Exponential Functions

An exponential function is any function of the form $f(x) = a^x$ (or any transformation of a function of this form, e.g., $f(x) = 5 \cdot 3^{x-2} + 4$). We say a is the *base* of the function.

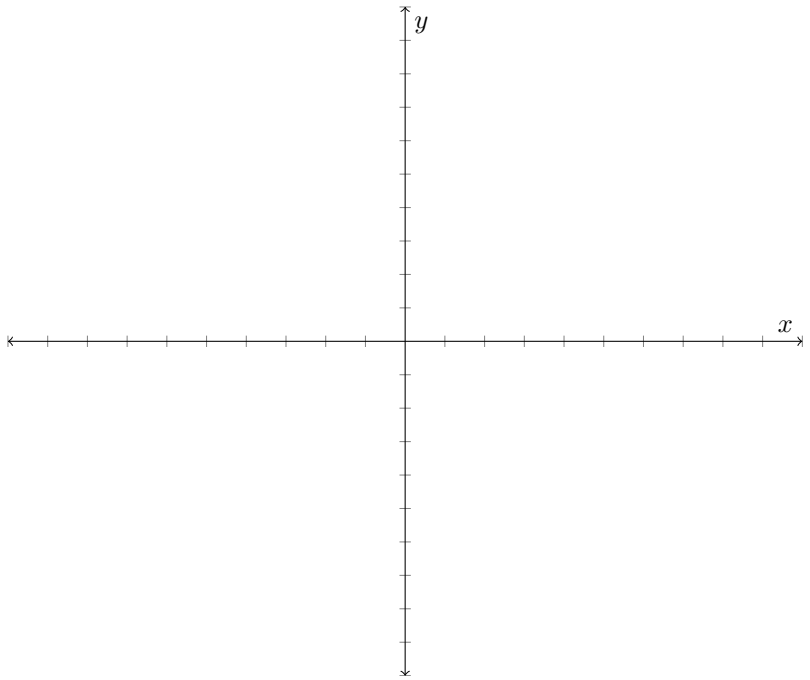
1. First, let's address this, since it comes up from time to time. True or false: $3 \cdot 5^x = 15^x$?

2. We typically restrict ourselves to only looking at exponential functions where the base a is $a > 1$ or $0 < a < 1$. Why?

3. Let's figure out the general shape of the graph of exponential functions by graphing 2^x.
   (a) Plug in some points:

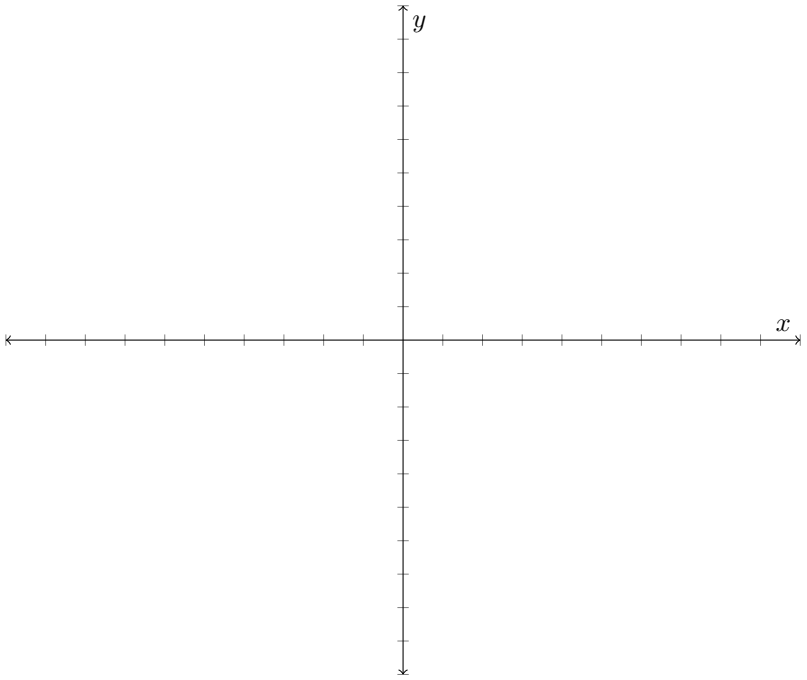
x	-3	-2	-1	0	1	2	3	4	5	10
2^x										

   (b) Now sketch a graph with those points. You might need to be careful with your labels.



   (c) Compare this to the graph of x^2 by sketching x^2 it on the same axes.
   (d) Describe the major differences between the two.

4. How does changing the base affect the graph of an exponential function? Compare 2^x and 3^x. What about $\frac{1}{2}^x$? Or $\frac{1}{3}^x$?



5. What is the domain of an exponential function of the form $f(x) = a^x$? What is the range?

6. Draw a rough sketch of the function $g(x) = 2 \cdot 3^{-x} - 5$. Make sure your y-intercept is in the right place.