Warm-Up 4/13/2021

1. What is the value of

$f(x) = 4^{2x} - 100$ when $x = 2$?

$256 - 100 = 156$

2. What is the value of

$f(x) = 3^{2x+1}$ when $x = 1/2$?

$= 3^{2(\frac{1}{2})+1} = 9$

Day 2 Notes: Graphing Exponential Functions

The general form of an exponential function is:
$y = ab^x$

Where **a** represents your starting or initial value
b represents your growth/decay factor (change)

An **asymptote** is a line that an exponential graph gets closer and closer to but never touches or crosses.

The equation for the line of an asymptote is always y = __k__. Constant

$y = 3(2)^x + 4$

Graph the following:

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

$a = 3$
$b = 2$

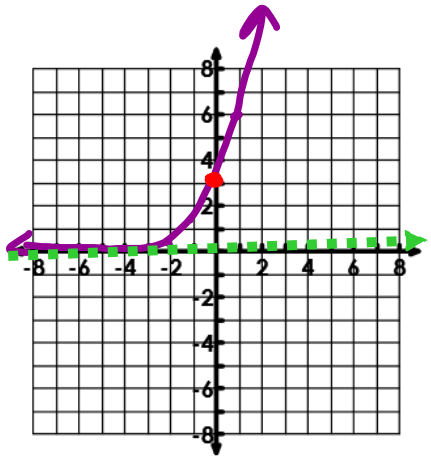
growth

Growth or decay?

Asymptote: $y = 0$

Y-intercept: $(0, 3)$

x	$y = 3(2)^x$
-2	3/4
-1	3/2
0	3
1	6
2	12



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

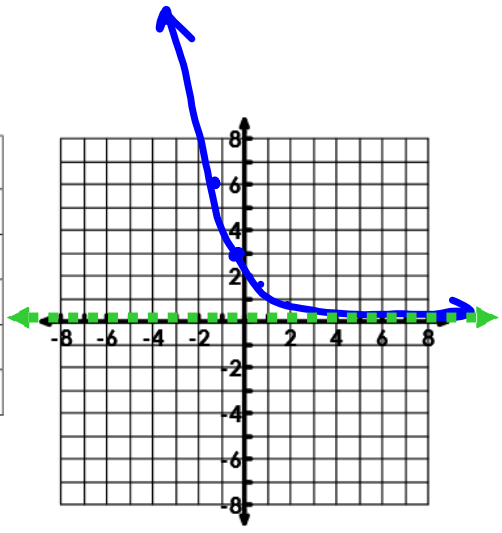
$a = 3$
$b = \frac{1}{2}$

Growth or decay?

Asymptote: $y = 0$

Y-intercept: $(0, 3)$

x	$y = 3\left(\frac{1}{2}\right)^x$
-2	12
-1	6
0	3
1	1.5
2	0.75




Untitled Graph
desmos
$3(2)^x + 4$
10
5
-20
-15
-10
-5
0

Creating Exponential Functions

Exponential Functions	a = Start/initial amount/y-int b = Change (growth/decay) x = How often change occurs y = Result of change over time
$y = ab^x$	

Write the equations that model these exponential functions.

1.

x	−1	0	1	2
y	50	10	2	0.4

$a = 10$ Decay

$b = \frac{0.4}{2} = 0.2$

$y = 10(0.2)^x$

2.

Position, x	0	1	2	3	4	5
Term, y	256	128	64	32	16	8

÷0.5 ×0.5

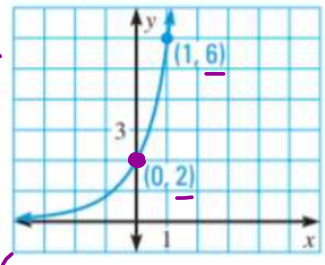
$b = \frac{32}{64}$ Decay

$b = \frac{1}{2}$ or 0.5

$a = 256$

$y = 256(0.5)^x$

3.



growth

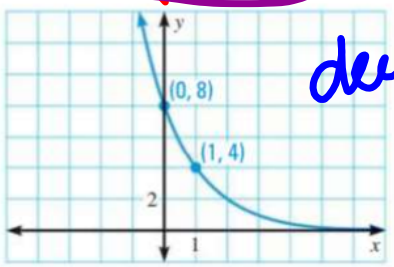
2, 6

$b = \frac{6}{2} = 3$

$a = 2$

$y = 2(3)^x$

4.



decay

8, 4

$b = \frac{4}{8} = \frac{1}{2}$ or 0.5

$a = 8$

$y = 8(0.5)^x$

$y = ab^x$

5. March Madness is an example of exponential decay. At each round of the tournament, only the winning teams stay, so the number of teams playing at each round is half of the number of teams playing in the previous round. If 64 teams are a part of the official bracket at the start, how many teams are left after 5 rounds of play?

$a = 64$ $y = 64\left(\frac{1}{2}\right)^x$

$b = \frac{1}{2}$ $f(5) = 64\left(\frac{1}{2}\right)^5 = 2$

Two Teams left after 5 rounds of play

6. Bacteria can multiply at an alarming rate, where each bacterium split into two new cells, doubling the number of bacteria present. If there are ten bacteria on your desk, and they double every hour, how many bacteria will be present tomorrow (desk uncleaned)?

$a = 10$ $f(x) = 10(2)^x$

$b = 2$ $f(24) = 10(2)^{24}$

$x = 24$ $f(24) = 167,772,160$ bacteria

7. Phosphorus-32 is used to study a plant's use of fertilizer. It has a half-life of 14 days. Write the exponential decay function for a 50-mg sample. Find the amount of phosphorus-32 remaining after 84 days.

Half-Life: $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{T}}$

A_0 – initial value
t = time
T = halflife

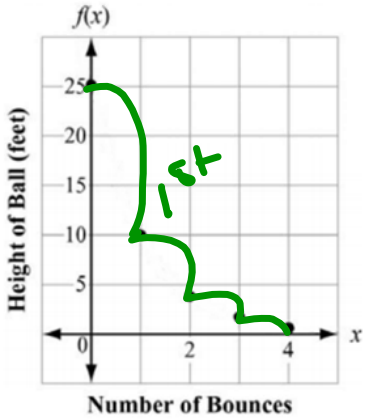
$A_0 = 50$
$t = 84$
$T = 14$

$A = 50\left(\frac{1}{2}\right)^{\frac{84}{14}}$

$A = 0.78125$ mg

≈ 0.78 mg

8. The function graphed on this coordinate grid shows $f(x)$, the height of a dropped ball in feet after its xth bounce.



On which bounce was the height of the ball 10 feet?

A. bounce 1
B. bounce 2
C. bounce 3
D. bounce 4

Day 2 Class Work: Exponential Functions **Practice Assignment**

Graph the following:

1. $y = \left(\frac{1}{4}\right)^x$

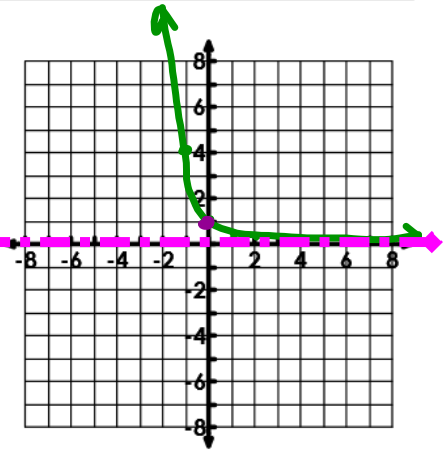
a = 1
b = 1/4

Growth or decay?

Asymptote: y=0

Y-intercept: (0,1)

x	$y = \left(\frac{1}{4}\right)^x$
-2	16
-1	4
0	1
1	0.25
2	0.0625



2. Bacteria can multiply at an alarming rate, where each bacterium split into two new cells, doubling the number of bacteria present. If there are 15 bacteria in a petri dish in a lab, and they double every hour, how many bacteria will be present in 24 hours?

$a = 15$

$b = 2$

$x = 24$

3. The half-life of a certain type of radioactive substance is 70 months. If 41 lbs of the substance was originally present in a treasure chest, how much would be left after 20 months?

Half-Life $\Rightarrow A = A_0\left(\frac{1}{2}\right)^{\frac{t}{T}}$

$A = 41\left(\frac{1}{2}\right)^{\frac{20}{70}}$

$A = 33.6 \text{ lbs}$

A_0 = initial value

t = time

T = half life

Write the equations that model these exponential functions.

4. decay

x	y
0	64
1	32
2	16
3	8

$a = 64$

$b = \frac{32}{64} = \frac{1}{2}$ or 0.5

$y = 64\left(\frac{1}{2}\right)^x$

5. growth

x	y
1	9
2	27
3	81
4	243

÷ 3

× 3

$b = \frac{27}{9} = 3$

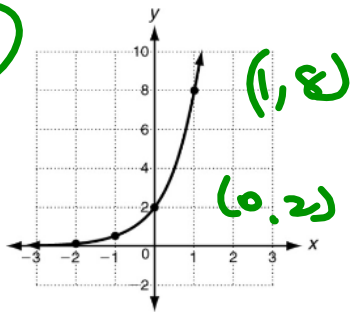
$a = 9 \div 3 = 3$

$y = 3(3)^x$

$a=2$ $b=4$

6. Which graph shows $y = 2(4)^x$?

A.



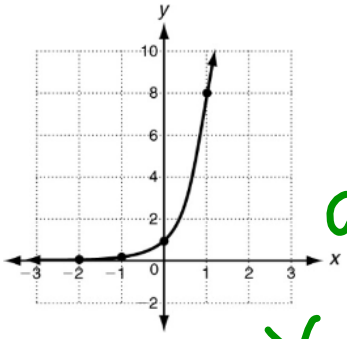
(1, 8)

(0, 2)

$a=2$

$b = 8/2 = 4$

B.



$a=1$

X

Home Work on Deltamath.com

Unit 4: Exponential Functions

Due 4/21/2021