

Section 5.2 Logarithmic Functions and Their Graphs

Objective: In this lesson you learned how to recognize, evaluate, and graph logarithmic functions.

Course Number

Instructor

Date

Important Vocabulary

Define each term or concept.

Common logarithmic function

Natural logarithmic function

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I. Logarithmic Functions (Pages 356–357)

The **logarithmic function with base a** is defined as

_____ , for $x > 0$ and $0 < a \neq 1$, if and only if $x = a^y$.

The logarithmic function with base a is the _____ of the exponential function $f(x) = a^x$.

The equation $x = a^y$ in exponential form is equivalent to the equation _____ in logarithmic form.

When evaluating logarithms, remember that a logarithm is a(n) _____. This means that $\log_a x$ is the _____ to which a must be raised to obtain _____.

Example 1: Use the definition of logarithmic function to evaluate $\log_5 125$.

Example 2: Use a calculator to evaluate $\log_{10} 300$.

Complete the following properties of logarithms:

- 1) $\log_a 1 =$ _____
- 2) $\log_a a =$ _____
- 3) $\log_a a^x =$ _____ and $a^{\log_a x} =$ _____
- 4) If $\log_a x = \log_a y$, then _____.

What you should learn

How to recognize and evaluate logarithmic functions with base a

Example 3: Solve the equation $\log_7 x = 1$ for x .

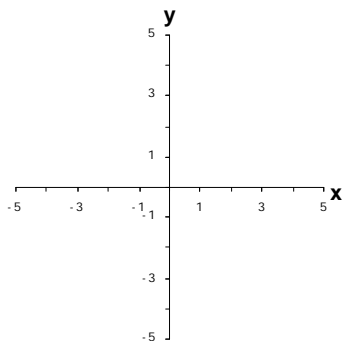
II. Graphs of Logarithmic Functions (Pages 358–359)

For $a > 1$, is the graph of $y = \log_a x$ increasing or decreasing over its domain? _____

For the graph of $y = \log_a x$, $a > 1$, the domain is _____, the range is _____, and the intercept is _____.

Also, the graph has _____ as a vertical asymptote. The graph of $y = \log_a x$ is a reflection of the graph of $y = a^x$ about _____.

Example 4: Sketch the graph of the function $f(x) = \log_3 x$.



III. The Natural Logarithmic Function (Pages 360–361)

Complete the following properties of natural logarithms:

- 1) $\ln 1 =$ _____ 2) $\ln e =$ _____
- 3) $\ln e^x =$ _____ and $e^{\ln x} =$ _____
- 4) If $\ln x = \ln y$, then _____.

Example 5: Use a calculator to evaluate $\ln 10$.

What you should learn
How to graph logarithmic functions

What you should learn
How to recognize and evaluate natural logarithmic functions

Example 6: Find the domain of the function $f(x) = \ln(x + 3)$.

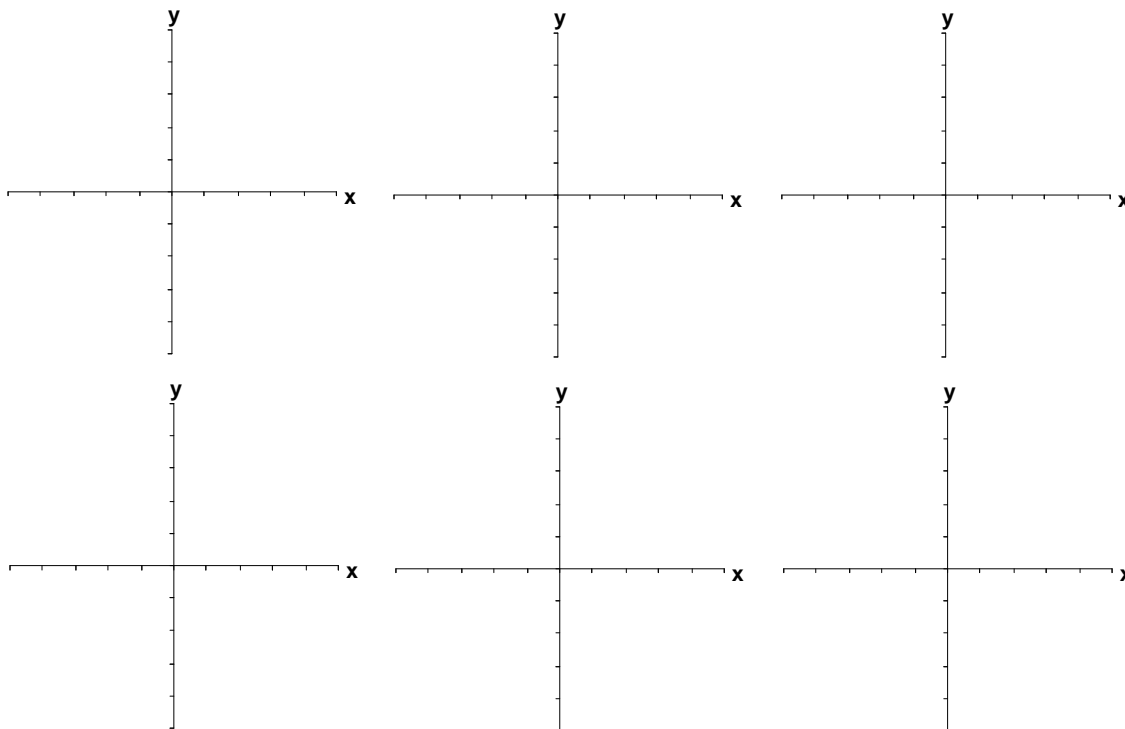
IV. Applications of Logarithmic Functions (Page 362)

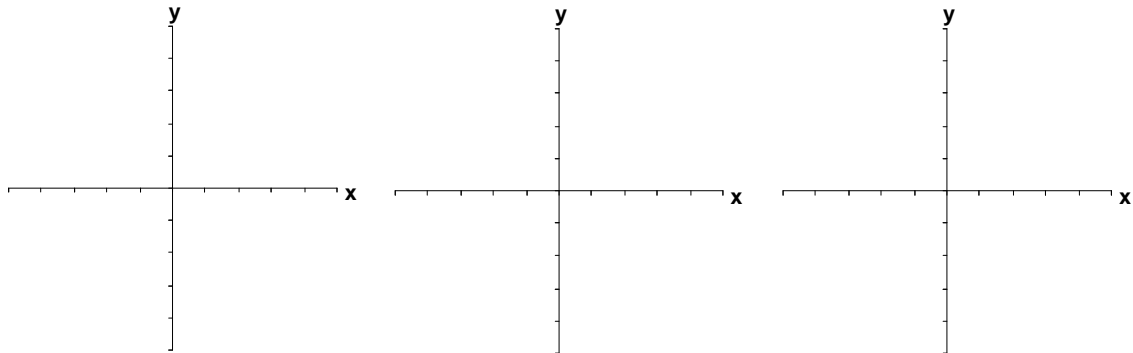
Describe a real-life situation in which logarithms are used.

What you should learn

How to use logarithmic functions to model and solve real-life applications

Example 7: A principal P , invested at 6% interest and compounded continuously, increases to an amount K times the original principal after t years, where t is given by $t = \frac{\ln K}{0.06}$. How long will it take the original investment to double in value? To triple in value?



Additional notes**Homework Assignment**

Page(s)

Exercises