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11-2 Exponential Functions.....#

Objectives

Evaluate exponential functions.
Identify and graph exponential functions.

Review:
Simplify the following:
1) $\frac{2}{3}(3)^4$ 2) $-5(2)^5$

LEFT PAGE! LEFT PAGE!

Feb 14-9:31 AM

The table and the graph show an insect population that increases over time.

Time (days)	Population
0	2
1	6
2	18
3	54

A function rule that describes the pattern above is $f(x) = 2(3)^x$. This type of function, in which the independent variable appears in an exponent, is an **exponential function**. Notice that 2 is the starting population and 3 is the amount by which the population is multiplied each day.

Write this in your notes!
Exponential Functions
An exponential function has the form $f(x) = ab^x$, where $a \neq 0$, $b \neq 1$, and $b > 0$.

Feb 14-9:36 AM

The function $f(x) = 500(1.035)^x$ models the amount of money in a certificate of deposit after x years. How much money will there be in 6 years?

$f(x) = 500(1.035)^x$ Write the function.
 $f(6) = 500(1.035)^6$ Substitute 6 for x .

How do you know the exponent applies to b and not ab ?
There will be \$614.63 in 6 years.

$f(6) = \$614.63$

The function $f(x) = 200,000(0.98)^x$, where x is the time in years, models the population of a city. What will the population be in 7 years?

$f(7) = 200,000(0.98)^7$
 $f(7) = 173,625$

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Remember that linear functions have constant first differences and quadratic functions have constant second differences. Exponential functions do not have constant differences, but they do have *constant ratios*.

x	$f(x) = 2(3)^x$
1	6
2	18
3	54
4	162

As the x -values increase by a constant amount, the y -values are multiplied by a constant amount. This amount is the constant ratio and is the value of b in $f(x) = ab^x$.

EXP
 $\times 3$
 $\times 3$
 $\times 3$

EXPLORE EXE
LINEAR = CONSTANT RATE OF CHANGE

Feb 14-9:43 AM

I think it is easier when the ordered pairs are in a table...

Tell whether each set of ordered pairs satisfies an exponential function. Explain your answer.
{(0, 4), (1, 12), (2, 36), (3, 108)}

x	y
0	4
1	12
2	36
3	108

EXP growth
 $\frac{12}{4} = 3$
 $\frac{36}{12} = 3$
 $\frac{108}{36} = 3$
 $\times 3$
 $\times 3$
 $\times 3$

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Tell whether each set of ordered pairs satisfies an exponential function. Explain your answer.
{(-1, -64), (0, 0), (1, 64), (2, 128)}

-1	-64
0	0
1	64
2	128

NO, Linear
 $+64$
 $+64$
 $+64$

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graphing...

To graph an exponential function, choose several values of x (positive, negative, and 0) and generate ordered pairs. Plot the points and connect them with a smooth curve.

$y = ab^x$ with $a > 0$ and $b > 1$

Graph $y = 0.5(2)^x$.

Choose several values of x and generate ordered pairs.

Graph the ordered pairs and connect with a smooth curve.

x	$y = 0.5(2)^x$
-1	0.25
0	0.5
1	1
2	2

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How can the values of a and b tell you which direction the graph takes and in which quadrants the graph is located?

Graph each function.

$y = 4^x$

x	y
-1	0.25
0	1
1	4
2	16

$4^{-1} = \frac{1}{4}$

$4^0 = 1$

$4^1 = 4$

$4^2 = 16$

$y = -6^x$

x	y
-2	
0	
1	
2	

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The box summarizes the general shapes of exponential function graphs.

Graphs of Exponential Functions

For $y = ab^x$, if $b > 1$, then the graph will have one of these shapes.

For $y = ab^x$, if $0 < b < 1$, then the graph will have one of these shapes.

Feb 14-9:52 AM

Homework:

Worksheet

Feb 14-9:52 AM

1. $f(x) = 20(0.9)^x$

$f(6) = 20(0.9)^6$

$f(6) = 10.6 \text{ ft}$

Feb 24-12:19 PM

3. No, linear
w/ +5 rate

$f(x) = 100(1.04)^x$

6. double 18yrs

7. 1000 ————— ans $\times 1.04 =$

100 enter =

200

1	5	+5
2	10	+5
3	15	+5
4	20	+5

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

x	y	(x, y)
-2	$-2(4)^{-2}$	$(-2, -0.125)$
-1		
0		
1		
2		

calc

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