FST Name:

Notes 5.2 Date: Block:

***5.2 Exponential Growth and Decay Applications***

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

$f\left(x\right)=3(1.79)^{x}$ $f\left(x\right)=520(0.23)^{x}$

$f\left(x\right)=\left(\frac{7}{10}\right)^{x}$ $f\left(x\right)=2\left(3.621\right)^{x}$

**Example)** Consider a culture of 100 bacteria that is placed into a petri dish. The bacteria are expected to grow at a rate of 4.7% each hour. Write a function that gives the total amount of bacteria in the petri dish after x hours have passed. Sketch a graph of the function.

a) How many bacteria will be in the b) When can you expect to see 1300

petri dish after 8 hours? bacteria in the petri dish?

**Example)** You bought $2000 worth of stocks in 2015. The value of the stocks have been decreasing by 9% per year since you bought them. Write a function that represents the value of the stock x years after you bought them in 2015.

a) What was the stock worth in 2018? b) If you keep the stock, when will it be worth $1200?

**Compound Interest:**

|  |  |
| --- | --- |
| **Annual Compounding:** | **Compounding *n* times per year:**  |

**Example)** $1000 is invested into an account earning 6% annual interest. How much will be in the account after 5 years?

**Example.** $1000 is invested into an account earning 6% interest **compounded quarterly**. How much will be in the account after 5 years?

What is the *n* value if the interest was compounded…

|  |  |  |  |
| --- | --- | --- | --- |
| Yearly:  | Monthly:  | Weekly:  | Daily:  |

|  |
| --- |
| **Continuous Compounding:**  |

What happens if you compound interest **continuously**?

**Example)** You invest $1000 earning 6% interest **compounded continuously**. How much will you have after 5 years?

Example) At present, the Population of Gambia is about 2.05 million people. The population is

growing at a rate of 3.22% compounded annually. If the population continues to grow at this

rate, what will the population of Gambia be in 10 years?

What if the population was growing at a rate compounded continuously? How different would

be the approximate population be?

**Example)** The value of an antique ring is said to increase by 18% each year. If the ring was purchased in 1940 for $12, what is the value of the ring today (2022)?

**Example)** During the economic recession which started in 2008, CNN reported that property values were declining at rates as high as 18% annually through 2012. Find the value of the properties below in 2012 if their value in 2008 was…

*Home 1:* $\$248,940$ *Home 2:* $\$563,500$

In 2014, the housing market began to rebound. If property values increased at an annual rate of 12.3%, how many years would it take before the two houses were back at their original value?

*Home 1:* Original Value: $\$248,940$ *Home 2:* Original Value: $\$563,500$

Value in 2012: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Value in 2012: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Years to Rebound: \_\_\_\_\_\_\_\_\_\_\_\_\_ Years to Rebound: \_\_\_\_\_\_\_\_\_\_\_\_\_

Example) A population of rhinos were introduced to a habitat in 2000. After 2 years, there were 18 rhinos in the habitat. After 7 years, there were 28 rhinos in the habitat. If the population of rhinos is said to have grown by a fixed percentage each year, at what rate is the rhino population increasing?