-Sit wherever (preferably in a place where you can see and will be able to concentrate)
-Then, get out a piece of paper, write your name on it and who you live with and the best ways to contact them (email, phone), there's paper on the shelves if you need some.
-At the bottom write a brief paragraph about yourself...

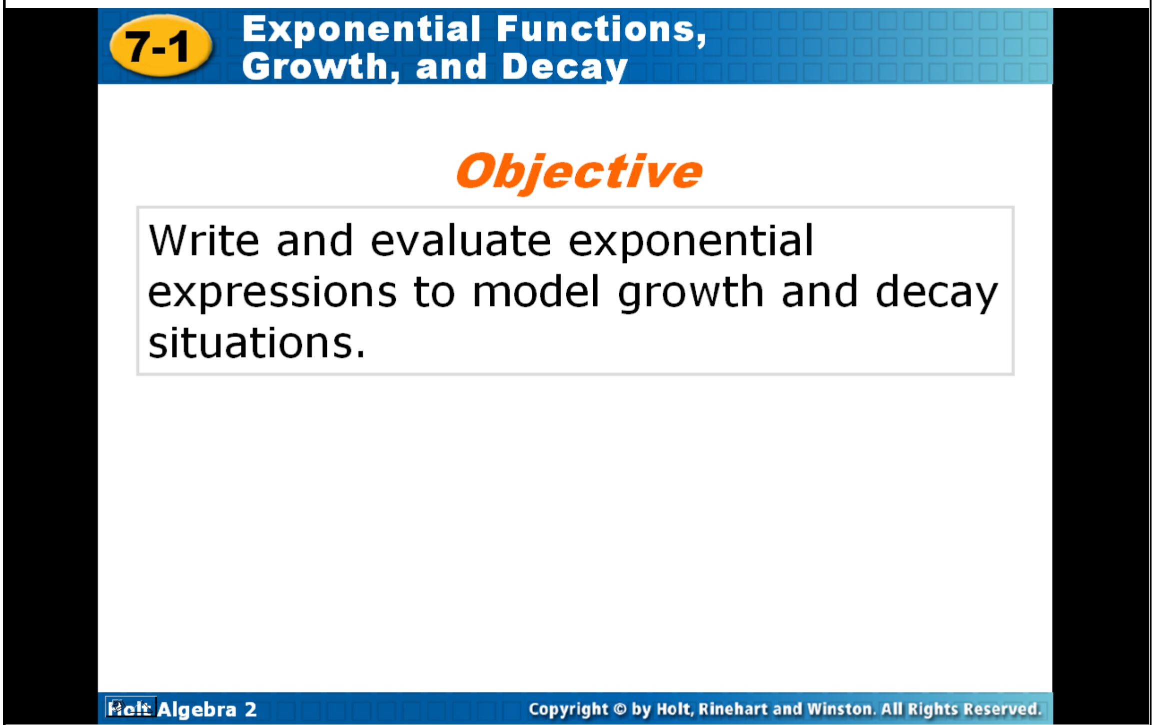
Let's start with a little game...

I just won the recent mega millions lottery and now want to hire a personal assistant for 30 days. You all have been granted a piece of the job and get to choose your pay scale. Here is how it works, you can choose one of the two following:

1 1) $1 million a day for all 30 days.
5 || 2) $.01 on the first day and double each day thereafter, therefore on day 2 you make $.02, etc.

Which would you choose? Why?

What we saw on the last slide was an example of exponential growth. Growth which gets bigger each day, we will look at this along with exponential decay.



7-1 Exponential Functions, Growth, and Decay

Vocabulary

exponential function
base
asymptote
exponential growth
exponential decay

7-1 Exponential Functions, Growth, and Decay

Growth that doubles every year can be modeled by using a function with a variable as an exponent. This function is known as an *exponential function*. The parent **exponential function** is $f(x) = b^x$, where the **base** b is a constant and the exponent x is the independent variable.

2^x

Base Exponent

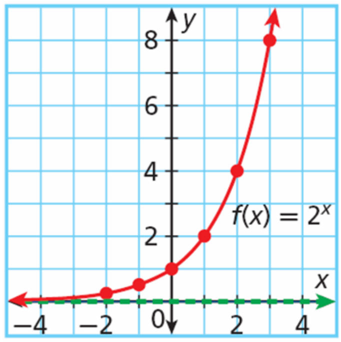
$$f(x) = b^x, \text{ where } b > 0, b \neq 1$$

7-1 Exponential Functions, Growth, and Decay

2^x

The graph of the parent function $f(x) = 2^x$ is shown. The domain is all real numbers and the range is $\{y | y > 0\}$.

$2^0 = 1$



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

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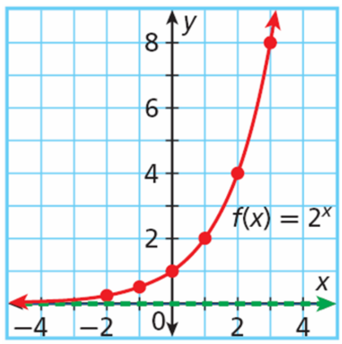
7-1 Exponential Functions, Growth, and Decay

Notice as the x-values decrease, the graph of the function gets closer and closer to the x-axis. The function never reaches the x-axis because the value of 2^x cannot be zero. In this case, the x-axis is an *asymptote*. An **asymptote** is a line that a graphed function approaches as the value of x gets very large or very small.



line the function gets close to

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7-1 Exponential Functions, Growth, and Decay

A function of the form $f(x) = ab^x$, with $a > 0$ and $b > 1$, is an **exponential growth** function, which increases as x increases. When $0 < b < 1$, the function is called an **exponential decay** function, which decreases as x increases.

$b=2$
$2^1=2$
$2^2=4$
$2^3=8$

$b=\frac{1}{2}$
$(\frac{1}{2})^1=\frac{1}{2}$
$(\frac{1}{2})^2=\frac{1}{4}$
$(\frac{1}{2})^3=\frac{1}{8}$

7-1 Exponential Functions, Growth, and Decay

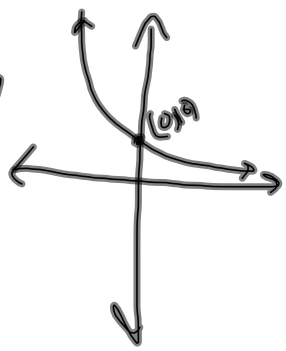
Example 1A: Graphing Exponential Functions

Tell whether the function shows growth or decay. Then graph.

$f(x) = 10\left(\frac{3}{4}\right)^x$ Decay

$x=0$

$10\left(\frac{3}{4}\right)^0=10$



7-1 Exponential Functions, Growth, and Decay

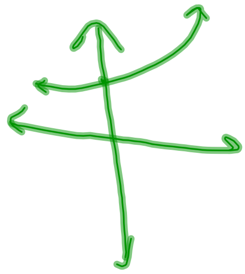
Example 1B: Graphing Exponential Functions

Tell whether the function shows growth or decay. Then graph.

$g(x) = 100(1.05)^x$

$100(1.05)^0$

$(0, 100)$



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Write your own function for exponential growth and exponential decay. Discuss with your partner how you know your function is either growth or decay.

7-1 Exponential Functions, Growth, and Decay

You can model growth or decay by a constant percent increase or decrease with the following formula:

Initial amount

Number of time periods

$$A(t) = a(1 \pm r)^t$$

Final amount

Rate of increase

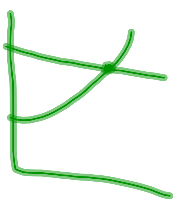
23% = .23

7-1 Exponential Functions, Growth, and Decay

Example 2: Economics Application

Clara invests $5000 in an account that pays 6.25% interest per year. After how many years will her investment be worth $10,000?

$10000 = 5000(1+.0625)^x$



$x = 11.407$

7-1 Exponential Functions, Growth, and Decay

Check It Out! Example 2

In 1981, the Australian humpback whale population was 350 and increased at a rate of 14% each year since then. Write a function to model population growth. Use a graph to predict when the population will reach 20,000.

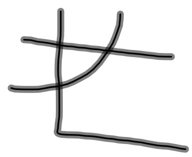
$20000 = 350(1+.14)^x$

$x_{max} = 50$

$y_{max} = 22000$

$x = 30$

2011



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7-1 Exponential Functions, Growth, and Decay

Example 3: Depreciation Application

A city population, which was initially 15,500, has been dropping 3% a year. Write an exponential function and graph the function. Use the graph to predict when the population will drop below 8000.

$8000 = 15500(1-.03)^x$

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Homework: p. 493
2-6, 12-14, 28-30