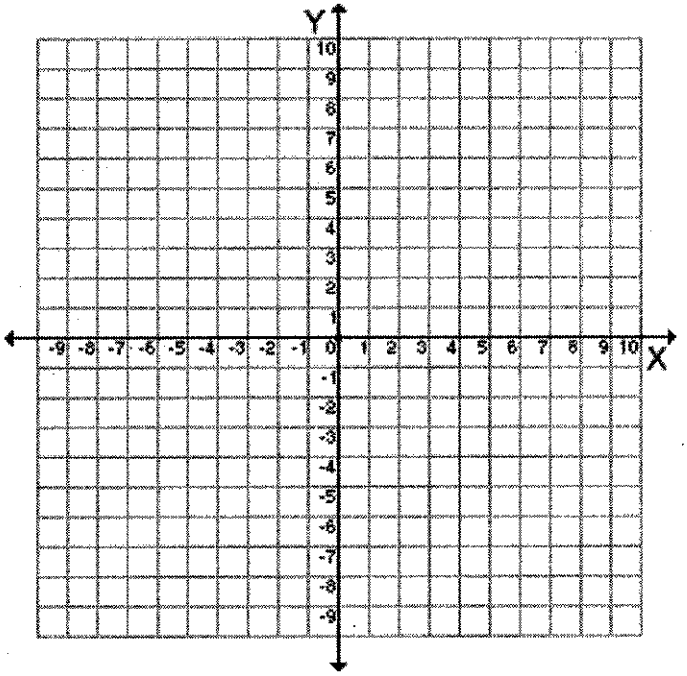
Graphing Exponential Functions

Name _____ Period # _____

Ex 1: The function $y = 3^x$ is called an _____ function because the exponent is a _____.

Now, let's look at how to graph the exponential function $y = 3^x$.

x	$y = 3^x$	y	(x, y)
-3	$y = 3^{(-3)} = \frac{1}{3^3} = \frac{1}{27}$		
-2			
-1			
0			
1			
2			
3			



Definition 1: Since the y values increase as the x values increase in the example above, this is what we call exponential _____. (The graph goes up the hill from left to right)

QUESTION: In the exponential function $y = 3^x$, the y-values can never equal or be less than _____.

Definition 2: Since the y-value can NEVER equal zero in this function, there is a horizontal _____ at $y = 0$.

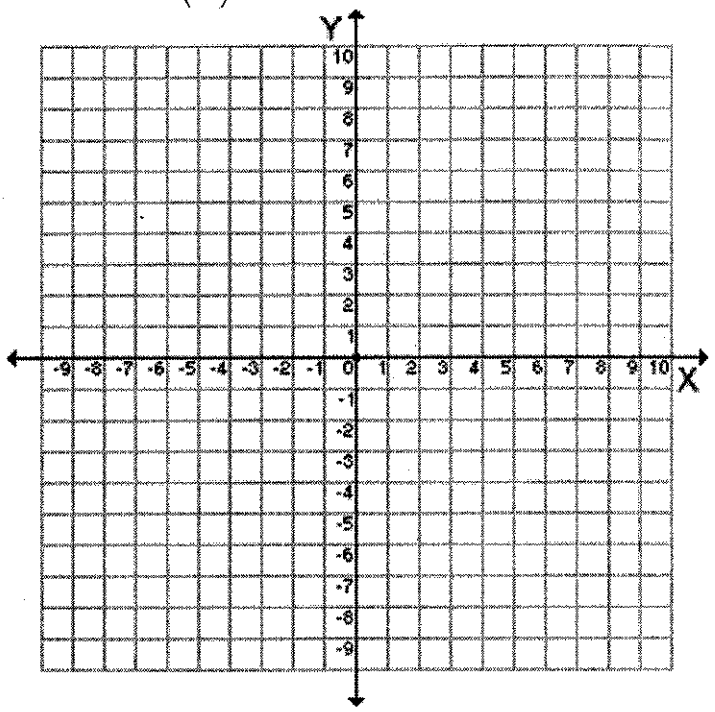
Ex 2: By looking at the graph above, list the domain and range of the function $y = 3^x$

DOMAIN:

RANGE:

Ex 3: ***Now, let's look at how to graph the exponential function*** $y = \left(\frac{1}{3}\right)^x$.

x	$y = \left(\frac{1}{3}\right)^x$	y	(x, y)
-3			
-2			
-1			
0			
1			
2			
3			



Definition 3: Since the y values decrease as the x values increase in the example above, this is what we call exponential _____. (The graph goes down the hill from left to right)

QUESTION: Is there an asymptote? If so, where is it?

Ex 4: By looking at the graph above, list the domain and range of the function $y = \left(\frac{1}{3}\right)^x$

DOMAIN:

RANGE:

Tell whether the functions below show exponential GROWTH or DECAY.

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

6) $y = 2^x$

7) $y = 1^x$

8) $y = 5^x$

9) $y = 0^x$

10) $y = \left(\frac{2}{3}\right)^x$

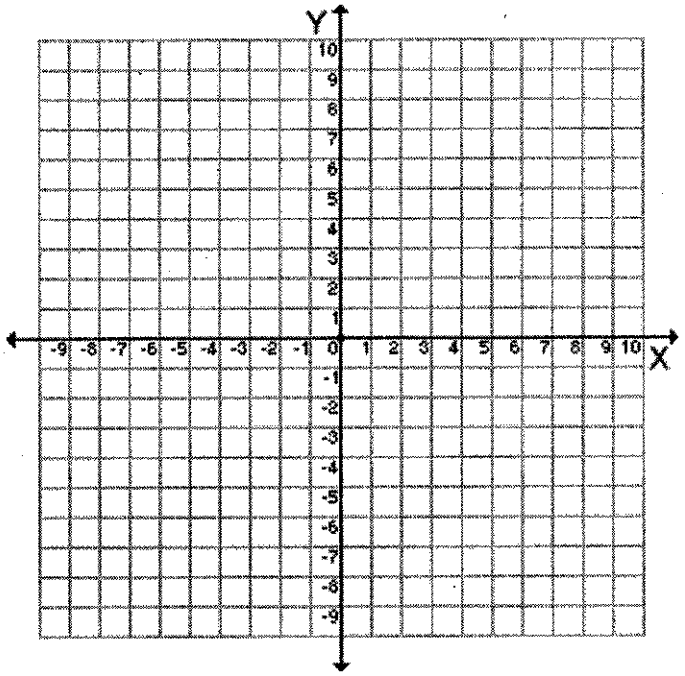
Graphing Exponential Functions Practice Worksheet

Name _____ Period # _____

Graph the following functions and tell whether they show exponential growth or decay.

1)

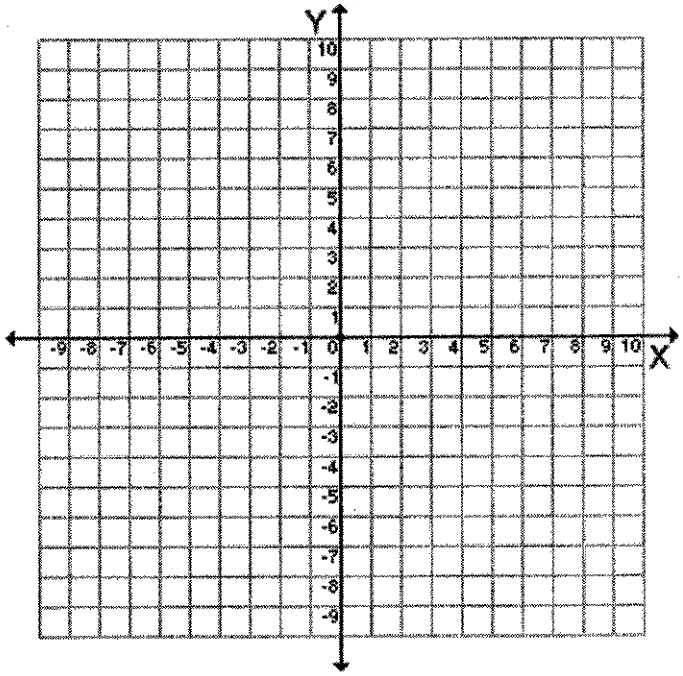
x	$y = 2^x$	y	(x, y)
-3			
-2			
-1			
0			
1			
2			
3			



Does the function above show exponential GROWTH or DECAY?

2)

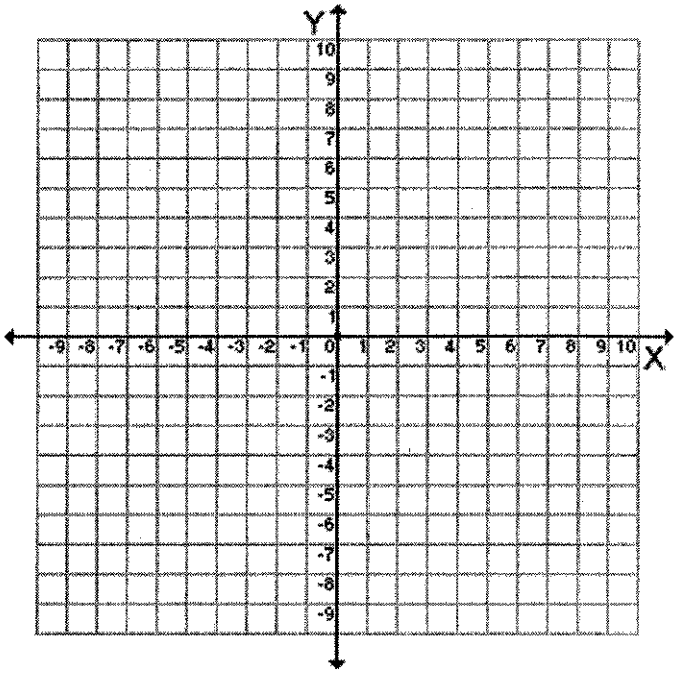
x	$y = \left(\frac{1}{2}\right)^x$	y	(x, y)
-3			
-2			
-1			
0			
1			
2			
3			



Does the function above show exponential GROWTH or DECAY?

3)

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



Does the function above show exponential GROWTH or DECAY?

Tell whether the functions below show exponential GROWTH or DECAY.

4) $y = 9^x$

5) $y = \left(\frac{1}{5}\right)^x$

6) $y = 4^x$

7) $y = \left(\frac{2}{7}\right)^x$

8) $y = \left(\frac{5}{6}\right)^x$

9) $y = 0^x$

Graphing Exponential Functions

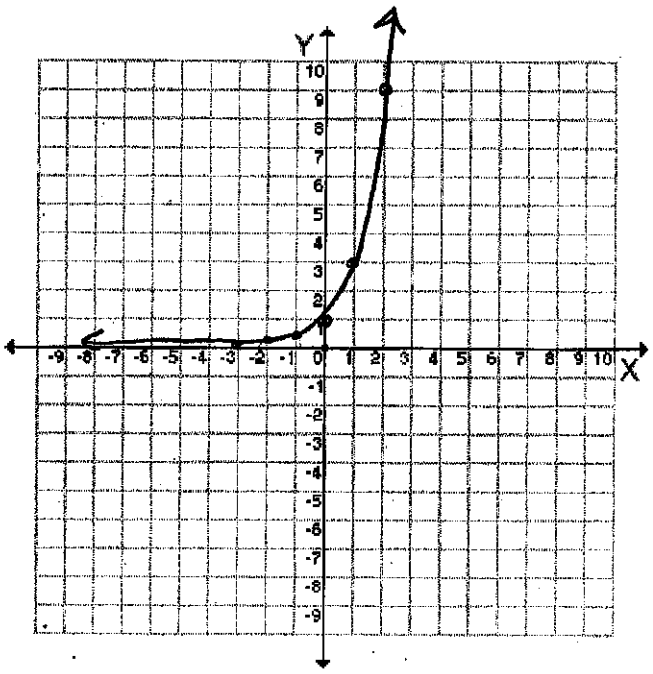
Name Key Period # _____

Ex 1: The function $y = 3^x$ is called an exponential function because the exponent is a variable.

$y = ab^x$

Now, let's look at how to graph the exponential function $y = 3^x$.

x	$y = 3^x$	y	(x, y)
-3	$y = 3^{(-3)} = \frac{1}{3^3} = \frac{1}{27}$	$\frac{1}{27}$	$(-3, \frac{1}{27})$
-2	$y = 3^{(-2)} = \frac{1}{9}$	$\frac{1}{9}$	$(-2, \frac{1}{9})$
-1	$y = 3^{(-1)} = \frac{1}{3}$	$\frac{1}{3}$	$(-1, \frac{1}{3})$
0	$y = 3^0 = 1$	1	$(0, 1)$
1	$y = 3^1$	3	$(1, 3)$
2	$y = 3^2$	9	$(2, 9)$
3	$y = 3^3$	27	$(3, 27)$



Definition 1: Since the y values increase as the x values increase in the example above, this is what we call exponential growth. (The graph goes up the hill from left to right)

QUESTION: In the exponential function $y = 3^x$, the y-values can never equal or be less than zero.

Definition 2: Since the y-value can NEVER equal zero in this function, there is a horizontal asymptote at $y = 0$.

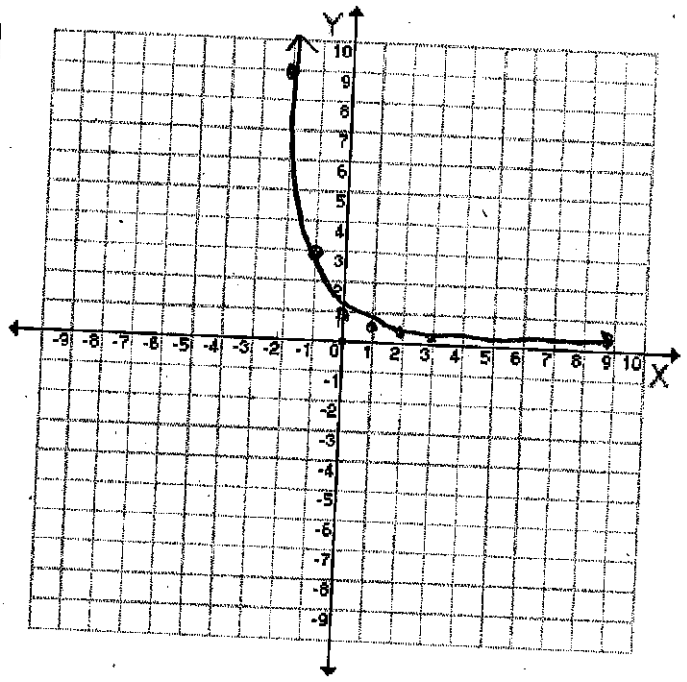
Ex 2: By looking at the graph above, list the domain and range of the function $y = 3^x$

DOMAIN: $(-\infty, \infty)$ All Real #'s

RANGE: $(0, \infty)$

Ex 3: *Now, let's look at how to graph the exponential function* $y = \left(\frac{1}{3}\right)^x$.

x	$y = \left(\frac{1}{3}\right)^x$	y	(x, y)
-3	$y = \left(\frac{1}{3}\right)^{-3}$	27	$(-3, 27)$
-2	$y = \left(\frac{1}{3}\right)^{-2}$	9	$(-2, 9)$
-1	$y = \left(\frac{1}{3}\right)^{-1}$	3	$(-1, 3)$
0	$y = \left(\frac{1}{3}\right)^{0}$	1	$(0, 1)$
1	$y = \left(\frac{1}{3}\right)^{1}$	$\frac{1}{3}$	$(1, \frac{1}{3})$
2	$y = \left(\frac{1}{3}\right)^{2}$	$\frac{1}{9}$	$(2, \frac{1}{9})$
3	$y = \left(\frac{1}{3}\right)^{3}$	$\frac{1}{27}$	$(3, \frac{1}{27})$



Definition 3: Since the y values decrease as the x values increase in the example above, this is what we call exponential decay. (The graph goes down the hill from left to right)

QUESTION: Is there an asymptote? If so, where is it?

yes $y = 0$

Ex 4: By looking at the graph above, list the domain and range of the function $y = \left(\frac{1}{3}\right)^x$

DOMAIN: $(-\infty, \infty)$

RANGE: $(0, \infty)$

$0 < b < 1$ decay (fraction)
$b > 1$ growth

Tell whether the functions below show exponential GROWTH or DECAY.

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

6) $y = 2^x$ growth

7) $y = 1^x$ Neither

8) $y = 5^x$ growth

9) $y = 0^x$ Neither

10) $y = \left(\frac{2}{3}\right)^x$ decay

Homework

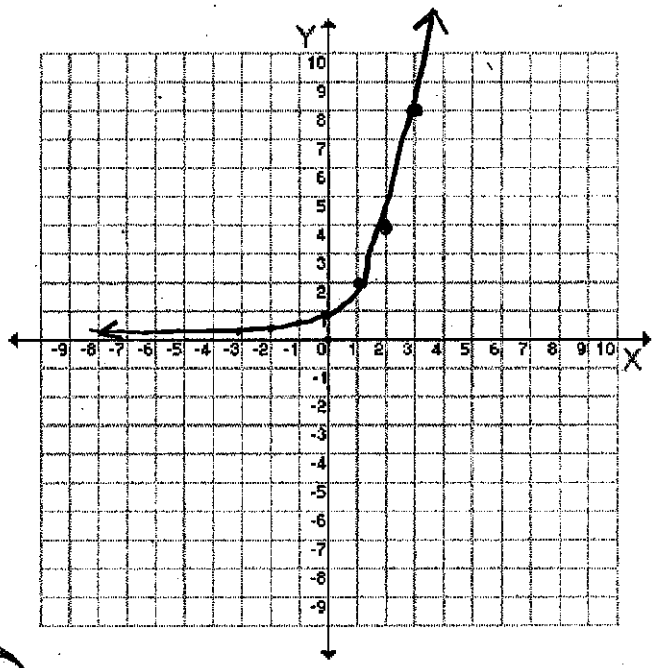
Graphing Exponential Functions Practice Worksheet

Name _____ Period # _____

Graph the following functions and tell whether they show exponential growth or decay.

1)

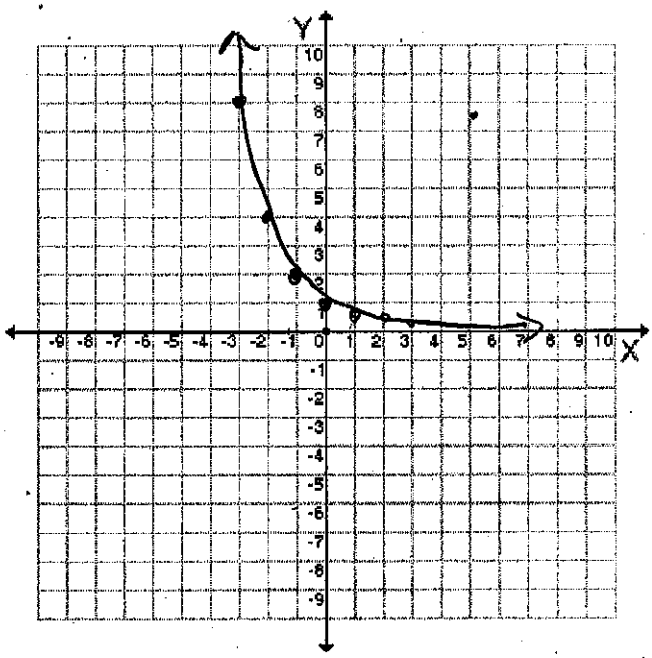
x	$y = 2^x$	y	(x, y)
-3	$y = 2^{-3}$	$\frac{1}{8}$	$(-3, \frac{1}{8})$
-2	$y = 2^{-2}$	$\frac{1}{4}$	$(-2, \frac{1}{4})$
-1	$y = 2^{-1}$	$\frac{1}{2}$	$(-1, \frac{1}{2})$
0	$y = 2^0$	1	$(0, 1)$
1	$y = 2^1$	2	$(1, 2)$
2	$y = 2^2$	4	$(2, 4)$
3	$y = 2^3$	8	$(3, 8)$



Does the function above show exponential GROWTH or DECAY?

2)

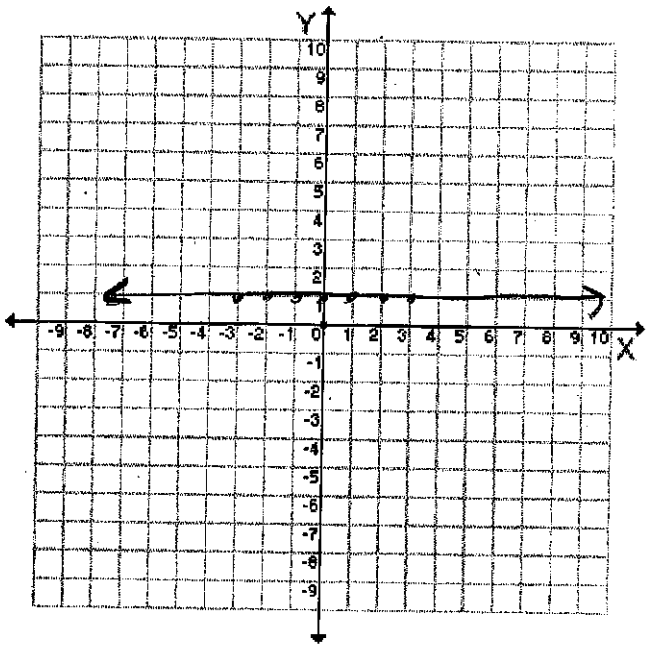
x	$y = \left(\frac{1}{2}\right)^x$	y	(x, y)
-3	$y = (\frac{1}{2})^{-3}$	8	$(-3, 8)$
-2	$y = (\frac{1}{2})^{-2}$	4	$(-2, 4)$
-1	$y = (\frac{1}{2})^{-1}$	2	$(-1, 2)$
0	$y = (\frac{1}{2})^0$	1	$(0, 1)$
1	$y = (\frac{1}{2})^1$	$\frac{1}{2}$	$(1, \frac{1}{2})$
2	$y = (\frac{1}{2})^2$	$\frac{1}{4}$	$(2, \frac{1}{4})$
3	$y = (\frac{1}{2})^3$	$\frac{1}{8}$	$(3, \frac{1}{8})$



Does the function above show exponential GROWTH or DECAY?

3)

x	$y = 1^x$	y	(x, y)
-3	$y = 1^{-3}$	1	(1, 1)
-2	$y = 1^{-2}$	1	
-1	$y = 1^{-1}$	1	
0	$y = 1^{0}$	1	
1	$y = 1^{1}$	1	
2	$y = 1^{2}$	1	
3	$y = 1^{3}$	1	



Does the function above show exponential GROWTH or DECAY?

Neither

Tell whether the functions below show exponential GROWTH or DECAY.

4) $y = 9^x$ Growth

5) $y = \left(\frac{1}{5}\right)^x$ Decay

6) $y = 4^x$ Growth

7) $y = \left(\frac{2}{7}\right)^x$ Decay

8) $y = \left(\frac{5}{6}\right)^x$ Decay

9) $y = 0^x$ Neither