Section 5.5 Exponential and Logarithmic Models

Objective: In this lesson you learned how to use exponential growth models, exponential decay models, Gaussian models, logistic growth models, and logarithmic models to solve real-life problems.

Important Vocabulary

- Bell-shaped curve
- Logistic curve
- Sigmoidal curve

I. Introduction (Page 428)

The exponential growth model is ________________.
The exponential decay model is ________________.
The Gaussian model is ________________.
The logistic growth model is ________________.
Logarithmic models are ________________ and ________________.

II. Exponential Growth and Decay (Pages 429–431)

Example 1: Suppose a population is growing according to the model \( P = 800e^{0.05t} \), where \( t \) is given in years.
(a) What is the initial size of the population?
(b) How long will it take this population to double?

To estimate the age of dead organic matter, scientists use the carbon dating model ________________, which denotes the ratio \( R \) of carbon 14 to carbon 12 present at any time \( t \) (in years).

Example 2: The ratio of carbon 14 to carbon 12 in a fossil is \( R = 10^{-16} \). Find the age of the fossil.
III. Gaussian Models  (Page 432)

The Gaussian model is commonly used in probability and statistics to represent populations that are ________ ________.

For a Gaussian model, the average value for a population can be found . . .

Example 3: Draw the basic form of the graph of a Gaussian model.

IV. Logistic Growth Models  (Page 433)

Give an example of a real-life situation that is modeled by a logistic growth model.

Example 4: Draw the basic form of the graph of a logistic growth model.
V. Logarithmic Models  (Page 434)

Example 5:  The number of kitchen widgets $y$ (in millions) demanded each year is given by the model 
$y = 2 + 3 \ln(x + 1)$, where $x = 0$ represents the year 2000 and $x \geq 0$. Find the year in which the number of kitchen widgets demanded will be 8.6 million.

What you should learn
How to use logarithmic functions to model and solve real-life problems

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Homework Assignment

Page(s)

Exercises