## Definition of logarithm:

$\log _{b} x=y \Longleftrightarrow b^{y}=x$ : a logarithm is an exponent.

Properties of logarithms: for all bases $b>0, b \neq 1$ we have

- $\log _{b}(m n)=\log _{b}(m)+\log _{b}(n)$ (The log of a product is the sum of the logs)
- $\log _{b}\left(\frac{m}{n}\right)=\log _{b}(m)-\log _{b}(n)$ (The log of a quotient is the difference of the logs)
- $\log _{b}\left(m^{a}\right)=a \log _{b}(m)$ (The log of a power is the power times the log)
- $\log _{b}(b)=1$
- $\log _{b}(1)=0$
- $b^{\log _{b}(x)}=x$
- $\log _{b}\left(b^{x}\right)=x$

The last two properties just come from the fact that logarithms are the inverse functions of exponential functions: put together they are the "Round-trip theorem" for these functions.

