

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.

$$f(x) = 3(1.79)^x$$

$$f(x) = 520(0.23)^x$$

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

$$f(x) = 2(3.621)^x$$

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 petri dish after 8 hours?

b) When can you expect to see 1300 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:

<u>Annual Compounding:</u>	<u>Compounding n times per year:</u>
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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:
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What happens if you compound interest **continuously**?

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

Continuous Compounding:

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?
