

Worksheet -- Section 5.5 Part b -- Exponential Growth/Decay Models.

We will focus on models of the form $P = P_0 e^{kt}$. $k < 0$ means decay. $k > 0$ means growth.

1. \$1000 is invested at an APR of 7.5% compounded continuously. [You are given the initial value]

a) How long will it take for the investment to double in value?

b) How long will it take for the investment to triple in value?

c) What is the value after 10 years?

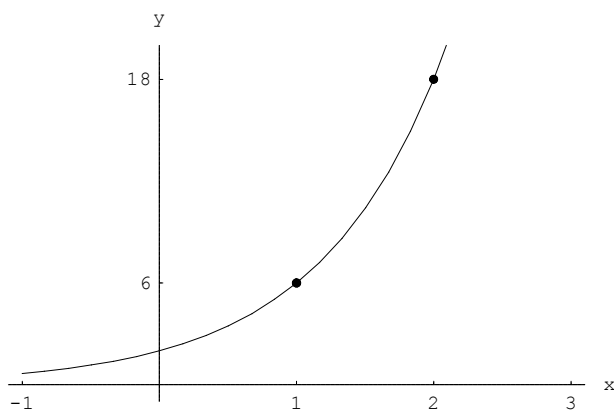
2. An investment is compounded continuously. After two years the investment is worth \$2708.22. After five years the investment is worth \$3307.82. [You are not given the initial value]

a) Find the APR.

b) Find the initial amount invested.

c) Find the amount of time it will take for the investment to double in value.

3. The following graph is that of a function having the form $f(x) = a e^{bx}$. Find the values of a and b .



4. A decaying substance (such as a radioactive isotope) has a half-life of 2500 years. If there is initially 12g of the substance, how much will there be 1000 years later?

5. After drinking a cup of coffee, the amount of caffeine in your body decays exponentially. Two hours after drinking the cup your body contains 42.43 mg of caffeine. Five hours after drinking the cup your body contains 25.23 mg of caffeine.

a) Find the decay rate of caffeine from the human body.

b) How much caffeine was in the cup?

6. **Depreciation.** Suppose you buy a new car. After two years you find the car is worth \$16,000. When the car is 5 years old it is worth \$12,000.

a) Assume the car is depreciating according to an exponential model of the form $V(t) = V_0 e^{kt}$.

b) Find the rate of depreciation. That is, find k .

c) What does V_0 represent in this situation?

d) How much did you pay for the car when it was new?

e) How old will the car be when it worth exactly half what you paid for it?