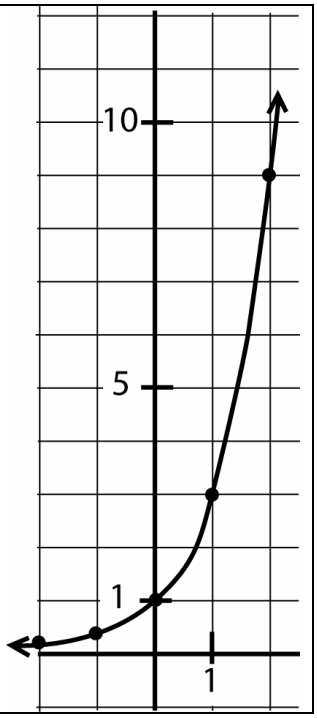
Working with exponential functions Solutions NAME:

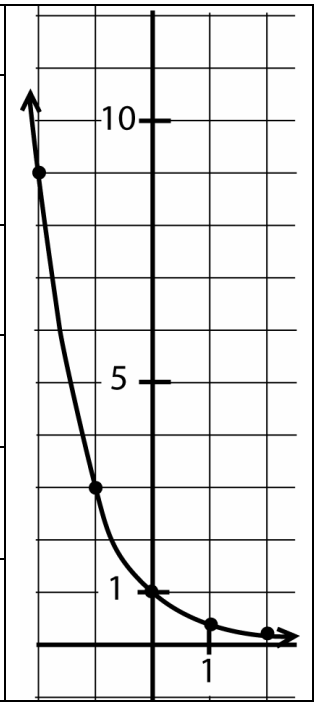
1. Complete the table. Then plot and connect the points to form a graph of $f(x) = 3^x$.

x	$f(x) = 3^x$
-2	$3^{-2} = 1/9$
-1	$3^{-1} = 1/3$
0	$3^0 = 1$
1	$3^1 = 3$
2	$3^2 = 9$



2. Complete the table. Then plot and connect the points to form a graph of $f(x) = \left(1/3\right)^x$.

x	$f(x) = \left(1/3\right)^x$
-2	$\left(\frac{1}{3}\right)^{-2} = 3^2 = 9$
-1	$\left(\frac{1}{3}\right)^{-1} = 3^1 = 3$
0	$\left(\frac{1}{3}\right)^{0} = 1$
1	$\left(\frac{1}{3}\right)^{1} = \frac{1}{3}$
2	$\left(\frac{1}{3}\right)^{2} = \frac{1}{9}$



3. Now, the first graph $f(x) = 3^x$ should be increasing over the whole domain. Make sure you can see that. The second graph of $f(x) = \left(\frac{1}{3}\right)^x$ is decreasing over its entire domain. What makes the difference? In other words, what about the formula for each makes it increase or decrease?

The base, in our two examples 3 or $\frac{1}{3}$, determines if the graph will increase or decrease from left to right. Look at the tables of values. Notice the y-values for the first function, $f(x) = 3^x$, triple from one to the next as we go down the table. So the graph will increase. The y-values for the second function, $f(x) = \left(\frac{1}{3}\right)^x$, decrease by a third from one to the next as we go down the table. So the graph will decrease.

4a. Make up an exponential function that will increase over its entire domain. Write it down and then sketch what you think it should look like. Then graph it on your grapher to verify.

Make up any exponential function whose base is greater than 1.

4b. Make up an exponential function that will decrease over its entire domain. Write it down and then sketch what you think it should look like. Then graph it on your grapher to verify.

Make up any exponential function whose base is positive but less than 1.

5. Simplify the following using the rules of exponents. Try to simplify them down so that the base (for example, the "5" in part a) occurs only once.

a.) $5^{2x} * 5^3 * 5$

$= 5^{2x} * 5^3 * 5^1$

$= 5^{2x+3+1}$

$= 5^{2x+4}$

$a^s a^t = a^{s+t}$

$a^s / a^t = a^{s-t}$

b.) $\frac{7^{2x}}{7^3}$

$= 7^{2x-3}$

c.) $\frac{(-3)^4 * (-3)^x}{-3}$

$= \frac{(-3)^4 * (-3)^x}{(-3)^1}$

$= \frac{(-3)^{4+x}}{(-3)^1}$

$= (-3)^{4+x-1}$

$= (-3)^{3+x}$

d.) $\frac{5e^x + e^x}{e^{-3}}$

Distribution property on top

$= \frac{e^x(5+1)}{e^{-3}}$

$= \frac{6e^x}{e^{-3}}$

$= 6e^x e^3$

$= 6e^{x+3}$

6. Use your calculator to evaluate the following.

a.) $5e^{-6} = .0124$

b.) $\frac{-8e^2 + 4e}{6} = -8.0399$

7. Let $f(x) = 3e^{2x}$.

a.) Find $f(-2)$.

$f(-2) = 3e^{2(-2)}$

$= 3e^{-4}$

$= .0549$

b.) Find $f(4)$.

$f(4) = 3e^{2(4)}$

$= 3e^8$

$= 8942.8740$