Section 5.5 Guided Notebook

Section 5.5 Applications of Exponential and Logarithmic Functions

- ☐ Work through Objective 1
- ☐ Work through Objective 2

Section 5.5 Applications of Exponential and Logarithmic Equations

<u>Section 5.5 Objective 1 Solving Compound Interest Applications</u>

Complete the two compound interest formulas seen here:

Compound Interest Formulas

Periodic Compound Interest Formula

$$A = \underline{\hspace{6cm}}$$

Continuous Compound Interest Formula

$$A = \underline{\hspace{6cm}}$$

where

A = Total amount after t years
P = Principal (original investment)
r = Interest rate per year
n = Number of times interest is compounded per year
t = Number of years

Section 5.5

Work through the video that accompanies Example 1 and take notes here:

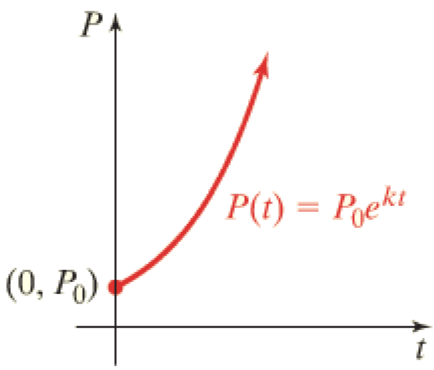
How long will it take (in years and months) for an investment to double if it earns 7.5% compounded monthly?

Work through the video that accompanies Example 2 and take notes here:

Suppose an investment of \$5,000 compounded continuously grew to an amount of \$5,130.50 in 6 months. Find the interest rate, and then determine how long it will take for the investment to grow to \$6,000. Round the interest rate to the nearest hundredth of a percent and the time to the nearest hundredth of a year.

Section 5.5 Objective 2 Exponential Growth and Decay

Exponential Growth: When a population grows at a rate proportional to the size of the current population, the following exponential growth function is used. $P(t) = P_0 e^{kt}$ where $k > 0$ and P_0 (sometimes called "P-not") is the initial population. The graph of this exponential growth function is seen below. Note that k is a constant called the **relative growth rate.**



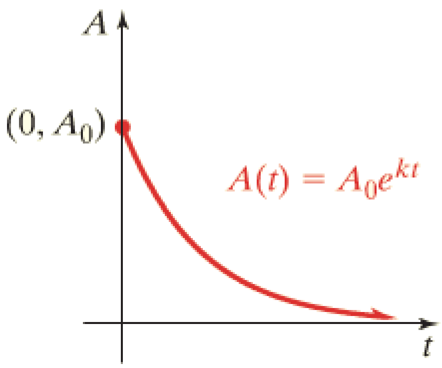
Graph of $P(t) = P_0 e^{kt}$ for $k > 0$

Work through the video that accompanies Example 3:

The population of a small town grows at a rate proportional to its current size. In 1900, the population was 900. In 1920, the population had grown to 1,600. What was the population of this town in 1950? Round to the nearest whole number.

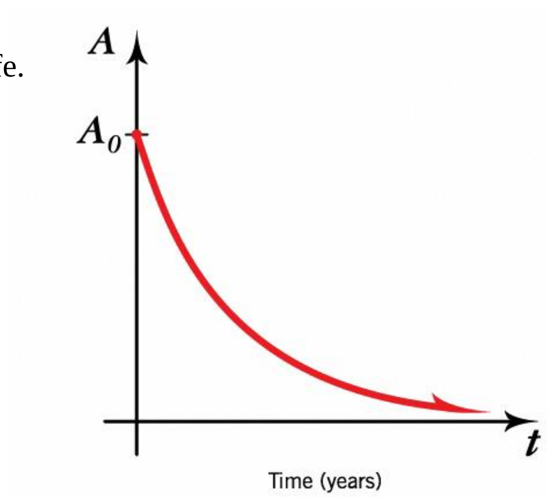
Exponential Decay

A model that describes the exponential decay of a population, quantity, or amount *A*, after a certain time, *t*, is $A(t) = A_0 e^{kt}$ where $k < 0$ and A_0 (sometimes called "A-not") is the initial quantity. The graph of this exponential decay function is seen below.



Graph of $A(t) = A_0 e^{kt}$ for $k < 0$

One very useful application of the exponential decay model is **half-life.**



Work through the animation that describes half-life.

Define **half-life:**

What is the half-life of Cesium-137?

On the graph on the previous page, insert the relevant time values and corresponding A values as seen in this animation. How much Cesium-137 would be left after 120 years? 150 years?

Work through the video that accompanies Example 4:
Suppose that a meteorite is found containing 4% of its original krypton-99. If the half-life of krypton-99 is 80 years, how old is the meteorite? Round to the nearest year.