Course Number

Instructor

Date

Section 3.2 Logarithmic Functions and Their Graphs

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

Important Vocabulary Define each term or concept.

Common logarithmic function

Natural logarithmic function

What you should learn
How to recognize and evaluate logarithmic functions with base a

I. Logarithmic Functions (Pages 229–231)

For $x > 0$, $a > 0$, and $a \neq 1$, where $x = a^y$, the **logarithmic function with base *a*** is defined as

_____ , which is read as

_____.

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 _____.

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

II. Graphs of Logarithmic Functions (Pages 231–232)

What you should learn
How to graph logarithmic functions

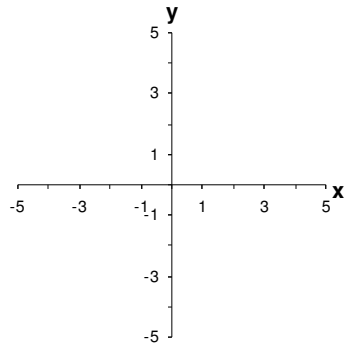
To sketch the graph of $y = \log_a x$, you can use the fact that . . .

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 x-intercept is _____.

Also, the graph has _____ as a vertical asymptote.

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



III. The Natural Logarithmic Function (Pages 233–234)

What you should learn
How to recognize, evaluate, and graph natural logarithmic function

The natural logarithm is written without a base; the base is understood to be _____.

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 $\ln 10$.

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

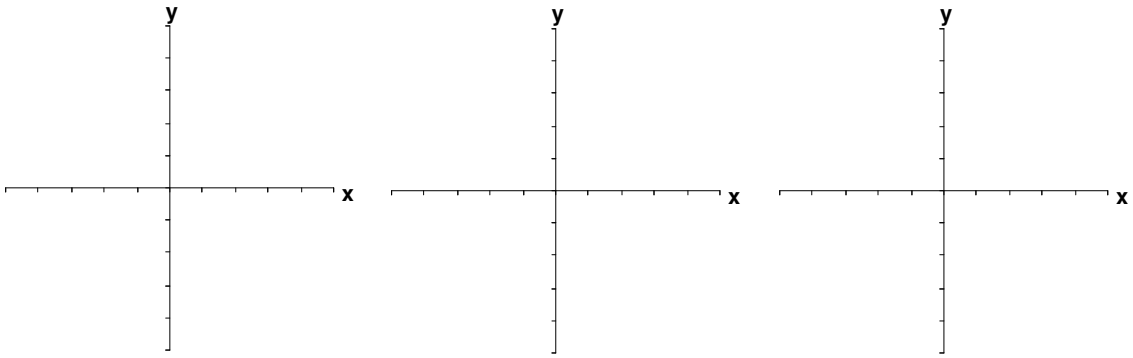
IV. Applications of Logarithmic Functions (Page 235)

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

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

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 $t = \dfrac{\ln K}{0.06}$. How long will it take the original investment to double in value? To triple in value?

Additional notes



Homework Assignment

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