Name: KEY Hour: ____________ Date: ____________

NOTES: Section 7.1 – Graph Exponential Growth Functions

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

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

#3 - I can use an exponential growth model in a real life situation involving compound interest.

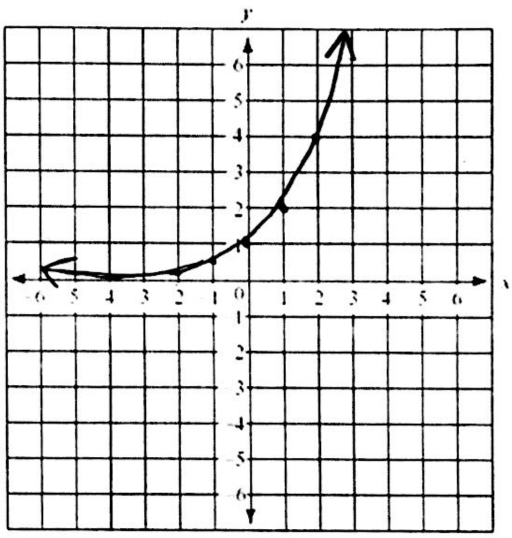
Homework: Lesson 7.1 Worksheet

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

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

$y = 2^x$

x	y
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4



Notes:

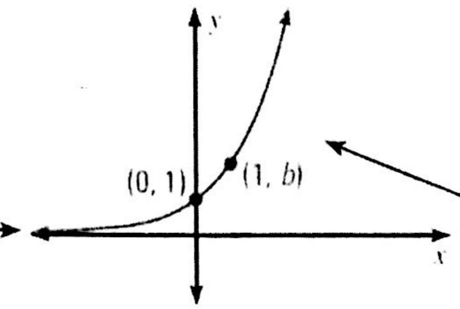
An exponential function has the form: $y = a \cdot b^x$

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

If $b > 1$, then the exponential function is an exponential growth function.

Name:______________________ Hour: __________ Date: __________

The x-axis is an **asymptote** of the graph. An asymptote is a line that a graph approaches more and more closely.



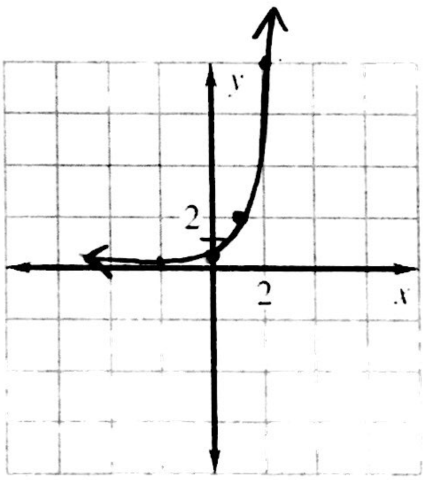
The graph rises from left to right, passing through the points (0, 1) and (1, b).

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

y-int initial amount ↑ ↑ growth factor

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

1. $y = \frac{1}{2} \cdot 4^x$

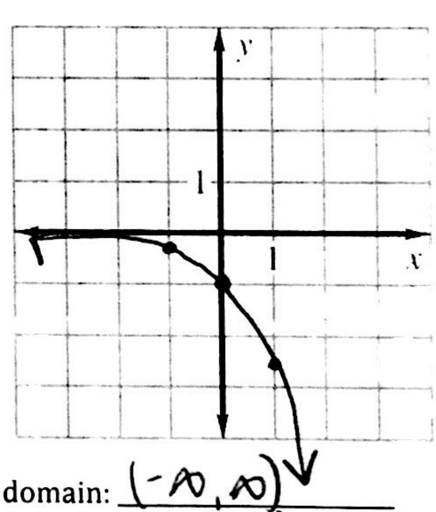


x	y
-1	1/8
0	1/2
1	2
2	8

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

range: $(0, \infty)$

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



x	y
-1	-2/5
0	-1
1	-2.5
2	-6.3

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

range: $(-\infty, 0)$

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

1. What transformation would happen if we added k to $y = a \cdot b^x + k$

vertical shift (up or down)

2. What transformation would happen if we subtracted h to $y = a \cdot b^{x-h}$

horizontal shift (left or right)

Name:______________________ Hour: __________ Date: __________

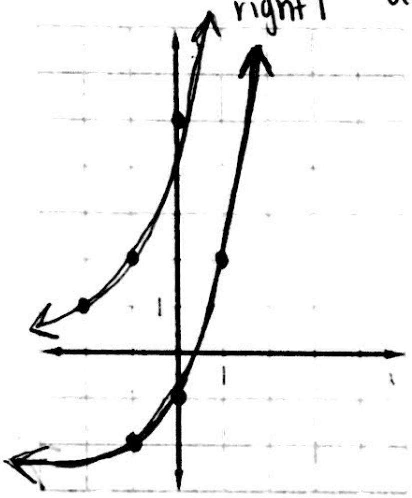
Notes:

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 #2: Graph the function. Then state the domain and range.

1. $y = 4 \cdot 2^{x-1} - 3$ right 1 down 3 $y = 4 \cdot 2^x$



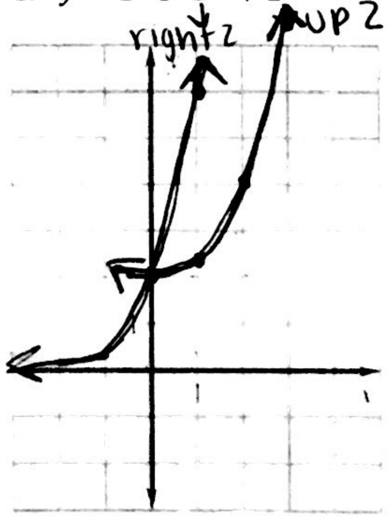
x	y
−1	2
0	4
1	8
2	16
−2	1

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

range: $(-3, \infty)$ (down 3)

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

1. $y = 2 \cdot 3^{x-2} + 2$ right 2 up 2



$y = 2 \cdot 3^x$

x	y
−1	2/3
0	2
1	6
2	18

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

range: $(2, \infty)$

Name:______________________ Hour: __________ Date: __________

Notes:

When a real-life quantity increases 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

$$y = a(1 + r)^{t} \rightarrow \text{time (years)}$$

initial amount

percent (decimal)

growth factor

Example #3: Use the model to identify the intial amount, the growth factor, and the annual percent increase.

1. $y = 2500(1.50)^{t}$

initial amt: 2500

growth factor: 1.50

% increase: 50%

$1.5 = 1 + r$

$-1 \quad -1$

$r = 0.5$

50%

2. $y = 0.42(2.47)^{t}$

initial amt: 0.42

growth factor: 2.47

% increase: 147%

$2.47 = 1 + r$

$-1 \quad -1$

$r = 1.47$

$= 147\%$

Example #3: In the last 12 years, an initial population of 38 buffalo in a state park grew by about 7% per year.

1. Write an exponential growth model giving the number n of buffalo after t years.

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

$y = 38(1 + 0.07)^{t}$

$\boxed{y = 38(1.07)^{t}}$

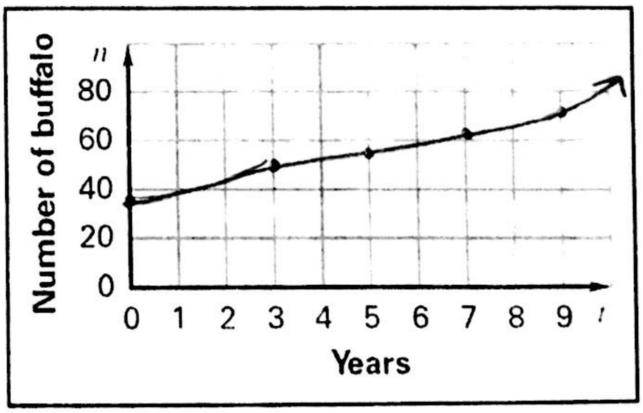
2. About how many buffalo were in the park after 7 years?

$y = 38(1.07)^{7}$

$y \approx$ $\boxed{\text{61 buffalo}}$

3. Graph the model. Use the graph to estimate the year when there were about 53 buffalo.

t	y
0	38
3	47
5	53
7	61
9	70



Name:________________________ Hour: __________ Date: __________

Notes:

Exponential growth functions are used in real-life situations involving compound interest.

Compound interest is interest paid on an intial investment, called the principal, and on previously earned interest.

To represent compound interest we use the equation:

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$nt \to$ time (years)

$r \to$ rate (decimal)

$A \to$ amount

$P \to$ principal (initial amt)

n: times compounded

Annually: 1

Semi-annually: 2

Quarterly: 4

Monthly: 12

Daily: 365

Example #4: You deposit $2900 in an account that pays 3.5% annual interest. Find the balance after 1 year if the interest in compounded monthly and annually.

$A = 29000\left(1 + \frac{0.035}{n}\right)^{n \cdot 1}$

1. With interest compounded monthly, the balance after 1 year is:

$n = 12$

$A = 2900\left(1 + \frac{0.035}{12}\right)^{12 \cdot 1}$

$= 2900(1.003)^{12}$

$= \boxed{\$3003.14}$

2. With interest compounded annually, the balance after 1 year is:

$n = 1$

$A = 2900\left(1 + \frac{0.035}{1}\right)^{1 \cdot 1}$

$= 2900(1.035)^{1}$

$= \boxed{\$3001.50}$