**Warm Up 11/19**

**Lesson 4-2: Logarithmic Functions**

**Objective**

Students will…

* Be able to define the logarithmic function, as the inverse of the exponential function
* Be able to know and apply the properties of logarithms
* Be able to use calculators to compute logarithms

**Inverses**

In mathematics, **inverses** can be defined as the reverse operation (operations that revert the original operation).

We’ve dealt with plenty of examples of inverses in the past. Consider the following examples.

Starting with *𝑎*…

Multiplication and division:

Addition and subtraction:

Powers and roots:

One-to-one Function and Inverse Function:

**The Inverse of Exponential Function**

With regards to the exponential function, there exists an inverse function which is called the **Logarithmic Function**.

**Definition:** Let *𝑎* be a number with *𝑎≠1*. The **logarithmic function** with base *𝑎*, denoted by \_\_\_\_\_\_\_ is defined by

if and only if

So, here *𝑦* is the *exponent* to which the base *𝑎* must be raised to give *𝑥*.

Examples

Revisiting our warm-up problems then…

1) 2) 3)

*𝑥=3* means *𝑥=2* means *𝑥=3* means

4)  5) 6)

*𝑥=4* means *𝑥=0* means *𝑥=5* means

**Properties of Logarithms**

We are familiar with some of the properties *of exponents*. Here, we’ve established that *﷐𝑙𝑜𝑔﷮𝑎﷯* is an exponent. Therefore, the **properties of logarithms** exist, much similar to the properties of exponents.

Property Reason

1.  Anything raised to the zero power is 1

2. Anything raised to the 1st power is itself

3. *𝑎* raised to the *𝑥* power is *﷐𝑎﷮𝑥﷯*

4. *\_\_\_\_\_\_\_\_\_\_\_\_\_* is the power to which *𝑎* must be raised to get *𝑥*

Examples

For base 5…

By property 1:

By property 2:

By property 3:

By property 4:

You try

For base 10…

By property 1:

By property 2:

By property 3:

By property 4:

**Common Logarithm**

In logarithms, base 10 is considered the “standard base.” Therefore, it has a special name within the logarithmic function.

**Common Logarithm**- Base 10 said to be the **common base**, so any base 10 is denoted without the base written:

So always assume that has base 10 if there is no base written.

Ex. and

**In Closing**

Homework 11/19

TB pg. 349-350 #1, 3-5, 9, 12, 15, 19, 29