**UNDERSTANDING LOGARITHMS PROOFS.**

**“Log”** just means **“Index”**

**(**or power or exponent)

1. Consider 23 = 8

Obviously the **index** **=** **3**

 ie the **Log = 3**

 or in full: **Log 28 = 3**

**The THREE LOG LAWS.**

**1*. log (xy) = log x + log y***

***This means that when you multiply two numbers you add the indices (ie logs)***

***Suppose x = ca and y = cb***

***Log x×y means: what is the index of x×y***

 ***ie what is the index of ca × cb***

 ***but ca × cb = c (a + b)***

 ***so the index of x×y is a + b***

***ie the index of x×y equals the (index of x) plus (the index of y)***

***or more explicitly the log of x×y = the log of x + the log of y***

***This means that when you multiply two numbers you add the indices (ie logs)***

**2. *log x = log x – log y***

 ***y***

**This means that when you divide two numbers you subtract the indices (logs)**

***Suppose x = ca and y = cb***

 ***x = ca = c( a – b)***

 ***y cb***

***log of x means: what is the index of x***

 ***y y***

***ie what is the index of ca***

 ***cb***

***ie what is the index of c ( a – b )***

***and clearly the index is a – b***

***ie the index of x equals the (index of x) minus (the index of y)***

 ***y***

***or more explicitly the log of x = the log of x – the log of y***

 ***y***

**This means that when you divide two numbers you subtract the indices (logs)**

**3*. log xn = n log x***

**This is just an extension of law 1 and becomes more meaningful when we consider:**

 ***log x3 = log x.x.x***

 ***= log x + log x + log x***

 ***= 3 log x***

 **Using these laws, expand these:**

**Eg log u4v3 = log u4 + log v3 *– log w5***

 **w5**

 **= 4 log u + 3 log v *– 5log w***