MA 103 CHAPTER 9 EXPONENTIAL FUNCTIONS

SECTION 9.2: SKETCHING GRAPHS OF EXPONENTIAL FUNCTIONS

PAPER CUP FUNCTIONS

1. Linear function

Draw paper cup stacks to match the entries in the table.

X	Y = 2X + 1
0	1
1	
2	
3	
4	

Note the line made by skimming the tops of the cups.

Note that each stack is 2 cups taller than the previous stack.

2. Exponential function

Draw paper cup stacks to match the entries in the table.

X	$Y = 2^X$
0	1
1	
2	
3	
4	

Note the curve made by skimming the tops of the cups.

Note that each stack is 2 times taller than the previous stack.

3. DEFINITION

An **exponential function** has the form $f(x) = ab^x$, $a \neq 0$, $b > 0$, & $b \neq 1$.

4. SOME NOTES ON EXPONENTIAL FUNCTIONS

A. The variable is an exponent!

B. b is called the base of the function.

C. The domain is the set of all real numbers.

D. The graph of a basic exponential function is a curve that is steeper on one end and flatter (approaching horizontal) on the other end. Sometimes the curve goes up (from left to right) and sometimes the curve goes down (from left to right).

5. SKETCH THE GRAPH OF $f(x) = 3^x$

x	f(x)
-3	
-2	
-1	
0	
1	
2	
3	

Note in the table for each unit increase in x, the y value is tripled. Compare this to how a linear function is recognized in its table form.

For linear functions we had a slope addition property. For exponential functions we have a **Base Multiplier Property:** For an exponential function of the form $y = ab^x$, for each unit increase in x, the value of y is multiplied by b.

6. What size window do you need to graph the points in the table above?

X_{min} = _____ Y_{min} = _____ Graph using this window.

X_{max} = _____ Y_{min} = _____

7. Fill in the following table:

x	$g(x) = 4\left(\frac{1}{2}\right)^x$	$h(x) = 7(2)^x$	$j(x) = -4\left(\frac{1}{2}\right)^x$	$k(x) = -(2)^x$
-3				
-2				
-1				
0				
1				
2				
3				

8. State the y-intercept of the functions g, h, j, and k:

g(x) _____ j(x) _____

h(x) _____ k(x) _____

9. The y-intercept of an exponential function of the form $y = ab^x$ is (0, _____).

10. Examine the shape of the graphs for the functions in the table above.

A. When $a > 0$ and $b > 1$, is $y = ab^x$ increasing or decreasing?

B. When $a > 0$ and $0 < b < 1$, is $y = ab^x$ increasing or decreasing?

C. When $a < 0$ and $b > 1$, is $y = ab^x$ increasing or decreasing?

D. When $a < 0$ and $0 < b < 1$, is $y = ab^x$ increasing or decreasing?

11. The graphs of $f(x) = -ab^x$ and $g(x) = ab^x$ are reflections of each other across the x-axis. Which two functions f, g, h, or k are reflections of each other? Verify by graphing.

12. Note Putting It All Together: page 621