FST Name:

Notes 5.1 Date: Block:

***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. $f\left(x\right)=3(2)^{x}$ 2.) $f\left(x\right)=6(3)^{x}$



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

$3.) f\left(x\right)=4(1.5)^{x}$ 4.) $f\left(x\right)=10(8)^{x}$



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

$5.) f\left(x\right)=(\frac{1}{2})^{x}$ 6.) $f\left(x\right)=4(\frac{1}{4})^{x}$



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

$7.) f\left(x\right)=3(\frac{2}{3})^{x}$ 8.) $f\left(x\right)=20(\frac{4}{5})^{x}$





**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.

$f\left(x\right)=8(6)^{x}$ $f\left(x\right)=100(0.8)^{x}$

$f\left(x\right)=\left(\frac{2}{3}\right)^{x}$ $f\left(x\right)=9\left(\frac{10}{3}\right)^{x}$

$f\left(x\right)=\frac{4}{7}\left(5\right)^{x}$ $f\left(x\right)=\frac{8}{3}\left(\frac{8}{9}\right)^{x}$

$f\left(x\right)=70\left(1.054\right)^{x}$ $f\left(x\right)=8.45\left(1.7\right)^{x}$

$f\left(x\right)=0.6(0.34)^{x}$ $f\left(x\right)=0.93\left(6.3\right)^{x}$

**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.