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

Addional Info for
p.216 #2 (*at end*)

4.6 Transformations of Exponential Functions

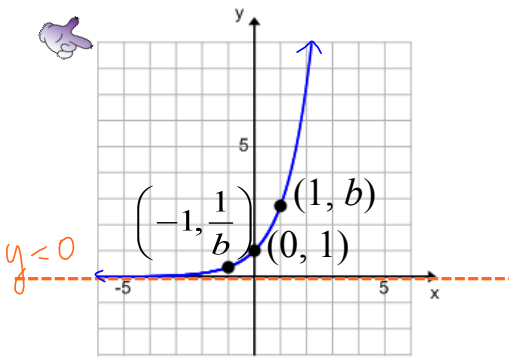
Date: Apr. 11/19

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

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

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

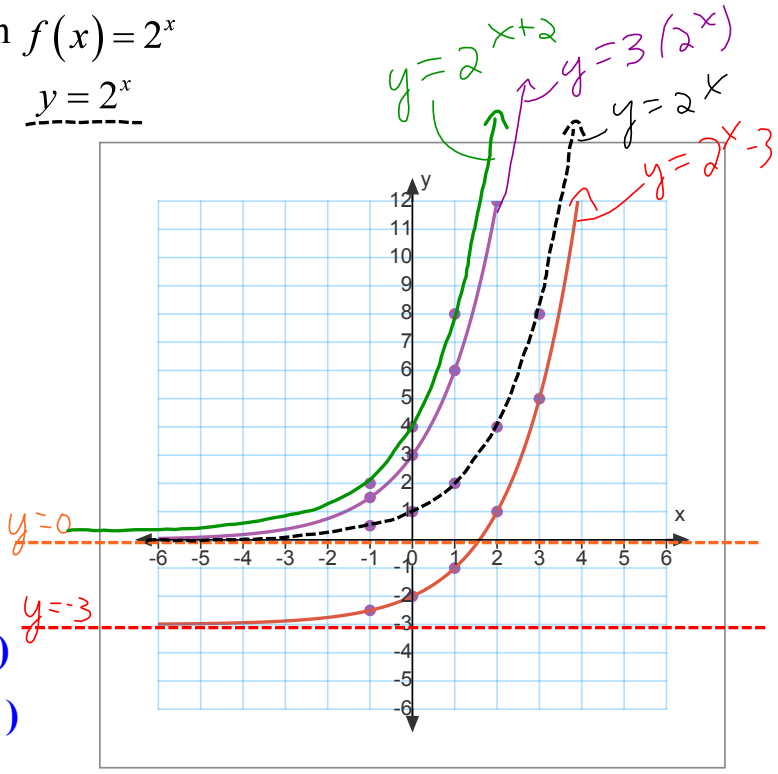
If b>1, it is a growth function.

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

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

$y = f(x) - 3$ $y = f(x+2)$

$y = 2^x - 3$ $y = 2^{x+2}$



$y = 3f(x)$

$y = 3(2^x)$

(x, y)	$(x, 3y)$
(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 function is $y=2^x$

horizontal translation 4 units right
vertical translation 3 units up

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

base function is $y=4^x$

vertical compression by a factor of $\frac{1}{3}$

horizontal translation 2 units right
vertical translation 1 unit down

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

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

base function is $y=5^x$

vertical compression by a factor of $\frac{1}{2}$

horizontal compression by a factor of $\frac{1}{3}$

horizontal translation 3 units right
vertical translation 2 units down

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

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

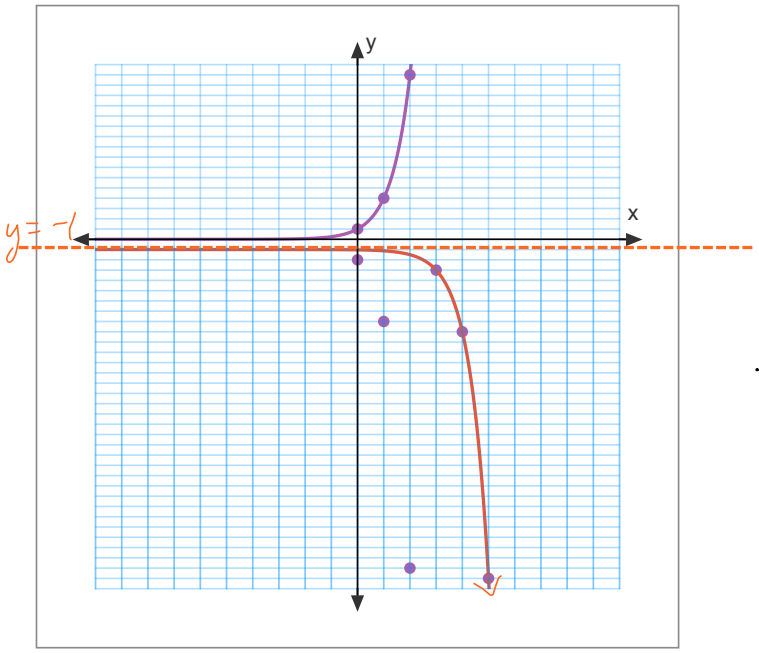
base function is $y=3^x$

vertical stretch by a factor of 2
reflection in the x-axis

horizontal compression by a factor of ½
reflection in the y-axis

horizontal 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.



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

$y = \left(4^{x}\right)$

x	y
-1	
0	
1	

D: {x∈ℝ}
R: {y∈ℝ | y<-1}

y-int, let x =

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

$= -2(4^{0-3}) - 1$

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

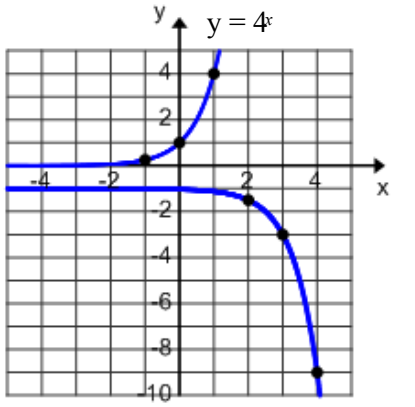
$= -2\left(\frac{1}{4^3}\right) - 1$

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

$= -\frac{2}{32} - 1$

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

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



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

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

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

D = {x∈ℝ}
R = {y∈ℝ | y < -1}
Hor. Asymptote: y = -1
y-intercept = $\frac{-33}{32}$ *let $x = 0$ and solve

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

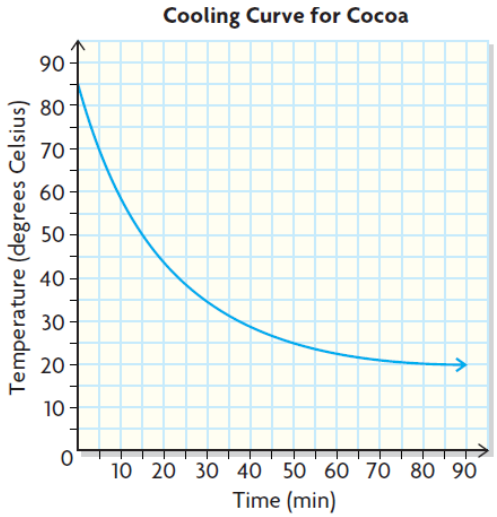
Today's Homework Practice includes:

pp. 251-253 #(1,2)ab, 3, 4ab, 5ab, 9

(*Oponal Wkst 4.6 Extra Pracce*)

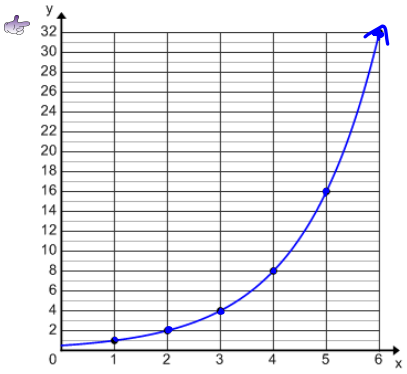
Addional Info for
p.216 #2 (*next page*)

1. A cup of hot cocoa left on a desk in a classroom had its temperature measured once every minute. The graph shows the relationship between the temperature of the cocoa, in degrees Celsius, and time, in minutes.



a) What characteristics of this graph are the same as the graph(s) you drew in the ball-bounce experiment?
b) What was the temperature of the cocoa at the start of the experiment?
c) What is the temperature of the classroom?

p. 216 # 2 What would the graph of the first six days look like?



Day	Number of Grains of Rice		Day	Number of Grains of Rice
1	1		33	4294967296
2	2		34	8589934592
3	4		35	17179869184
4	8		36	34359738368
5	16		37	68719476736
6	32		38	137438953472
7	64		39	274877906944
8	128		40	549755813888
9	256		41	**1,099,511,627,776**
10	512		42	2199023255552
11	1024		43	4398046511104
12	2048		44	8796093022208
13	4096		45	17592186044416
14	8192		46	35184372088832
15	16384		47	70368744177664
16	32768		48	140737488355328
17	65536		49	281474976710656
18	131072		50	562949953421312
19	262144		51	1125899906842620
20	524288		52	2251799813685250
21	1048576		53	4503599627370500
22	2097152		54	9007199254740990
23	4194304		55	18014398509482000
24	8388608		56	36028797018964000
25	16777216		57	72057594037927900
26	33554432		58	144115188075856000
27	67108864		59	288230376151712000
28	134217728		60	576460752303423000
29	268435456		61	1152921504606850000
30	536870912		62	2305843009213690000
31	1073741824		63	4611686018427390000
32	2,147,483,648		64	**9,223,372,036,854,780,000**

Note: This is 9.2 quintillion

9.2×10^{18}