Course Number
Instructor
Date

Section 3.5 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 Define each term or concept.

Bell-shaped curve

Logistic curve

Sigmoidal curve

I. Introduction (Page 257)

> ***What you should learn***
> How to recognize the five most common types of models involving exponential and logarithmic functions

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 258–260)

> ***What you should learn***
> How to use exponential growth and decay functions to model and solve real-life problems

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.

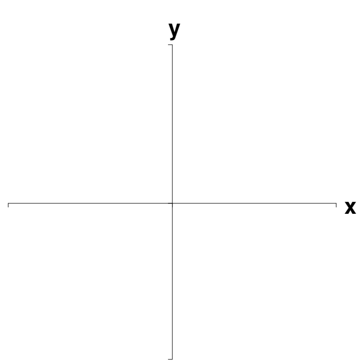
III. Gaussian Models (Page 261)

> ***What you should learn***
> How to use Gaussian functions to model and solve real-life problems

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.

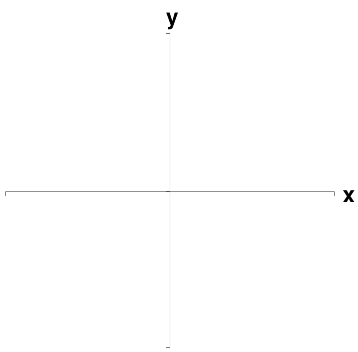


IV. Logistic Growth Models (Page 262)

> ***What you should learn***
> How to use logistic growth functions to model and solve real-life problems

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.

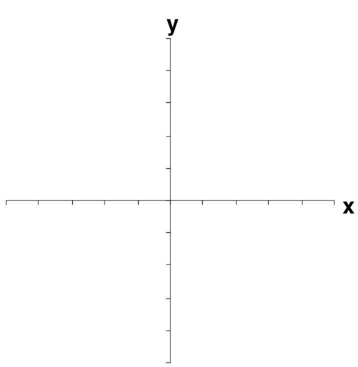


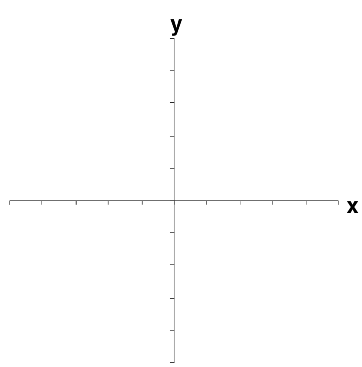
V. Logarithmic Models (Page 263)

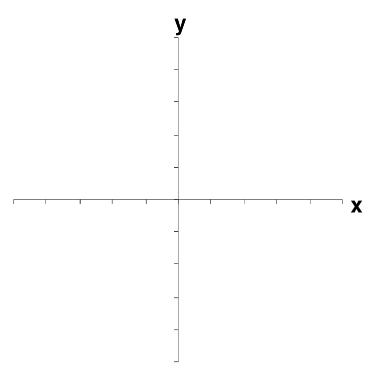
> ***What you should learn***
> How to use logarithmic functions to model and solve real-life problems

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.

Additional notes







Homework Assignment

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Exercises