Math 3 **3.3 Properties of Logarithms** ­Unit 3

*EQ: How do you condense, expand, and solve logarithmic equations by using the properties of logarithms?*

Since logarithms are inverses of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the properties of logarithms can be derived from the properties of exponents.

* When ***expanding***logs, we want to have multiple logs being added or subtracted from each other.
* When ***condensing***logs, we want to end with one log and multiple variables.

**PRODUCT PROPERTY:**



The logarithm of a product (multiplication) is the same as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the logs

**Example 1:** Expand 

**You Try!** Expand 

**Example 2:** Condense

**You Try!** Condense:

**EXPONENT PROPERTY:**



The logarithm of the power is the same as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the logs

**Example 5:** Expand 

**You Try!** Expand 

**Example 6:** Condense 

**You Try!** Condense 

**QUOTIENT PROPERTY:**



The logarithm of a quotient (division) is the same as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the logs

**Example 3:** Expand: 

**You Try!** Expand 

**Example 4:** Condense 

**You Try!** Condense 

**Square Roots:** If you ever see a square root in a problem, you must convert it to a rational exponent. \*Remember – the index becomes the denominator of the exponent!

**Example 7:** Expand 

**You Try!** Expand 

**Example 8:** Condense: 

***Putting it all together:*** Expand or condense the following logarithms using properties listed above.

1. Expand 
2. Expand 
3. Expand 
4. Condense 
5. Condense 
6. Condense 

**RULE:** If there are multiple logs on the same side of an equation, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ before solving, then apply the rules from Day 1 (cancel, swoosh, or evaluate)

**Example 9:** ** Example 10: **

1. Expand 
2. Condense 
3. Solve for x: 
4. Solve for x: 
5. Solve for x: 
6. Solve for x: 