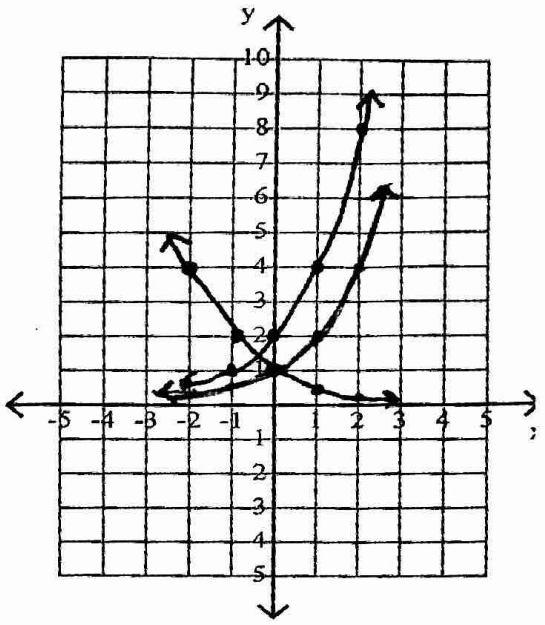
5.1 Investigation

Graph the equation $y = 2^x$

x	y
-2	1/4
-1	1/2
0	1
1	2
2	4



$2^{-1} = 1/2$

2^(-1)

1. When will the graph cross the x axis? (When will $y = 0$)?

never! asymptote at $y=0$

$y=2^{-x}$

2. Now graph the equations $y = 2^{-x}$, and $y = 2^{x+1}$ on the same graph as before.

flip over y-axis

x	y
-2	4
-1	2
0	1
1	1/2
2	1/4

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

Left 1

3. Based on the results from question 2, what do you think the graphs of $y = -2^x$ and $y = 2^x - 1$ would look like?

$2^x - 1$ $2^x - 1$ 2^{x-1}

$y = -2^x$ over x-axis

$y = 2^x - 1$ down 1

$y = -2^x$

4. ~~For the equation~~ $y = a^x$, a is known as the base. Ex. $y = 2^x$ has a base of 2. Write a general rule for the following equations. (Describe what will happen to the graph.)

Equation	$y = a^{x-1}$	$y = a^{x+1}$	$y = a^{-x}$
Rule	right 1	left 1	over y-axis
Equation	$y = -a^x$	$y = a^x + 1$	$y = a^x - 1$
Rule	over x-axis	up 1	down 1

AZ

10/23 Notes

exponential transforms

$$y = a(b)^{\frac{x-h}{c}} + k$$

- The parent function is $y = b^x$ (you keep the same base)
- h tells you left/right
- k tells you up/down (look at asymptote)
- a is the vertical dialation, if negative flips over x-axis
- c is the horizontal dialation, if negative flips over y-axis.