**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***