**12.2 Explore: Logarithm Properties** Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Pre-AP Algebra 2 Date \_\_\_\_\_\_\_\_\_\_\_ Per \_\_\_\_\_\_

**Properties of Logs**

In your graphing calculator, enter the following and record your answer to three decimal places.

1. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Enter the following into Y= and look at the table.

  For , how do the values in the table compare?

  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. From these examples, what can you conclude?

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. Write the **Power Property of Logarithms:**

= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Now, let’s do some more exploration to find two other properties of logarithms.

In your graphing calculator, enter the following and record your answer to three decimal places.

7. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. Enter the following into Y= and look at the table.

  How do the values in the table compare?

  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

From these examples, what can you conclude?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The property you have discovered is called the **Product Property of Logarithms**.

 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In your graphing calculator, enter the following and record your answer to three decimal places.

11.  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

12.  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

13. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

14. Enter the following into Y= and look at the table.

  How do the values in the table compare?

  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

From these examples, what can you conclude?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The property you have discovered is called the **Quotient Property of Logarithms**.

 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Calculator Skills**

 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ =\_\_\_\_\_\_\_\_\_ =\_\_\_\_\_\_\_\_\_\_\_\_\_

Now, let’s take a look at a short-cut for solving logs:

15.  16. 

17.  18. 

Describe the pattern you just discovered:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**PROPERTIES OF LOGARITHMS** **SUMMARY**

(only works when , , and )

 **Logarithm with Base a Natural Logarithm**

**Product Property:  **

**Quotient Property:  **

**Power Property:  **

**Identity:**  

  

**Using Properties of Logarithms**

Write each logarithm in terms of  and .

1)  2) 

Find the exact value of each expression without using a calculator.

3)  4)  5) 

6)  7) 

**Rewriting Logarithmic Expressions**

Expand each logarithmic expression.

8)  9) 

10)  11) 

Condense each logarithmic expression. (Write as a single logarithm and simplify.)

12)  13) 

14)  15) 