Exponentials- Study Guide

1. Label and explain the following exponential equations:

a) $y = ab^x$ → Time
→ change factor
Total
Initial value

b) $y = a(1 \pm r)^x$ → time
→ % rate
Initial value
Total
change factor

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

$a \rightarrow$ Stretch /Compress/ flip
　　> 1　fraction　—

$b \rightarrow$ Growth / Decay
　　> 1　　fraction

$h \rightarrow$ horizontal left /right
　　　　　　－　　＋

$k \rightarrow$ Vertical　up / down
　　　　　　＋　　－

Determine whether the table represents an *exponential growth function*, an *exponential decay function*, *linear*, or *neither*. Make sure to explain your reasoning.

2.

+1　+1　+1

x	0	1	2	3
y	2	4	12	48

×2　×3　×4
+2　+8　+36

Neither The y's are not multiplying by a constant facter. Also not adding by a Constant value

3.

+1　+1　+1

x	0	1	2	3
y	270	90	30	10

÷3　÷3　÷3

Exponential Decay

The y values are being divided by a constant facter

4.

−1　−1　−1

x	-1	0	-1	-2
y	-4	0	4	8

+4　+4　+4

Neither
The x values are not changing by a constant value

Find the value of *a, b, and r*. Determine whether the data represents an *exponential growth function*, an *exponential decay function*. Make sure to explain your reasoning.

5. $y = 3(.85)^x$

$a = 3$
$b = .85$
$r = .15$

Exponential decay because the change factor is less than 1

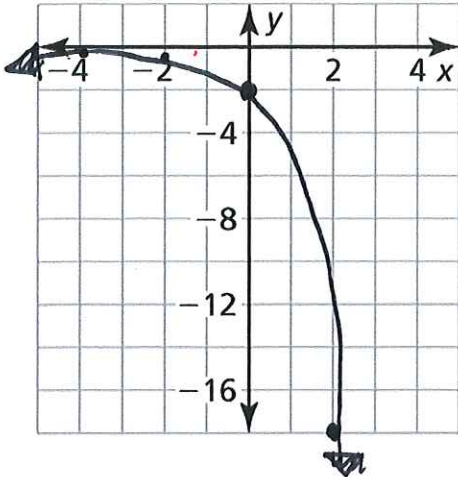**6.** $y = 3(1 - .3)^x$

$a = 3$
$b = .7$
$r = .3$

Exponential Decay because the rate is being subtracted.

7. $y = 2(1.4)^x$

$a = 2$
$b = 1.4$
$r = .4$

Exponential Growth because the change facter is greater than 1

8. Graph $y = -2(3)^x$

X	Y
-4	-.024
-2	-.22
0	-2
2	-18
4	-162

$y = -2(3)^{-4}$
$y = -2(.0123)$
$y = -.024$

$y = -2(3)^{-2}$
$y = -2(.11)$
$y = -.222$

$y = -2(3)^0$
$y = -2(1)$
$y = -2$

$y = -2(3)^2$
$y = -2(9)$
$y = -18$

$y = -2(3)^x$
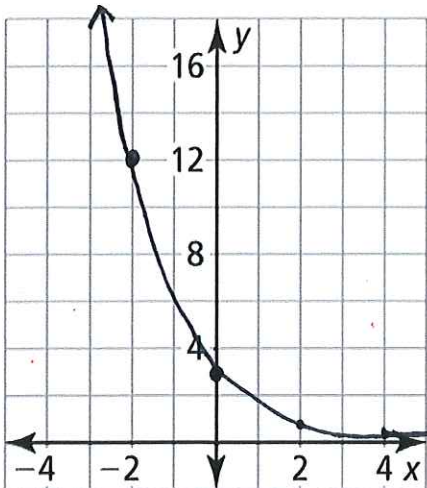$y = -2(3)^4$
$y = -2(81)$
$y = -162$

9. Graph $y = 3(0.5)^x$

X	Y
-4	48
-2	12
0	3
2	.75
4	.1875

$y = 3(.5)^{-4}$
$y = 3(16)$
$y = 48$

$y = 3(.5)^{-2}$
$y = 3(4)$
$y = 12$

$y = 3(.5)^0$
$y = 3(1)$
$y = 3$

$y = 3(.5)^2$
$y = 3(.25)$
$y = .75$

$y = 3(.5)^4$
$y = 3(.0625)$
$y = .1875$

Name:_____   Date: _____

Evaluate the function for the given value of x.

10. $y = 2^x;\ x = 5$

$y = 2^5$
$y = 32$

11. $f(x) = 3(4)^x;\ x = -1$

$f(-1) = 3(4)^{-1}$
$f(-1) = 3\left(\frac{1}{4}\right)$
$f(-1) = \frac{3}{4}$
$f(-1) = .75$

12. $y = -4(2)^x;\ x = -3$

$y = -4(2)^{-3}$
$y = -4\frac{1}{2^3}$
$y = -4\left(\frac{1}{8}\right)$
$y = -\frac{4}{8}$
$y = -\frac{1}{2}$
$y = -.5$

13. $f(x) = 5(3)^x;\ x = 0$

$f(0) = 5(3)^0$
$f(0) = 5(1)$
$f(0) = 5$

Write an equation to model the situation. Be sure to label the parts of your equation.

1. You are brushing your teeth and you have 4 bacterial. They double every hour.

$y = 4(2)^x$

x → hours
→ change factor
Total Bacteria   Initial bacteria in Mouth

2. You have 5 weeds in the yard. They triple every hour.

$y = 5(3)^x$

hour
change factor
Total # of Weeds
Initial # of weeds

3. There are 3 zombies. They increase by 10% every hour.

$y = 3(1+.10)^x$

hour
% Change
Total Zombies   initial # of Zombies

4. There were once 1,000 dodo birds. Their population was cut down by 15% every day.

$y = 1,000(1-.15)^x$

day
% rate
Total # of Birds
Initial # of dodo birds