Graphing Exponential Functions from a Data Table or Formula

Definitions:
An **Exponential Function** is a relationship of numbers in which a positive base is raised to powers other than one.
There are four types of exponential curves.

Formulas:
$y = ab^x + c$ or
$f(x) = ab^x + c$

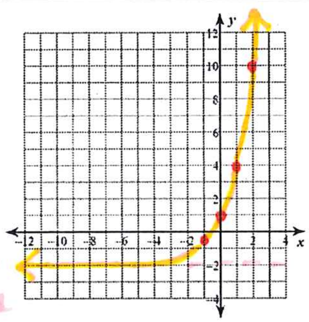
a is an initial value or coefficient.
b is the base being raised.
c is the horizontal asymptote.

Example #1:

$y = 3*2^x - 2$

Table Shows:

x	y
-1	-.5
0	1
1	4
2	10



C = -2

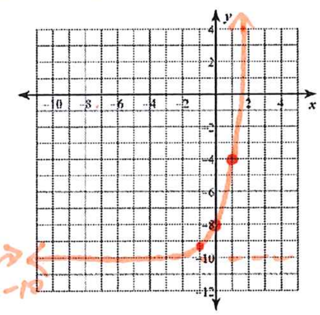
There are a few ways to graph an exponential curve, we can use a graphing calculator, we can make an x–>y table, or we can look for a few critical points. Our method involves the calculator this semester. We enter the formula in using the "y =" button and we use the "^" to tell the calculator that the next number is an exponent.

Example #2:

$y = 2*3^x - 10$

Table Shows:

x	y
-1	-9.333
0	-8
1	-4
2	8



C = -10

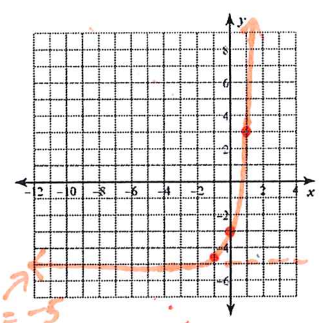
As it did in example #1, the calculator gives us an output for every whole-number input. Some of the outputs are more useful than others as they might give us whole numbers. We notice a couple things about this graph, the c-value, '-10' has shown us the asymptote and the curve is steeper than that of example #1.

Example #3:

$y = 2*4^x - 5$

Table Shows:

x	y
-1	-4.5
0	-3
1	3
2	27



C = -5

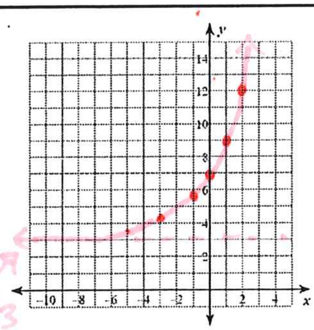
As with examples one and two, our c-value revealed the horizontal asymptote. It is considered useful or proper to mark the asymptote with a dashed line. Also, we see this curve is even steeper than the previous two. In fact, the b-value, as it goes up, makes the curve steeper and steeper.

Example #4:

$y = 4*(1½)^x + 3$

Table Shows:

x	y
-1	5.667
0	7
1	9
2	12



C = 3

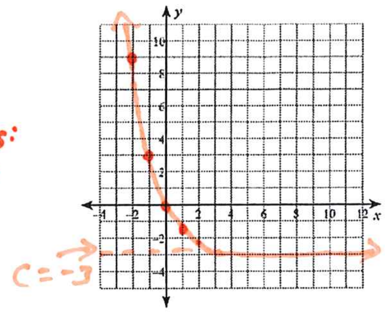
Example four revealed two things to us. First we saw that we could use a fraction as a b-value by typing in the number is the calculator as (3/2) or (1.5), either raised to the x. Second we found the graph was less-steep than example #1, because the b-value was less than two and closer to zero.

Example #5:

$y = 3*(½)^x - 3$

Table Shows:

x	y
-2	9
-1	3
0	0
1	-1.5



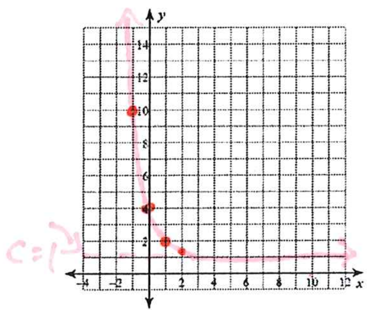
Example #5 seems different than the first four because for the first time our b-value is less than 1 but still greater than zero. This creates a different shaped exponential curve called an exponential decay curve.

Example #6:

$y = 3*(^1/_3)^x + 1$

Table Skills

-1	10
0	4
1	2
2	1.333



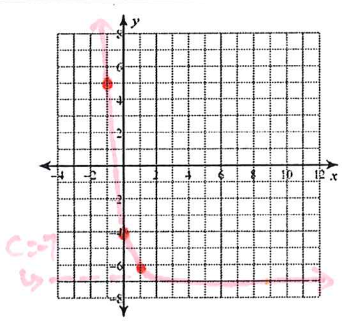
It is important when entering a fraction into the graphing calculator to use the parentheses so that the calculator raises the entire value to the power of x.

Example #7:

$y = 3*(^1/_4)^x - 7$

Table skills

x	y
-2	41
-1	5
0	-4
1	-6.25



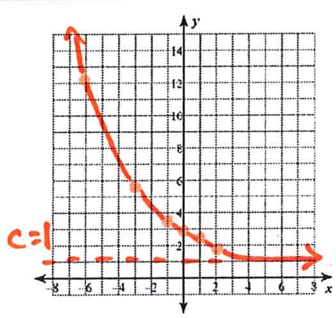
Having tried a half, a third, and now a quarter to the x-power, we find that our curve is getting more and more steep. That happens because the b-value is getting closer and closer to zero, which would make the curve a vertical line.

Example #8:

$y = 2*(^3/_4)^x + 1$

Table Shows

x	y
-3	5.741
-1	3.667
0	3
1	2.5
3	1.844



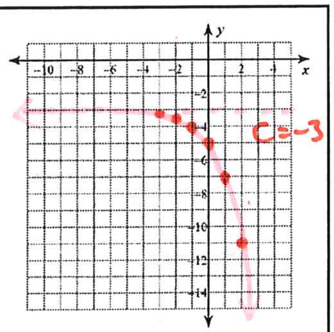
Our three-quarters decay curve is the least-steep so far because it is the highest decay-curve b-value we have had, making it the closest to '1.' If the b-value is '1,' our curve would become a horizontal line.

Example #9:

$y = -2*2^x - 3$

Table Shows:

x	y
-3	-3.25
-2	-3.5
-1	-4
0	-5
1	-7



Example nine does something entirely new. Our exponential growth curve, instead of curving up curves down (left to right). This is because of the negative a-value which makes this an inverse exponential growth curve.