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

I. Logarithmic Functions (Pages 196–197)

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

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

The **logarithmic function with base *a*** is defined as ______________________, for $x > 0$, $a > 0$, and $a \neq 1$, if and only if $x = a^y$. The notation "$\log_a x$" is read as "__________________ ______________________."

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 198–199)

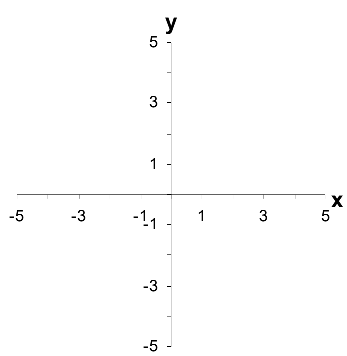
What you should learn
How to graph logarithmic functions with base *a*

For *a* > 1, is the graph of $f(x) = \log_a x$ increasing or decreasing over its domain? _________________________

For the graph of $f(x) = \log_a x$, *a* > 1, the domain is __________________, the range is ________________, and the intercept is _______________.

Also, the graph has _______________________ as a vertical asymptote. The graph of $f(x) = \log_a x$ is a reflection of the graph of $f(x) = a^x$ in ____________________.

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



III. The Natural Logarithmic Function (Pages 200–202)

> ***What you should learn***
> How to recognize, evaluate, and graph natural logarithmic functions

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 $f(x) = \ln(x+3)$.

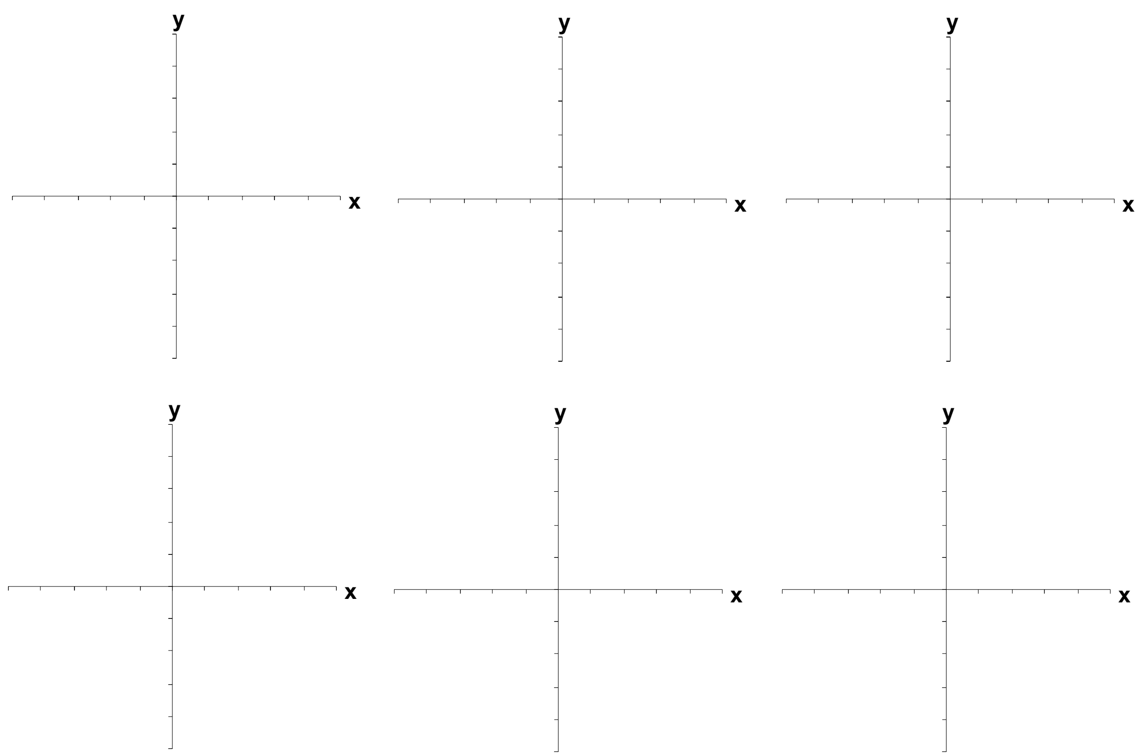
IV. Applications of Logarithmic Functions (Page 202)

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

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

Additional notes



Homework Assignment

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