

## Section 5.3 Properties of Logarithms

**Objective:** In this lesson you learned how to rewrite logarithmic functions with a different base and how to use properties of logarithms to evaluate, rewrite, expand, or condense logarithmic expressions.

Course Number

Instructor

Date

### I. Change of Base (Page 403)

Let  $a$ ,  $b$ , and  $x$  be positive real numbers such that  $a \neq 1$  and  $b \neq 1$ .

Use the Change-of-Base Formula to rewrite  $\log_a x$  using base  $b$ :

$$\log_a x = \underline{\hspace{4cm}}$$

Explain how to use a calculator to evaluate  $\log_8 20$ .

***What you should learn***

How to rewrite logarithmic functions with a different base

### II. Properties of Logarithms (Page 404)

Let  $a$  be a positive number such that  $a \neq 1$ ; let  $n$  be a real number; and let  $u$  and  $v$  be positive real numbers. Complete the following properties of logarithms:

1.  $\log_a (uv) = \underline{\hspace{4cm}}$

2.  $\log_a \frac{u}{v} = \underline{\hspace{4cm}}$

3.  $\log_a u^n = \underline{\hspace{4cm}}$

***What you should learn***

How to use properties of logarithms to evaluate or rewrite logarithmic expressions

### III. Rewriting Logarithmic Expressions (Page 405)

To expand a logarithmic expression means to . . . .

***What you should learn***

How to use properties of logarithms to expand or condense logarithmic expressions

**Example 1:** Expand the logarithmic expression  $\ln \frac{xy^4}{2}$ .

To condense a logarithmic expression means to . . . .

**Example 2:** Condense the logarithmic expression  
 $3\log x + 4\log(x - 1)$ .

#### IV. Applications of Properties of Logarithms (Page 406)

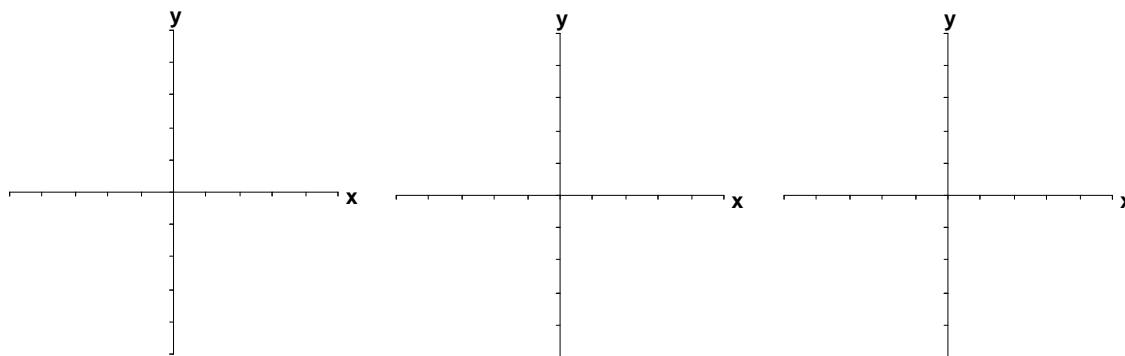
One way of finding a model for a set of nonlinear data is to take the natural log of each of the  $x$ -values and  $y$ -values of the data set. If the points are graphed and fall on a straight line, then the  $x$ -values and the  $y$ -values are related by the equation:

\_\_\_\_\_ , where  $m$  is the slope of the straight line.

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

**Example 3:** Find a natural logarithmic equation for the following data that expresses  $y$  as a function of  $x$ .

$x$	2.718	7.389	20.086	54.598
$y$	7.389	54.598	403.429	2980.958



#### Homework Assignment

Page(s)

Exercises