

This is simple proof for  $\log x + \log y = \log xy$

*Proof.*  $\log a^x + \log a^y = \log a^{x+y}$  or  $\log x + \log y = \log xy$

Given:

$$a^x a^y = a^{x+y}$$

$\log$  both sides

$$\log(a^x a^y) = \log a^{x+y}$$

$$\log(a^x a^y) = (x + y) \log a$$

$$\log(a^x a^y) = x \log a + y \log a$$

$$\log(a^x a^y) = \log a^x + \log a^y$$

$$\log a^{x+y} = \log a^x + \log a^y$$

□