3.2 Exponential & Logistic Modeling

Target 3F: Model real world situations and use regressions with the use of functions

Review of Prior Concepts

The population (P) of a city can be represented in an equation $P = 3000e^{kt}$, where $t = 0$ represents the year 1900. In 1850, the population was 1100. Find the value of k and use this value of k to estimate the population in the year 2012.

More Practice

Population Modeling

http://www.coolmath.com/algebra/17-exponentials-logarithms/06-population-exponential-growth-01
http://www.purplemath.com/modules/expoprob2.htm
https://www.youtube.com/watch?v=63udRYh04sY

SAT Connection

Passport to Advanced Mathematics

1. Create a quadratic or exponential function or equation that models a context.

Example: A radioactive substance decays at an annual rate of 13 percent. If the initial amount of the substance is 325 grams, which of the following functions f models the remaining amount of the substance, in grams, t years later?

A) $f(t) = 325(0.87)^t$

B) $f(t) = 325(0.13)^t$

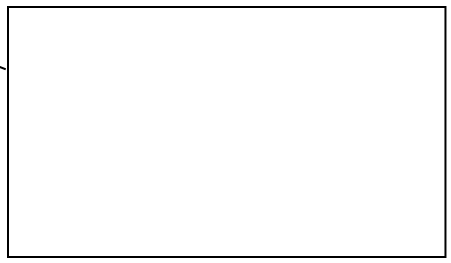
C) $f(t) = 0.87(325)^t$

D) $f(t) = 0.13(325)^t$

Solution

Logistic Model

$$f(x) = \frac{c}{1 + a \cdot b^x}$$



Example 1:
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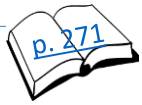

Example 2:
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Example 3:
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More Practice

Logistic Models

http://www.ck12.org/book/CK-12-Precalculus-Concepts/section/3.7/
https://www.youtube.com/watch?v=LyJrUtzKtwI
https://www.youtube.com/watch?v=OSMPeY354cU

Homework Assignment

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SAT Connection

Solution

Choice A is correct. Each year, the amount of the radioactive substance is reduced by 13 percent from the prior year's amount; that is, each year, 87 percent of the previous year's amount remains. Since the initial amount of the radioactive substance was 325 grams, after 1 year, 325(0.87) grams remains; after 2 years $325(0.87)(0.87) = 325(0.87)^2$ grams remains; and after t years, $325(0.87)^t$ grams remains. Therefore, the function $f(t) = 325(0.87)^t$ models the remaining amount of the substance, in grams, after t years.

Choice B is incorrect and may result from confusing the amount of the substance remaining with the decay rate. Choices C and D are incorrect and may result from confusing the original amount of the substance and the decay rate.