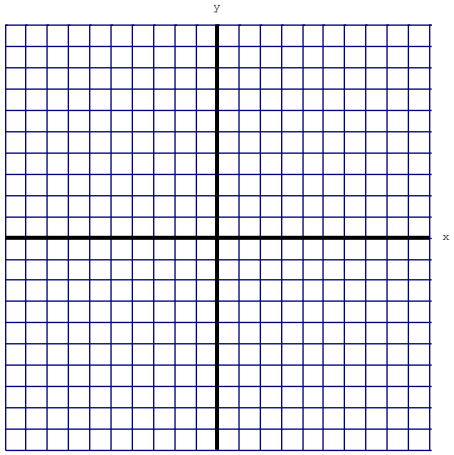
Exponential Functions Graph Exploration

When we were graphing lines, the first method we discussed this year was point-plotting. The point-plotting method consists of choosing x-values, plugging those x-values into the equation to find the corresponding y-value, and then graphing the point for each pair (x, y). We mentioned that the benefit of this method was that it could be used to create the graph of any function. Today we are going to extend this method to graph exponential functions.

Review: Fill in the T-Chart with the missing y-coordinate for the given equation. Then, graph the function.

1) Graph $y = 2x + 4$

x	y
-2	
-1	
0	
1	
2	



Your graph should be a line. You can look at the equation and tell that the graph is a line because you have y to the first power and x to the first power.

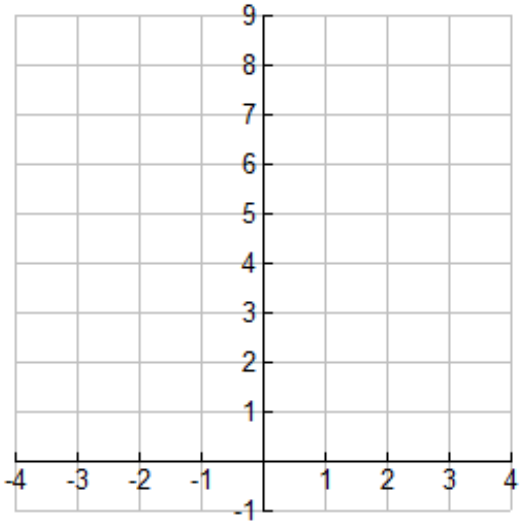
What we are going to be focusing on today are exponential functions. In general, an equation of the form $y = a \cdot b^x$, where $a \neq 0$, $b > 0$, and $b \neq 1$ is called an **exponential function.**

To graph an exponential function, we will make a table using integer values for *x* and plot the corresponding points. We will then connect the points with a smooth curve.

Just as you can recognize a line by looking at the equation, you can recognize an exponential by looking at the equation. Notice in the equation that x ***IS*** the exponent. When this occurs, you know that you are looking at an exponential function.

2) Sketch the graph of $f(x) = 3^x$ *(Remember that a negative exponent means to take the reciprocal or move the base across the fraction bar! As a result,* 2^{-3} *is* $\frac{1}{2^3}$*, or* $\frac{1}{8}$ *).*

x	3^x
-2	
-1	
0	
1	
2	



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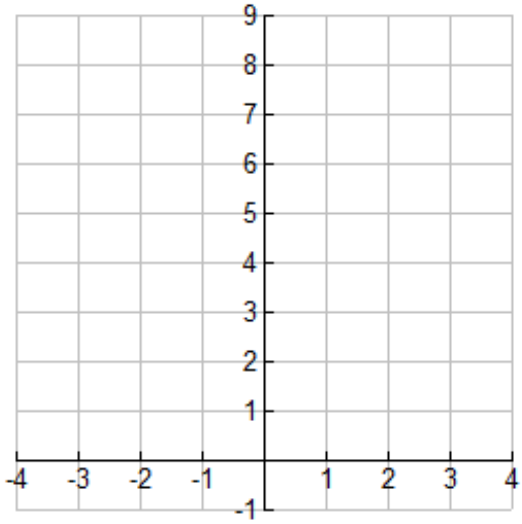
3) Sketch the graph of $f(x) = 2^x$

x	2^x
-2	
-1	
0	
1	
2	
3	

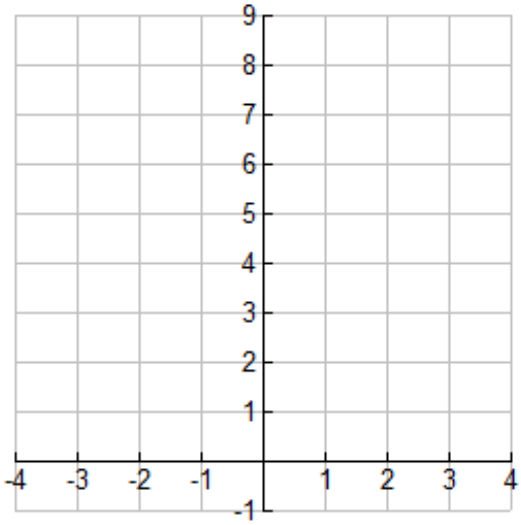


So far, we have seen $f(x) = a \cdot b^x$ when a has been 1 and b has been 3 and 2. Notice that x represents the variable, so while I gave you x-values on your T-charts, you could have picked any values for x.

3a) What similarities do you notice for the two functions you just graphed? What differences do you notice?

4) Graph $f(x) = \left(\frac{1}{2}\right)^x$.

x	$\left(\frac{1}{2}\right)^x$
-2	
-1	
0	
1	
2	
3	



4a) How are the graphs of $f(x) = 2^x$ and $f(x) = \left(\frac{1}{2}\right)^x$ *related?*

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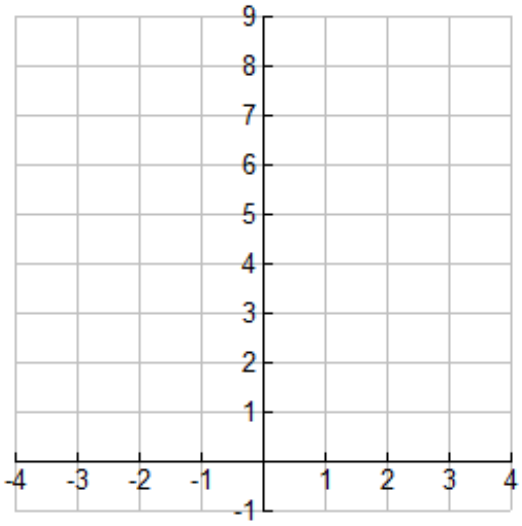
5)Sketch the graph of $y = \left(\frac{1}{3}\right)^x$.

x	$\left(\frac{1}{3}\right)^x$
-2	
-1	
0	
1	
2	

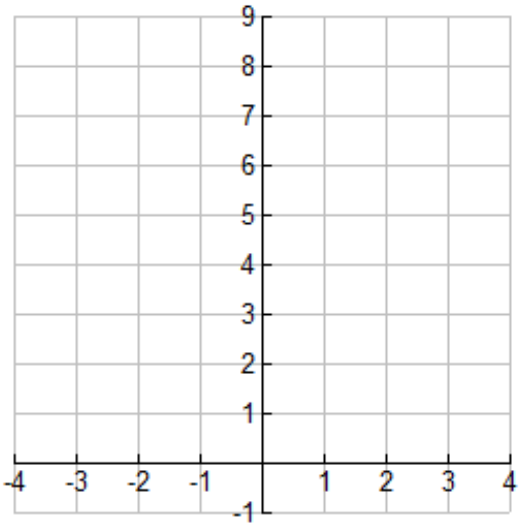


5a) Compare this graph to the first graph you created today. Based on your observations, predict how the graphs of $f(x) = b^x$ and $f(x) = \left(\frac{1}{b}\right)^x$ are related.

5b) What point do all graphs of the form $y = b^x$ have in common?

6) Sketch the graph of $y = 2x^2$.

x	$f(x) = 2x^2$
-2	
-1	
0	
1	
2	



6a) What do you notice about this graph? How is it similar to graphs 1 and 3? How is it different?

6b) Is this graph an Exponential graph? Why or why not (if you're not sure, re-read the information on the first page)?

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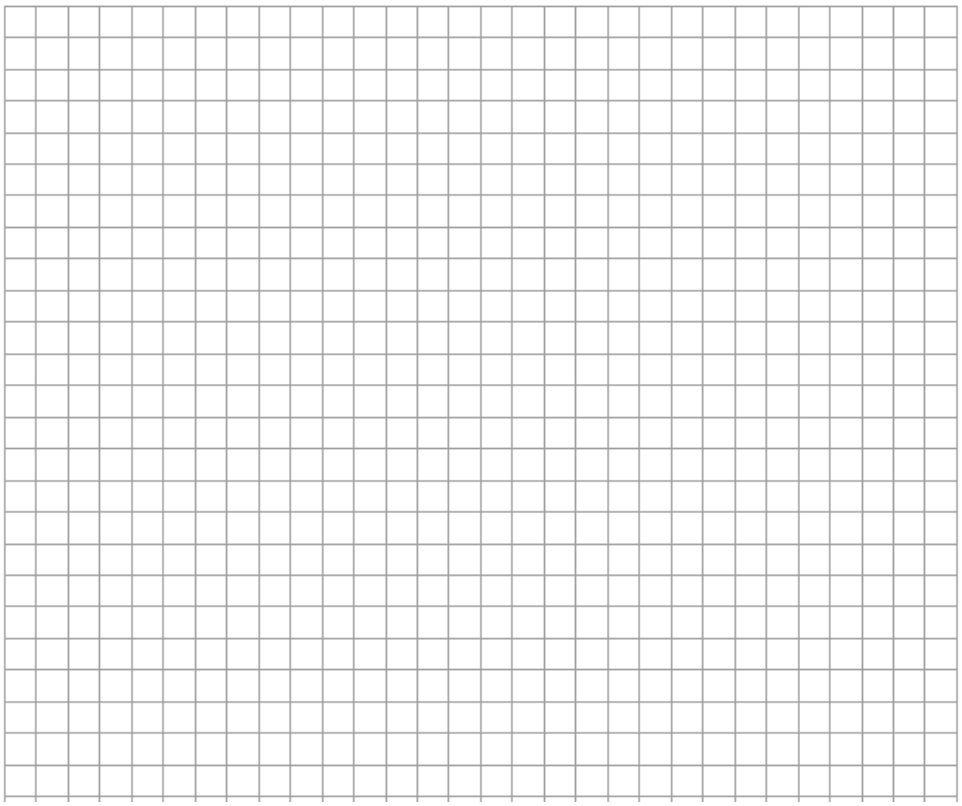
7) Create your own Exponential Graph. Rule: _____

x	f(x)
-2	
-1	
0	
1	
2	



7a) Fully describe your graph. Is it a function? Why or why not? What is the Domain and Range?

7b) What questions might you still have about Exponential functions?

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