Name: KEY Hour: ____________ Date: ____________

NOTES: Section 7.2 – Graph Exponential Decay Functions

Goals: #1 - I can graph exponential decay functions and state the domain and range.

#2 - I can use an exponential decay model in a real life situation.

Homework: Lesson 7.2 Worksheet

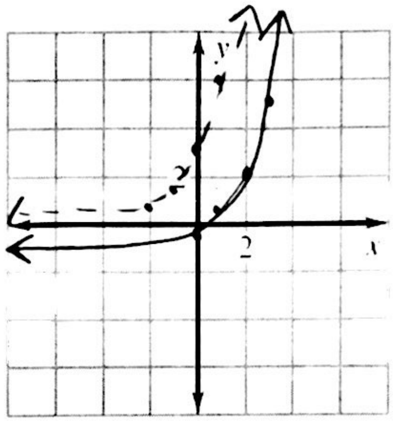
Warm Up:

$y = 3 \cdot 2^x$

x	y
-2	0.8
-1	1.5
0	3
1	6

1. $f(x) = 3 \cdot 2^{x-2} - 1$

right 2 down 1



domain: $(-\infty, \infty)$

range: $(-1, \infty)$

2. You deposit $1500 into an account that pays 3% annual interest compounded daily. What will be the balance in your account after 1 year?

$A = 1500\left(1 + \frac{0.03}{365}\right)^{365 \cdot 1}$

$A = 1500(1.000\ldots)^{365}$

$A \approx \$1545.68$

3. In 1992, 1219 parakeets were observed in the United States. For the next 11 years, about 12% more parakeets were observed each year. Write an exponential growth model for the number of parakeets observed in the U.S. since 1992.

$y = 1219(1 + 0.12)^t$

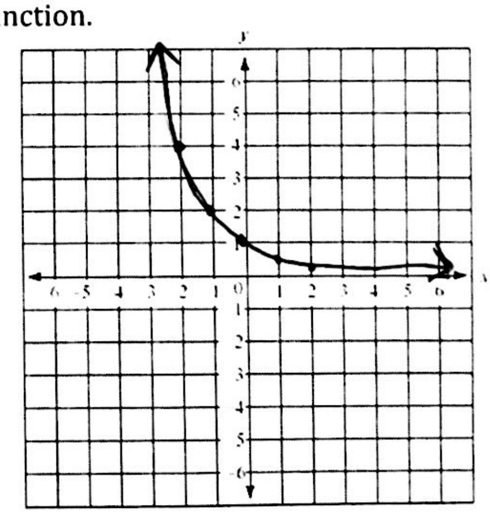
$y = 1219(1.12)^t$

Exploration #1: Work with a partner and answer the following questions.

1. Complete the table of vaules to graph the following function.

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

x	y
-2	4
-1	2
0	1
1	0.5
2	0.3



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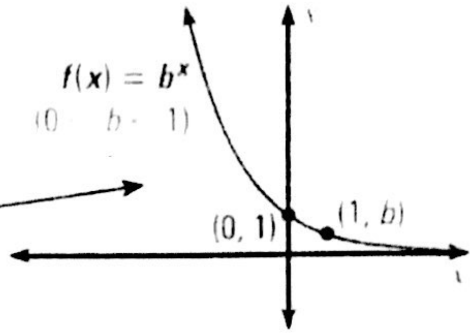
Notes:

An exponential function has the form: $y = a \cdot b^x$

where $a \neq 0$ and the base b is a positive number other than 1.

If $0 < b < 1$, then the exponential function is an exponential decay.

The graph falls from left to right, passing through the points (0, 1) and (1, *b*).



The *x*-axis is an asymptote of the graph.

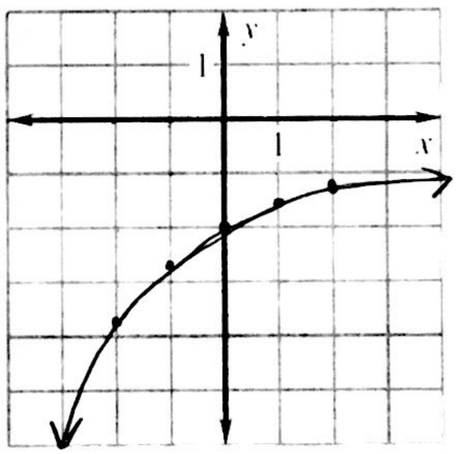
$$y = a \cdot b^x$$

y-int / initial amount (a); decay factor (b)

Example #1: Graph the function. Then state the domain and range.

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

x	y
-2	-3.6
-1	-2.7
0	-2
1	-1.5
2	-1.1



domain: $(-\infty, \infty)$

range: $(-\infty, 0)$

Example #2: Tell whether the function represents *exponential growth* or *exponential decay*.

1. $f(x) = 3\left(\frac{3}{4}\right)^x$

decay

$3/4 < 1$

2. $f(x) = -4\left(\frac{5}{2}\right)^x$

growth

$5/2 > 1$

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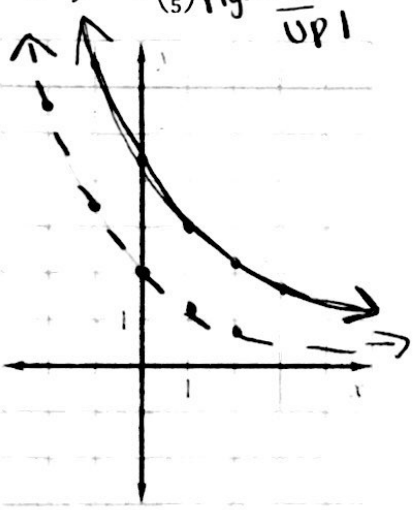
Notes:

To graph a function of the form $y = a \cdot b^{x-h} + k$, begin by sketching the graph of $y = a \cdot b^x$.

Then translate the graph horizontally by h units and vertically by k units.

Example #3: Graph the function. Then state the domain and range.

1. $y = 2\left(\frac{3}{5}\right)^{x-1} + 1$ right 1, up 1



$y = 2\left(\frac{3}{5}\right)^x$

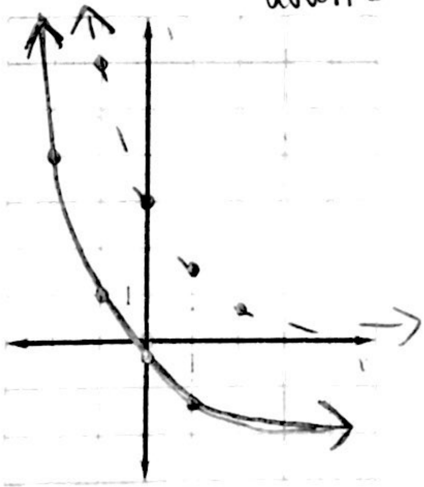
x	y
-2	5.6
-1	3.3
0	2
1	1.2
2	0.7

domain: $(-\infty, \infty)$

range: $(1, \infty)$

You practice: Graph the function. Then state the domain and range.

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



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

x	y
-2	12
-1	6
0	3
1	1.5
2	0.8

domain: $(-\infty, \infty)$

range: $(-2, \infty)$

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Notes:

When a real-life quantity decreases by a fixed percent each year (or other time period), the amount y of the quantity after t years can be modeled by the equation

$$y = a(1 - r)^t$$

t → time (years)
r → rate % (decimal)
a → initial amount
$(1 - r)$ → decay factor

Example #4: A new television costs $1200. The value of the television decreases by 21% each year.

1. Write an exponential decay model giving the television's value y (in dollars) after t years.

$y = 1200(1 - 0.21)^t$

$y = 1200(0.79)^t$

2. Estimate the value of the television after 2 years.

$y = 1200(0.79)^2$

$y \approx \$748.92$

3. Graph the model. Use the graph to estimate the year when the value of the television will be $300.

t	y
0	1200
2	748.92
4	467.40
6	291.70
8	182.05

≈ 6 years