

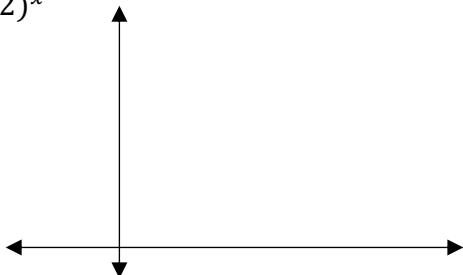
**5.1 Exponential Growth and Decay Introduction**

Explore:

Graph the following functions using Desmos and fill in the corresponding table for the given x values. What do you notice each of the functions have in common? What is different?

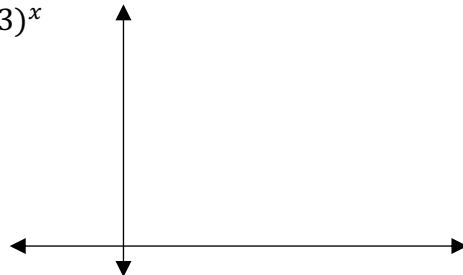
1.)  $f(x) = 3(2)^x$

x	y
0	
1	
2	
3	



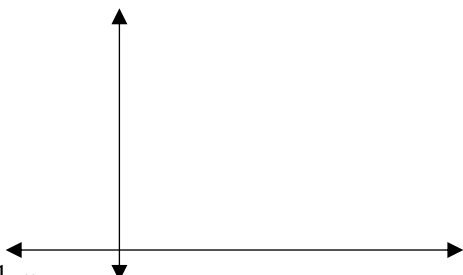
2.)  $f(x) = 6(3)^x$

x	y
0	
1	
2	
3	



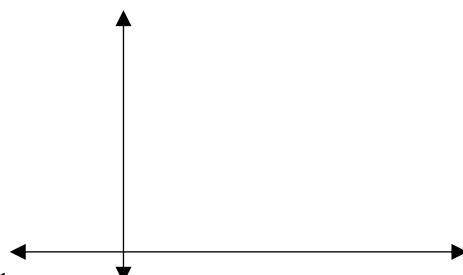
3.)  $f(x) = 4(1.5)^x$

x	y
0	
1	
2	
3	



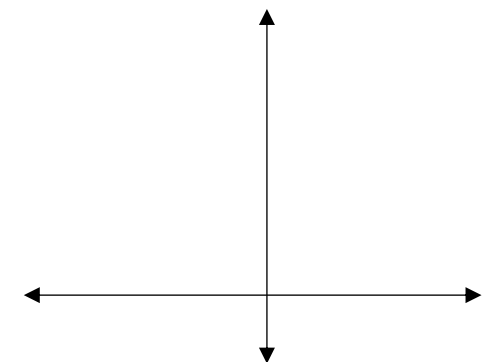
4.)  $f(x) = 10(8)^x$

x	y
0	
1	
2	
3	



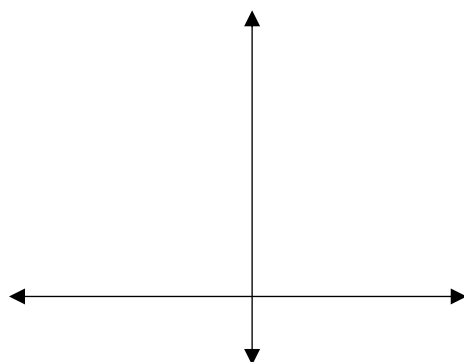
5.)  $f(x) = (\frac{1}{2})^x$

x	y
-3	
-2	
-1	
0	
1	
2	
3	



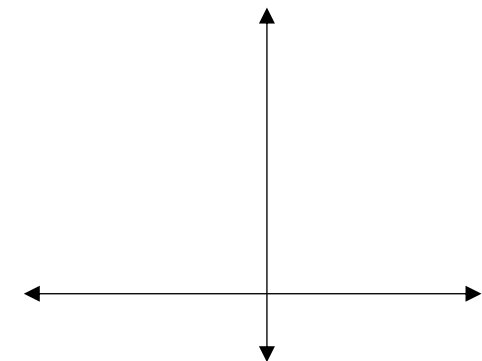
6.)  $f(x) = 4(\frac{1}{4})^x$

x	y
-3	
-2	
-1	
0	
1	
2	
3	



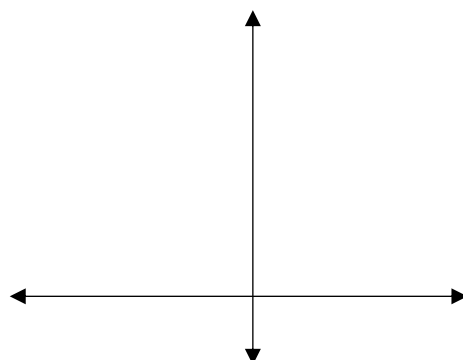
7.)  $f(x) = 3(\frac{2}{3})^x$

x	y
-3	
-2	
-1	
0	
1	
2	
3	

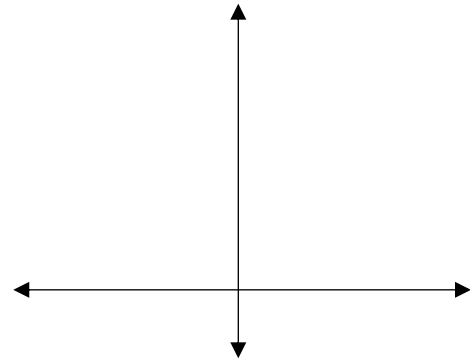


8.)  $f(x) = 20(\frac{4}{5})^x$

x	y
-3	
-2	
-1	
0	
1	
2	
3	



## Parent Function: Exponential Growth and Decay Functions



**Example)** Label the following functions as exponential growth, exponential decay, or neither. Then give their grow/decay rate and their growth/decay factor.

$$f(x) = 8(6)^x$$

$$f(x) = 100(0.8)^x$$

$$f(x) = \left(\frac{2}{3}\right)^x$$

$$f(x) = 9\left(\frac{10}{3}\right)^x$$

$$f(x) = \frac{4}{7}(5)^x$$

$$f(x) = \frac{8}{3}\left(\frac{8}{9}\right)^x$$

$$f(x) = 70(1.054)^x$$

$$f(x) = 8.45(1.7)^x$$

$$f(x) = 0.6(0.34)^x$$

$$f(x) = 0.93(6.3)^x$$

**Example)** 10 bacteria were introduced into a culture. Every minute, the bacteria will split into two pieces. Write a function where  $x$  represents the number of minutes since the bacteria was introduced to the culture and  $y$  represents the total number of bacteria. Then graph the function.

**Example)** A population of wolves was reintroduced into Yellow Stone Park in 1995, changing the landscape of the full park. If the initial population of wolves was 6 wolves in 1995 and the population grew at a rate of 8% per year, write a function for the total number of wolves in the population based on the number of years since the wolves arrived in 1995. Sketch a graph of the function.

**Example)** Mr. Tomato purchased a new (to him) vehicle for \$23,468. The vehicle is said to depreciate by a rate of 17% per year. Write a function for the value of the car based on the total number of years that Mr. Tomato has owned the car. Sketch a graph of the function.

