11-7

Study Guide

Modeling Real-World Data with Exponential and Logarithmic Functions

The **doubling time,** or amount of time t required for a quantity modeled by the exponential equation $N = N_0e^{kt}$ to double, is given by $t = \frac{\ln 2}{k}$.

Example ***Finance*** **Tara's parents invested $5000 in an account that earns 11.5% compounded continuously. They would like to double their investment in 5 years to help finance Tara's college education.**

a. Will the initial investment of $5000 double within 5 years?

Find the doubling time for the investment. For continuously compounded interest, the constant k is the interest rate written as a decimal.

$t = \frac{\ln 2}{k}$

$= \frac{\ln 2}{0.115}$ *The decimal for 11.5% is 0.115.*

≈ 6.03 years *Use a calculator.*

Five years is not enough time for the initial investment to double.

b. What interest rate is required for an investment with continuously compounded interest to double in 5 years?

$t = \frac{\ln 2}{k}$

$5 = \frac{\ln 2}{k}$

$\frac{1}{5} = \frac{k}{\ln 2}$ *Take the reciprocal of each side.*

$\frac{\ln 2}{5} = k$ *Multiply each side by ln 2 to solve for k.*

$0.1386 \approx k$

An interest rate of 13.9% is required for an investment with continuously compounded interest to double in 5 years.