Warm Up April 1, 2019

1.) The math club sells candy bars and drinks during football games.

- 60 candy bars and 110 drinks will sell for $265.
- 120 candy bars and 90 drinks will sell for $270.

Determine the cost of each candy bar. Express your answer in dollars.cents.

x = cost of candy bars

y = cost of drinks

$$2(60x+110y=265)$$
$$120x+90y=270$$

$$120x+220y=530$$
$$(-)\ 120x+90y=270$$
$$\frac{130y}{130}=\frac{260}{130}$$
$$y=2$$

$$120x+90(2)=270$$
$$120x+180=270$$
$$\frac{120x}{120}=\frac{90}{120}$$

$$x=\$0.75$$

2.) There were originally 4 trees in an orchard. Each year the owner planted the same number of trees. In the 29th year, there were 178 trees in the orchard.

slope!

$y=mx+b$

Write a function, *t(n)*, that can be used to determine the number of trees in the orchard in any year, *n*.

$$b=4 \qquad (0,4)(29,178)$$
$$m=\frac{178-4}{29-0}=\frac{174}{29}=6$$
$$t(n)=6n+4$$

Recall:
Given the sequences below, determine whether they are arithmetic or geometric, find the next three terms, and write an equation and NEXT/NOW statement.

Ex.) 2, 5, 8, 11,...
Arithmetic or Geometric

Next three terms: _________

Explicit: a_n = __________________

Recursive: a_n = __________________

Ex. 7, -14, 28, -56,....
Arithmetic or Geometric

Next three terms: _________

Explict: a_n = __________________

Recursive: a_n = ______________

Intro to Exponential Functions

An <u>exponential function</u> is a form of a geometric sequence.

A function in which the variable is the exponent is called an **<u>exponential function</u>**.

Form of an Exponential Function

$$\boxed{y = a \cdot b^x}$$

a = y-intercept (when there is no shift)
b = common ratio, base

Geometric Sequence

$$a_n = a_1 \cdot r^{n-1}$$

n^{th} term in the sequence

1st term in the sequence

common ratio

number of terms in the sequence

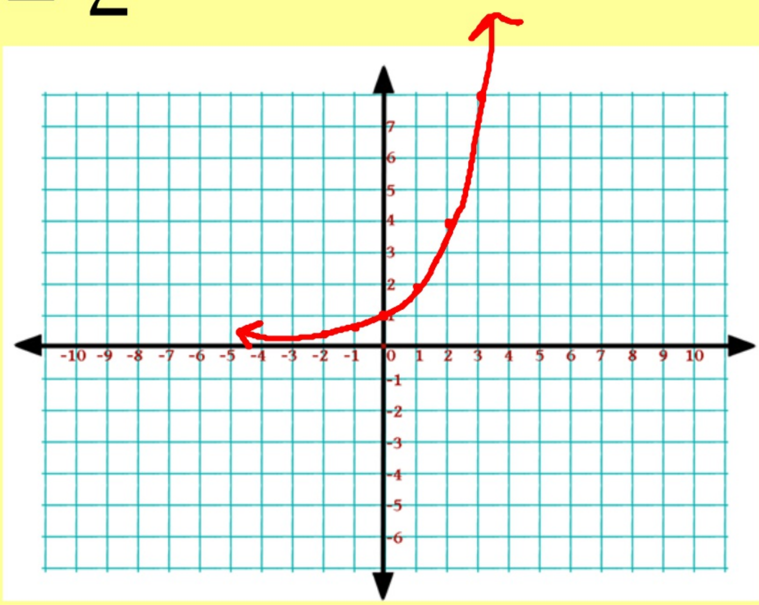
Exponential Function

$$y = a_1 \cdot r^{x-1}$$

Make a graph using a table

$$y = 2^x$$

x		y
-2	2^{-2}	.25
-1	2^{-1}	.5
0	2^{0}	1
1	2^{1}	2
2	2^{2}	4



y-int: (0,1)

base: 2

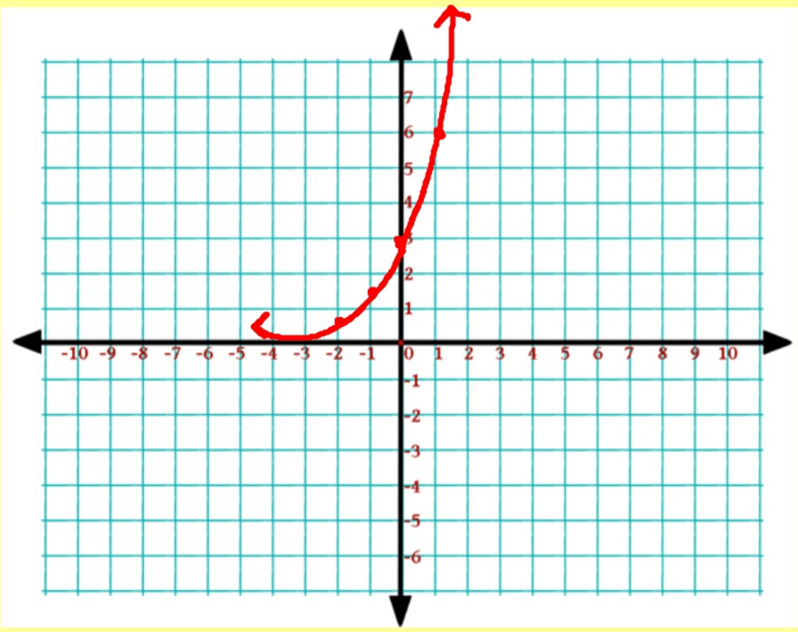
Make a graph using a table

$$y = 3(2)^x$$

x		y
-2	$3(2)^{-2}$	.75
-1	$3(2)^{-1}$	1.5
0	$3(2)^{0}$	3
1	$3(2)^{1}$	6
2	$3(2)^{2}$	12

y-int: (0, 3)

base: 2



Turn and Talk

What did you notice about the graphs of exponential functions?

How would you describe the increase?

(1 - 2 min)

Find the y-intercept of the exponential functions.

A.) $y = 3(.75)^x$

$(0, 3)$

C.) $y = 2(1.05)^x - 4$

$(0, -2)$

B.) $y = 0.5(1.04)^x$

$(0, 0.5)$

$y = 1(.80)^x - 3$

D.) $y = .80^x - 3$

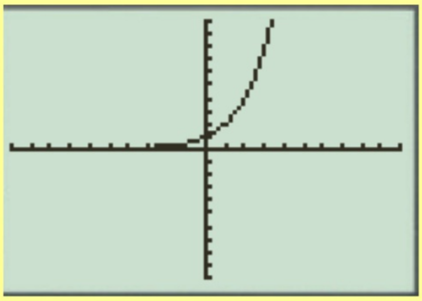
$(0, -2)$

Hint: Exercises C and D have shifts.
Y-intercept is value of y when x =0

What does it mean when an exponential function has a shift?

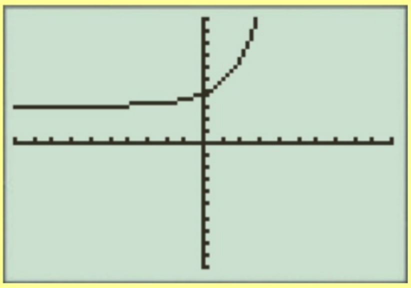
An exponential function in the form $\boxed{\underline{f(x)= a(b^x) + k}}$ has a vertical shift.

The constant, k, is what causes the shift to occur.



$y = 2^x$

(0,1)



$y = 2^x+3$

(0,4)

*Notice the y-intercepts.

Ex.) The function $f(x) = 3(2)^x$ was replaced with $f(x) + k$ so that the y-intercept became (0,5). What is the value of k?

$f(x)=3(2)^x$

$a = 3$, $b = 2$

y - int: (0,3)

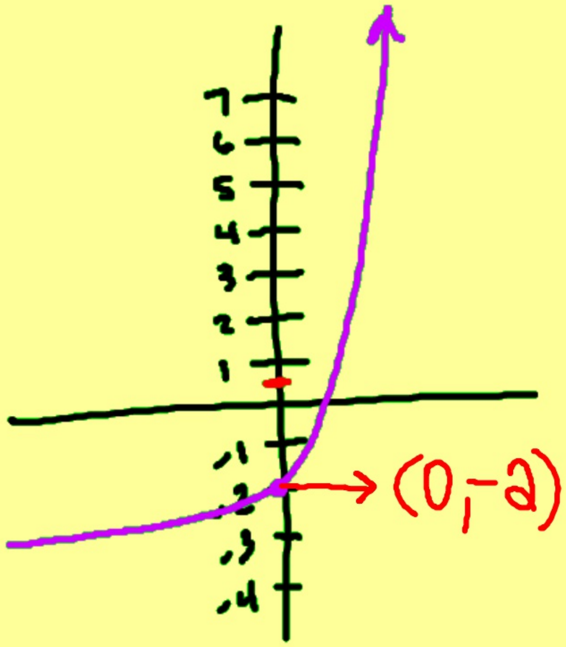
$$
\begin{array}{r}
3+k=5 \\
-3 \quad\; -3 \\
\hline
k=2
\end{array}
$$

Ex.) The function $\boxed{f(x) = -4(3)^x}$ was replaced with f(x) + k so that the y-intercpet became (0,3). What is the value of k?

$(0,-4) \longrightarrow (0,3)$

$$\begin{array}{r} -4+k=3 \\ +4 \quad\quad +4 \\ \hline k=7 \end{array}$$

Ex.) The function $\boxed{f(x) = 0.5(1.5)^x}$ was replaced with $f(x) + k$, as graphed below. What is the value of k?



$$
\begin{array}{r}
0.5 + K = -2 \\
-0.5 \qquad -0.5 \\
\hline
K = -2.5
\end{array}
$$