

Exponential and Logarithmic Models (§3.5)

1. If money is placed in an account paying interest compounded continuously, then the amount in the account at time t can be calculated by the formula $A = Pe^{rt}$, where P represents the principal and r the interest rate.

How long will it take \$1000 to double at $2\frac{1}{2}\%$ compounded continuously?

2. The population of a region at time t (in years) is modeled by the formula $P = P_0e^{rt}$, where P_0 is the initial population of the region and r the growth constant.
 - a) The population of Sonoma County in 2000 was 459 thousand and in 2010 it was 484 thousand. Determine r to four decimal places.

- b) If the growth rate remains the same, then when will the population be 1 million?

3. The population of a colony of bacteria is modeled by $P = \frac{240,000}{1 + 23e^{-0.1398t}}$, where t is measured (in days) from the beginning of the experiment. When will the population be 100,000?

4. It was discovered at the beginning of the 20th century that radioactive materials decay in a way that can be modeled by the formula $A = A_0e^{rt}$, where A_0 is the initial amount of the material present.

Strontium-90 is a radioactive material with a half-life of 28 years. It is one of the waste products from nuclear fission reactors.

a) Determine r to four decimal places.

b) How long will it be before 1% of the original sample remains?