

# Graphing Exponentials

## Agenda

Warm-Up  
Notes (p. 119)  
HW: Practice  
(2 pages)

## Reminders

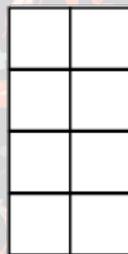
Quiz Friday  
HW 61 Due  
Friday  
Test next  
Thursday

## Warm-Up (Tuesday)

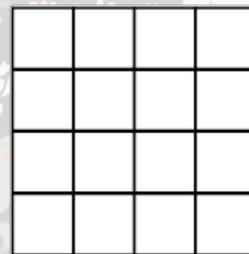
1. Complete the table below based on the pattern.



Stage 1



Stage 2



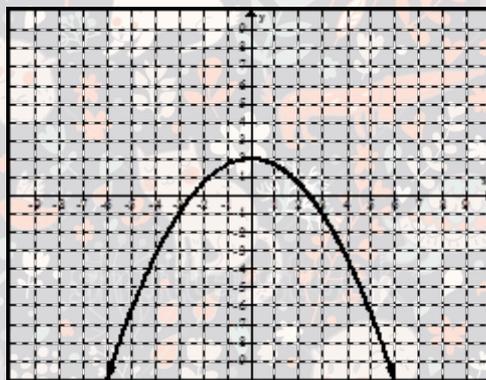
Stage 3

How many blocks would be needed for the 5<sup>th</sup> stage?

64 blocks

x	y
0	2 ↑ ×2
1	4 ↓ ×2
2	8 ↓ ×2
3	16
4	32

2. What is the parent function of the graph shown below?



- ~~A.  $y = -x$~~
- ~~B.  $y = -x^2$~~
- C.  $y = x$
- D.  $y = x^2$**

# Graphing Exponentials

Fold notes in half, glue blank side on page 119.

1. Complete the table of values below for the function  $f(x) = 3^x$ .

fraction  
to dec. :  
top :  
bottom

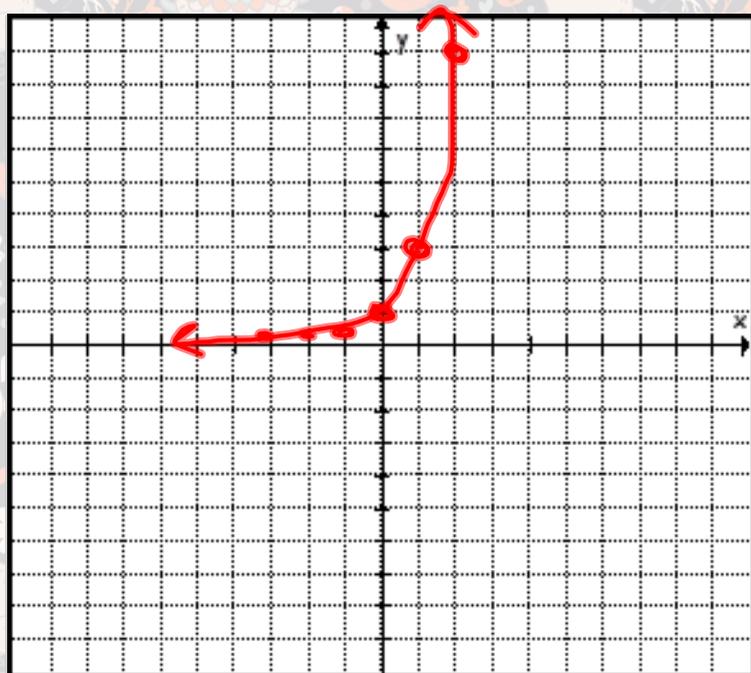
$x$	Process $3^x$	$f(x)$	$(x, y)$
-3	$3^{-3} = \frac{1}{3^3}$	$\frac{1}{27}$	$(-3, .04)$
-2	$3^{-2} = \frac{1}{3^2}$	$\frac{1}{9}$	$(-2, .11)$
-1	$3^{-1} = \frac{1}{3^1}$	$\frac{1}{3}$	$(-1, .33)$
0	$3^0$	1	$(0, 1)$
1	$3^1$	3	$(1, 3)$
2	$3^2 = 3 \cdot 3$	9	$(2, 9)$
3	$3^3$	27	$(3, 27)$

# Graphing Exponentials

Graph the function.

$$f(x) = 1 \cdot 3^x$$

a → b



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

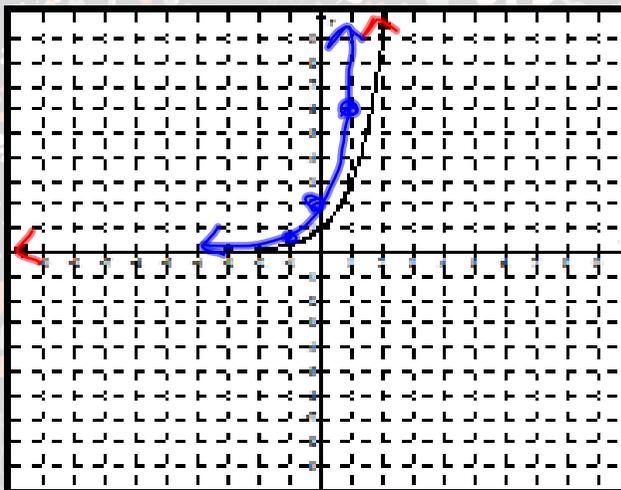
Exponential Function:

$$y = a \cdot b^x$$

scale factor  
y-intercept

base  
multiplier

# Graphing Exponentials



X	Y1
0	.22222
1	.66667
2	1.8
3	5.4
4	16.2

X = -2

exponent:  
press  $\wedge$   
(ABOVE :-)

	$f(x) = 3^x$	$f(x) = 2 \cdot 3^x$
Is $f(x)$ an increasing or decreasing function	increasing	increasing
y-intercept	(0, 1)	(0, 2)
value of $x$ where $f(x) = 0$	$y=0$ Does not exist	D.N.E.
Domain of the function	$\mathbb{R}$	$\mathbb{R}$
Range of the Function	$y > 0$	$y > 0$

3. Predict what would happen if you graphed the function:

$$f(x) = 2 \cdot 3^x$$

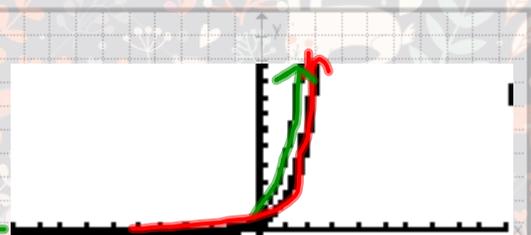
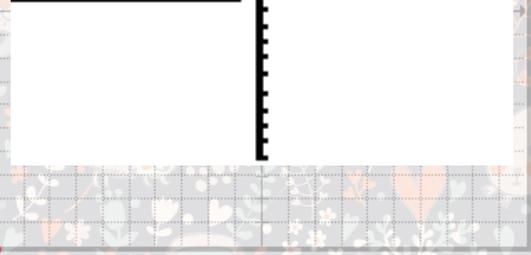
4. A) Graph  $f(x) = 2 \cdot 3^x$  on the coordinate plane in #2 and complete the chart.  
B) How is the new graph different from the old graph?

• y-int changes  
• graph is more narrow

# Graphing Exponentials

$y = a \cdot b^x$

Complete the table below.

Equation	Graph	Value of $b$	Value of $a$	Inc/Dec	y-intercept	Domain	Range
$y = 4^x$		4	1	inc.	(0, 1)	$\mathbb{R}$	$y > 0$
$y = \frac{1}{2} \cdot 4^x$		4	$\frac{1}{2}$	inc.	$(0, \frac{1}{2})$	$\mathbb{R}$	$y > 0$

multiply by fraction  $\rightarrow$  wider

6. Predict what would happen if you graphed the function:  $y = -3^x$

Reflects over x-axis  
\* decreasing

RANGE:  $y < 0$



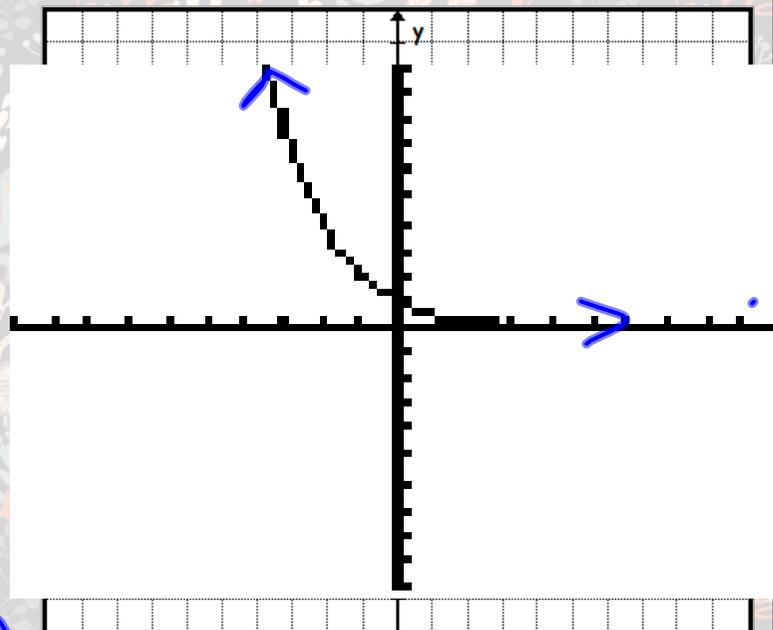
Hint: How did graphing  $y = -x^2$  compare to the original graph?

# Graphing Exponentials

7. Complete the table of values below for the function  $f(x) = \left(\frac{1}{2}\right)^x$ .

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

$x = -3$



- a) Determine the y-intercept of your graph.  $(0, 1)$
- b) Find the value of  $x$  where  $f(x) = 0$ ? D.N.E.
- c) Is  $f(x)$  an increasing or decreasing function? decreasing
- d) What is the domain of the function?  $\mathbb{R}$
- e) What is the range of the function?  $y > 0$

# Graphing Exponentials

Summary (outside of notes)

y-intercept

$$y = a \cdot b^x$$

multiplier

fraction

<b>b</b>	$0 < b < 1$	$b > 1$	
<b>Increasing/Decreasing</b>	decreasing	increasing	negative
<b>a</b>	$0 < a < 1$	$a > 1$	$a < 0$
<b>How does it compare to <math>b^x</math>?</b>	increases SLOWER (wider)	increases FASTER (narrower)	REFLECTS (decreasing)

g → ●

Algebra I - Unit 10: Topic 1 – Graphs of Exponential Functions

Practice – Graphs of Exponential Functions

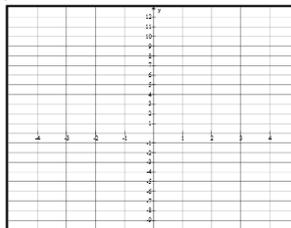
pp 772-778

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

1.  $y = 3 \cdot 2^x$

$y = 3 \cdot 2^x$

x	y
-3	
-2	
-1	
0	
1	
2	



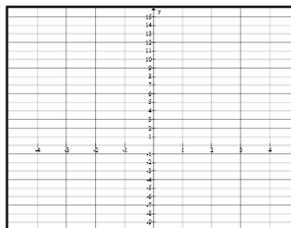
Increasing/Decreasing  
\_\_\_\_\_

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

2.  $f(x) = 4 \cdot \left(\frac{1}{2}\right)^x$

x	y
-2	
-1	
0	
1	
2	
3	



Increasing/Decreasing  
\_\_\_\_\_

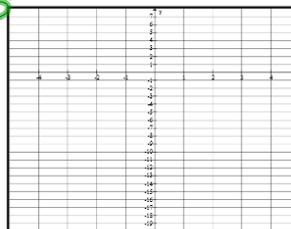
Domain: \_\_\_\_\_

Range: \_\_\_\_\_

3.  $y = -2 \cdot 3^x$

$y = -2 \cdot 3^x$

x	y
-2	
-1	
0	
1	
2	



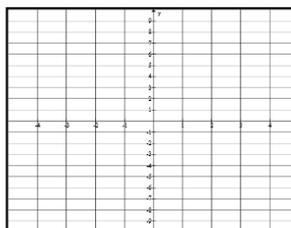
Increasing/Decreasing  
\_\_\_\_\_

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

4.  $y = -2(0.25)^x$

x	y
-2	
-1	
0	
1	
2	



Increasing/Decreasing  
\_\_\_\_\_

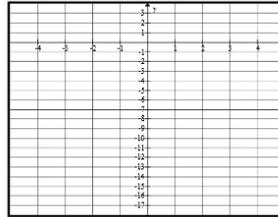
Domain: \_\_\_\_\_

Range: \_\_\_\_\_

Algebra I - Unit 10: Topic 1 - Graphs of Exponential Functions

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

x	y
-2	
-1	
0	
1	
2	



Increasing/Decreasing  
\_\_\_\_\_

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

6. Given the equation  $f(x) = a5^x$ , what value(s) of  $a$  will make the graph increase at a slower rate?

$f(x) = a \cdot 5^x$

7. Which function is not decreasing?

A  $y = -(3)^x$

B  $y = 2\left(\frac{1}{6}\right)^x$

C  $y = \left(\frac{1}{4}\right)(2)^x$

D  $y = \left(\frac{2}{3}\right)\left(\frac{1}{6}\right)^x$

8. Which of the following is the exponential parent function?

- ~~A~~  $f(x) = x$  ← line
- ~~B~~  $f(x) = x^2$  ← quad
- C  $f(x) = 2^x$
- ~~D~~ Does Not Exist

no neg.  
no numbers  
 $y = a \cdot b^x$

