\frac{3}{2}$
3	-3
4	-9

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

y-intercept, let $x = 0$

$$\begin{aligned} y &= -2(4^{0-3}) - 1 \\ &= -2(4^{-3}) - 1 \end{aligned}$$

$$= -2\left(\frac{1}{64}\right) - 1$$

$$= -\frac{1}{32} - \frac{32}{32}$$

$$= -\frac{33}{32}$$

$$y = 4^x$$

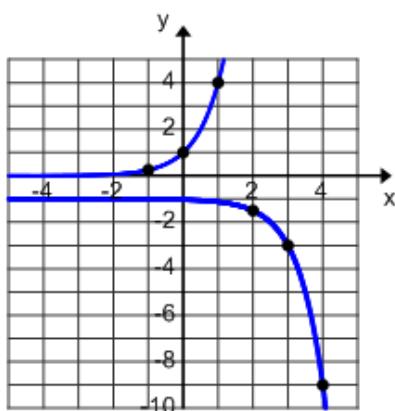
$$y = -2(4^{x-3}) - 1$$

$$D = \{x \in \mathbb{R}\}$$

$$R = \{y \in \mathbb{R} \mid y < -1\}$$

Hor. Asymptote: $y = -1$

y-intercept = -1.03125 *let $x = 0$ and solve



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

$$(x, y) \rightarrow (x+3, -2y-1)$$

Are there any Homework Questions you would like to see on the board?

Last day's work: pp. 214-215 A – H
p. 216 #1, 2

Today's Homework Practice includes:

pp. 251-253 #(1,2)ab, 3, 4ab, 5ab, 9
(Optional Wkst 4.6 Extra Practice)