Applications of log

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MA 158 Lesson 21

Example 1. Solve the following equation for t.

$$a = b(8 - e^{ct})$$

Example 2. You asked for gold for Christmas and foolishly did not specify which isotope. As a result, your friend gives you a 1kg sample of ^{196}Au, which has a half-life of 148.39 hours.

(a) Find a function $A(t)$ for the amount of the isotope, A in grams, which remains after time t in hours.

(b) Determine the time t in hours for 93% of the material to decay.

Example 3. The radioactive isotope ^{93}Sr has a half-life of 7.5 minutes. Find how long it will take for a sample to decay so that 63% of it original mass remains.

Example 4. In ideal conditions, the spread of disease follows the Law of Uninhibited Growth

$$N(t) = N_0 e^{kt}.$$

During the 2014 West Africa Ebola outbreak, there were an estimated 800 reported cases of Ebola on July 1, and 1500 on August 1 (31 days later). Let t be the time elapsed in days since the first observation.

(a) Find the growth constant k. Round your answer to four decimal places.

(b) Find a function which gives the number of reported cases $N(t)$ after t days.

(c) What is the doubling time for the number of reported cases?

Example 5. The population of a certain town is modeled by

$$P(t) = \frac{670}{1 + 6.55e^{-0.51t}}$$

where $P(t)$ is the population t years after 2010. Such a model is called logistic (growth) decay.

(a) What is the population in 2010?

(b) Find the population in 2012.

(c) When will the population reach 310?