Logarithmic Functions and Simple Interest

Finite Math

10 February 2017

Now You Try It!

Example

Solve for x in the following equations:

(a) $75 = 25e^{-x}$

(b) $42 = 7^{2x+3}$

(c) $200 = (2x - 1)^5$

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(a) $75 = 25e^{-x}$

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Solution

(a) $x \approx -1.09861$

(b) $x \approx -0.53961$

(c) $x \approx 1.94270$

Applications

Recall that exponential growth/decay models are of the form

$$A = ce^{rt}.$$

Using the natural logarithm, we can solve for the rate of growth/decay, r, and the time elapsed, t. Let's see this in an example.

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*The isotope carbon-*14 *has a half-life (the time it takes for the isotope to decay to half of its original mass) of* 5730 *years.*

(a) *At what rate does carbon-*14 *decay?*

(b) *How long would it take for* 90% *of a chunk of carbon-*14 *to decay?*

Simple Interest

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All of these things have an *interest rate* attached to them, essentially rent on the money, which is paid as *interest*.

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where $I =$ interest, $P =$ principal, $r =$ annual simple interest rate (written as a decimal), and $t =$ time in years.

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Suppose you deposit $\$2,000$ *into a savings account with an annual simple interest rate of* 6%*. How much interest will accrue after* 6 *months?*

Future Value

Often, we might be more curious about how much will be in the account or how much will be owed on the loan after a certain period. This amount is called the *future value*. Another name for principal is *present value*. It is found by simply adding the original investment/loan amount to the interest accrued.

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Suppose you take out a $\$10,000$ *loan at a simple annual interest rate of* 3.2%*. How much would be due on the loan after* 10 *months?*

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You make an investment of $\$3,000$ *at an annual rate of* 4.5%*. What will be the value of your investment after* 30 *days? (Assume there are* 360 *days in a year.)*

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Solution

$3,011.25