

# Algebra I

## Lesson 7-6

### Standard:

**F.IF.7.e** Graph exponential...functions, showing intercepts and end behavior...

### Learning Goal:

- I can evaluate and graph exponential functions.

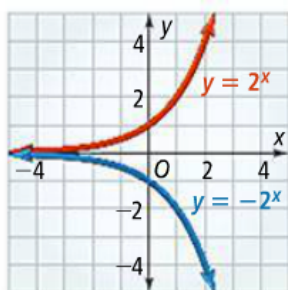
## Exponential Function

An exponential function is a function of the form

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

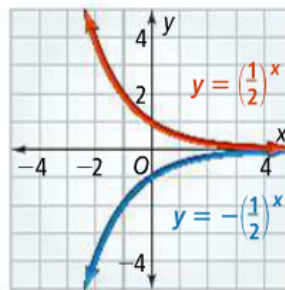
where  $a \neq 0$ ,  $b > 0$ ,  $b \neq 1$ , and  $x$  is a real number

linear  
 $y = mx + b$



$$y = -2^x$$

$$y = -1 \cdot 2^x$$



## Identifying Linear and Exponential Functions

Suppose all the  $x$ -values in a table have a common difference.

If all the  $y$ -values have a common difference...

the table represents  
a linear function

$x$	1	2	3	4
$y$	4	8	12	16

If all the  $y$ -values have a common ratio...

the table represents  
an exponential function

$x$	1	2	3	4
$y$	4	8	16	32

## Got It?

Which of the following are linear functions?  
exponential functions?

$x$	0	1	2	3
$y$	-1	-3	-9	-27

exponential

$$y = 3x$$

linear

$$y = 3 \cdot 6^x$$

exponential

$x$	1	2	3	4
$y$	-1	1	3	5

linear

## Evaluating an Exponential Function

Suppose 30 flour beetles are left undisturbed in a warehouse bin. The beetle population doubles each week. The function  $f(x) = 30 \cdot 2^x$  gives the population after  $x$  weeks. How many beetles will there be after 56 days?

$$f(x) = 30 \cdot 2^x$$

$x = \#$  of weeks

$$\begin{aligned} f(8) &= 30 \cdot 2^8 \\ &= 30 \cdot 256 \\ &= 7680 \end{aligned}$$

56 days = 8 weeks

After 56 days, there will be 7680 beetles.

## Got It?

An initial population of 20 rabbits triples every half year. The function  $f(x) = 20 \cdot 3^x$  gives the population after  $x$  half-year periods. How many rabbits will there be after 3 years?

$$\begin{aligned} f(6) &= 20 \cdot 3^6 \\ &= 20 \cdot 729 \\ &= 14,580 \end{aligned}$$

$x = \#$  of half-yrs

3 yrs = 6 half-yrs

After 3 years there will be 14,580 rabbits

# Assignment

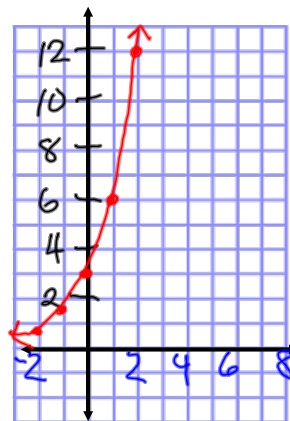
## Algebra I Lesson 7-6a

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### Graphing an Exponential Function

What is the graph of  $y = 3 \cdot 2^x$ ?

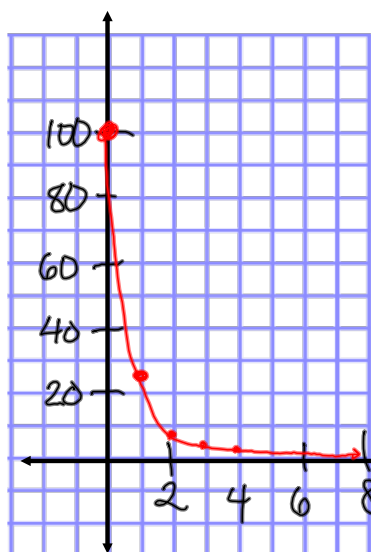
$x$	$y = 3 \cdot 2^x$	$(x, y)$
-2	$3 \cdot 2^{-2} = 3 \cdot \frac{1}{2^2} = 3 \cdot \frac{1}{4} = \frac{3}{4}$	$(-2, \frac{3}{4})$
-1	$3 \cdot 2^{-1} = 3 \cdot \frac{1}{2} = \frac{3}{2}$	$(-1, \frac{3}{2})$
0	$3 \cdot 2^0 = 3 \cdot 1 = 3$	$(0, 3)$
1	$3 \cdot 2^1 = 3 \cdot 2 = 6$	$(1, 6)$
2	$3 \cdot 2^2 = 3 \cdot 4 = 12$	$(2, 12)$



## Graphing an Exponential Model

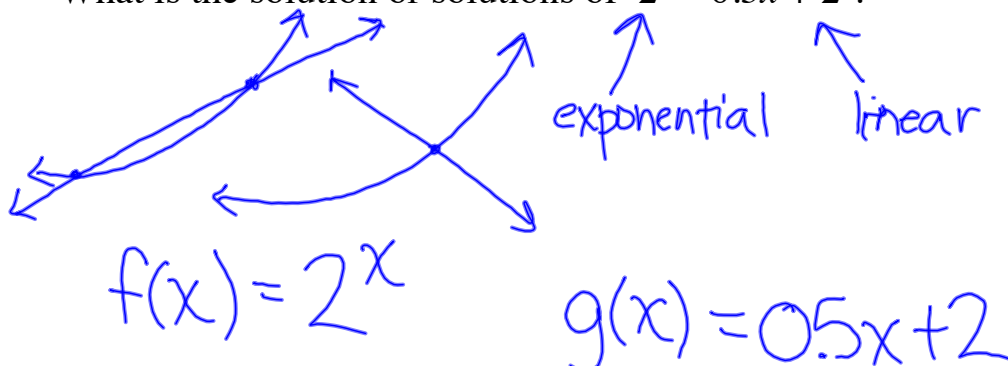
Computer mapping software allows you to zoom in on an area to view it in more detail. The function  $f(x) = 100 \cdot 0.25^x$  models the percent of the original area the map shows after zooming in  $x$  times. Graph the function.

$x$	$f(x) = 100 \cdot 0.25^x$	$(x, f(x))$
0	$100 \cdot 0.25^0 = 100 \cdot 1 = 100$	(0, 100)
1	$100 \cdot 0.25^1 = 100 \cdot 0.25 = 25$	(1, 25)
2	$100 \cdot 0.25^2 = 100 \cdot 0.0625 = 6.25$	(2, 6.25)
3	$100 \cdot 0.25^3 = 1.5625$	(3, 1.56)
4	$100 \cdot 0.25^3 = 0.390625$	(4, 0.39)



## Solving One-Variable Equations

What is the solution or solutions of  $2^x = 0.5x + 2$  ?



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

$$g(x) = 0.5x + 2$$

$$x = -3.86 \text{ and } 1.44$$

The solutions of  $2^x = 0.5x + 2$   
are about  $-3.86$  and  $1.44$

## Assignment

### Algebra I Lesson 7-6b

Pgs. 457-458 #20-26 even, 28-31 all,  
32-40 even, 41, 44-48 even