Here's the situation:

Your spaceship has crashed on an unknown planet. You and your crew encounter a drooling, carnivorous alien monster. As you can guess, this is not good. It gets worse. While you are cowering in a cave, trying not to cry "mommy" in front of your crew, your science officer is able to chart the monster's growth over several hours time. She comes back to you with her report (and minus one arm). The news is grim… With each hour that passes, the monster doubles in size (specifically, his height.) (She also said that the monster's stomach was making those growly-hungry noises.)

If we assume that the monster is 1 foot tall at birth, what formula would describe the growth of the monster?

TIME (t)	HEIGHT IN FEET
At birth: $t = 0$	1
After 1 hour: $t = 1$	$1 \cdot 2 = 2$
After 2 hours: $t = 2$	$1 \cdot 2 \cdot 2 = 2^2 = 4$
After 3 hours: $t = 3$	$1 \cdot 2 \cdot 2 \cdot 2 = 2^3 = 8$
After 4 hours: $t = 4$	$1 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^4 = 16$
See a pattern yet?	
⋮	
After 10 hours: $t = 10$	$2^{10} = 1024$
⋮	
After t hours	2^t

For some reason, your science officer starts yelling crazy things at you (while waving her one arm all around) and quits. In desparation, you promote the crew cook, Stu, and send him out of the cave to do more exploring. Unfortunately, he finds a second species of drooling alien monster... Fortunately for Stu, it's an herbavore! Unfortunately for Stu, your uniforms are green. Days later, one of Stu's socks and a clip board of growth data for the monster is found.

SECOND ALIEN SPECIES IS 4 INCHES TALL AT BIRTH

TIME (t)	HEIGHT IN INCHES
At birth: $t=0$	4
After 1 hour: $t=1$	$4 \cdot 3 = 12$
After 2 hours: $t=2$	$4 \cdot 3 \cdot 3 = 4 \cdot 3^2 = 36$
After 3 hours: $t=3$	$4 \cdot 3 \cdot 3 \cdot 3 = 4 \cdot 3^3 = 108$
After 4 hours: $t=4$	$4 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 4 \cdot 3^4 = 324$
⋮	
After 10 hours: $t=10$	$4 \cdot 3^{10}$
⋮	
After t hours	$4 \cdot 3^t$ ← time

initial height: 4 · 3^t

growth rate: 3^t

CONCLUSION: WITH EACH HOUR THAT PASSES, THE MONSTER TRIPLES IN HEIGHT AND MAY BE TASTY BROILED WITH ONIONS.

FORMULA FOR GROWTH:

$$h(t) = 4 \cdot 3^t$$

The 3 is a combination of 100% of original height plus a 200% increase.

$h(t) = 4(1 + 2)^t$

Your t
How tal
hours?

ter 2.5

After 4.2 hours?

You are sent out of the cave next... You find a third species of alien monster. It's not drooling, but it does have a serious breath problem. You find that this species is 2 cm tall at birth and gets five times as tall with each day that passes.

Create a formula to describe the monster's growth:

How tall will the monster be after 3.7 days?

$h(t) = 2 \cdot 5^t$

≈ 771.29 cm

$\approx 19,531,250$ cm

This concept works the same with decay

You are sent out of the cave...again...you find a fourth species of alien monster. This one is kind of cute except for the fact that if you look at it in the eyes, you shrink by 12% every second you lock orbits. You originally stand at 175 cm. Create a formula that models your height, h, with respect to time, t.

How tall will you be after 6 seconds of orbit lock?

Graph this equation!

LESSON 7-1 Graphing Exponential Functions

I can describe transformations, graph and determine the domain and range of exponential and logarithmic functions.

Today: Exponential functions

An **exponential function** is a function where the base is a constant and the exponent is the independent variable.

$$f(x) = 5^x$$

An **exponential growth function** is a function in the form

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

An **exponential decay function** is a function in the form

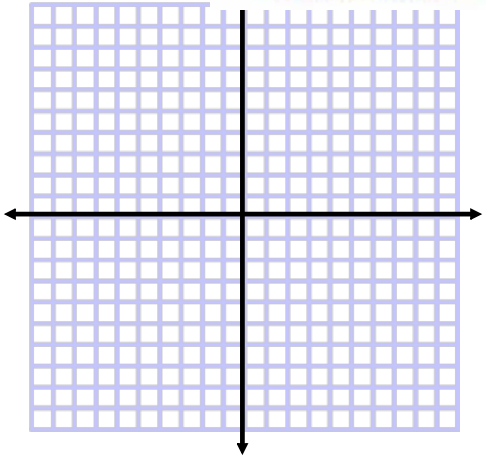
$$f(x) = b^x \text{ where } 0 < b < 1$$

ps.... this means b is a fraction!

Graph Exponential Growth Functions

Make a table of values.
Find the value the graph is approaching (asymptote).
Connect the points to sketch a smooth curve.

1. Graph $y = 2^x$. State the domain and range.



This monster is 1 foot tall and triples every day, and he wears a 1 foot tall top hat.

2. Graph $y = 3^x+1$. State the domain and range.

You Try
Graph. State the domain and range.

3. $y = (3)^x$

4. $y = 4^{x-1}$

Transformations

$$f(x) = ab^{x-h} + k$$

b^x - Parent function
h - Horizontal translation
k - Vertical translation
a - Orientation/Shape

Don't forget! A negative out front just flips the graph

5. Describe the transformations.

$$y = 2^{x-1} - 5$$

The parent function is: $y = 2^x$

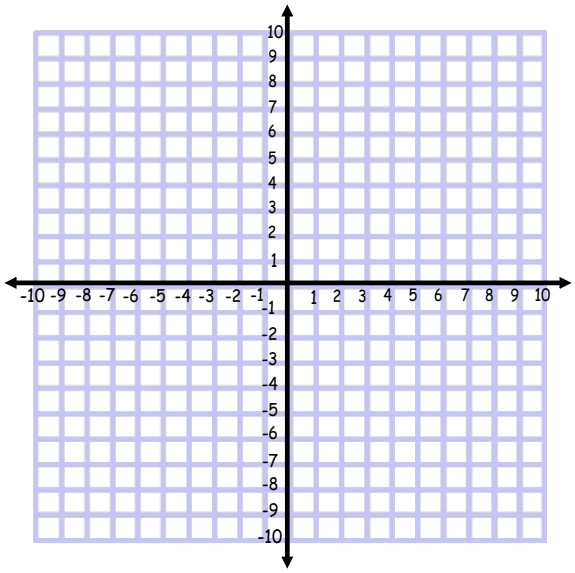
a= 1 , which means no change in shape

h= 1 , which means Right 1

k= -5 , which means down 5

5. Graph on same graph as #1 with parent function. State Domain and Range.

$y = 2^{x-1} - 5$



6. Describe the transformations.

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

The parent function is: $y=\left(\frac{1}{4}\right)^x$

a= 2 , which means vertical st by 2

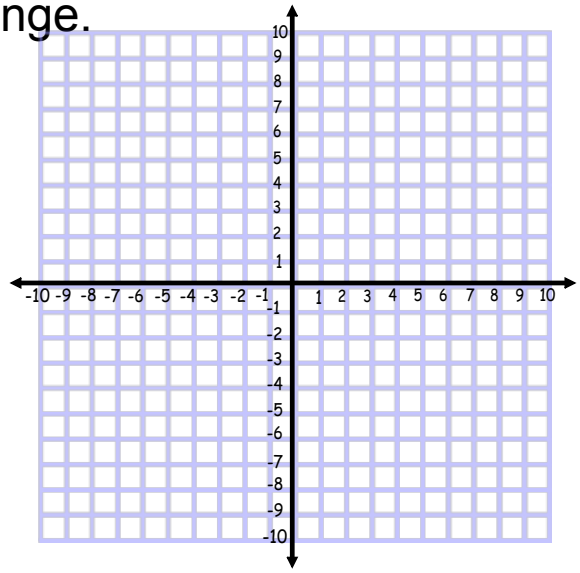
h= -2 , which means left 2

k= -3 , which means down 3

6. Graph the parent function and this function on same graph. State Domain and Range.

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

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



INTERNET In 2006, there were 1,020,000,000 people worldwide using the Internet. At that time, the number of users was growing by 19.5% annually. Draw a graph showing how the number of users would grow from 2006 to 2016 if that rate continued.

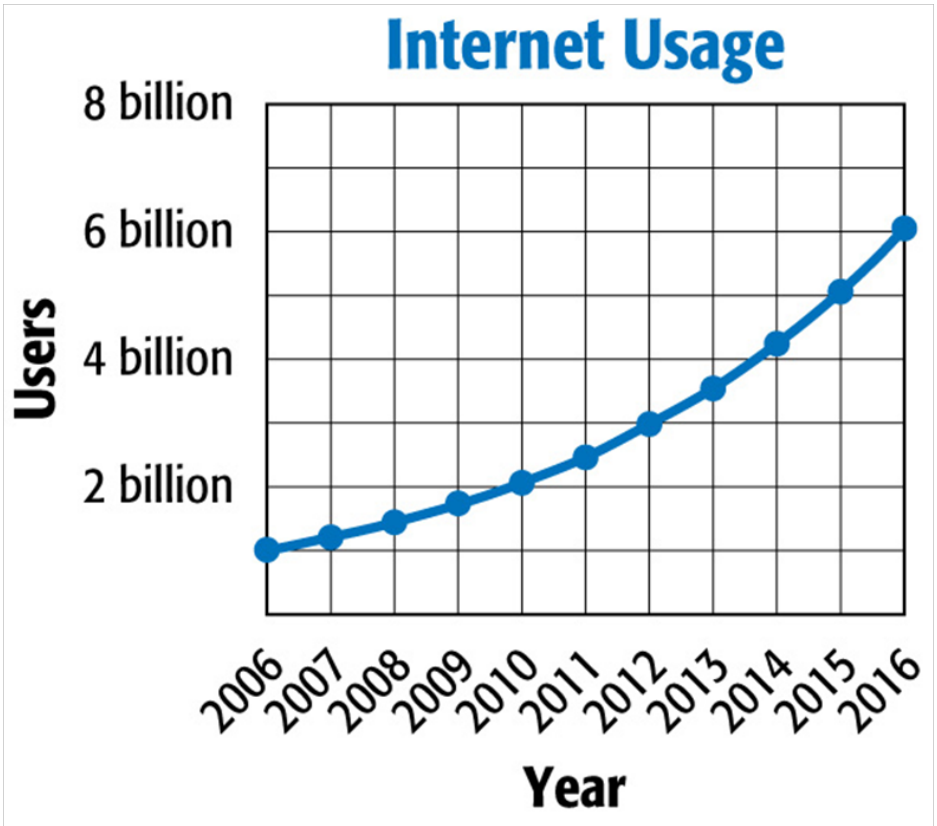
$$A(t) = a(1+r)^{t}$$

a *is starting amount*

r *is the rate converted to a decimal*

t *is the time*

Substitute a and r and graph! Choose increments evenly!



Homework 7.1

7.1 pg 456 #9-25o, 12, 26, 27

For #9-25o In addition to the books instructions:

State the parent function and all transformations.