3.3 You need to be able to calculate logarithms to the base 10 using calculator.

Problem: Find the value of x for which $10^x = 500$

Solution: $10^x = 500$ [Since $10^2 = 100$ and $10^3 = 1000$, x must be some where between 2 and 3]

so $\log_{10} 500 = x$

or $x = \log_{10} 500$ [By using calculator log base 10]

or $\boxed{x = 2.70}$ (to 3 S.F.) Answer

Problem 10 Find from your Calculator the value of 3 S.F. of: $\log_{10} 0.786$

Solution: $\log_{10} 0.786$

By using log (or lg) button on your calculator gives values of logs to base 10.

$\therefore \boxed{\log_{10} 0.786 = -0.1045 = -0.105}$ (3 S.F.) Ans

Problem 20 Prove that if $a^x = b^y = (ab)^{xy}$ Then $x+y=1$

Solution: Take logrithms to base a for a^x and b^y, we get

$$\log_a (a^x) = \log_a (b^y)$$

$$x \log_a a = y \log_a b \quad \text{[using logs law } \log a^x = x \log$$

$$x = y \log_a b \quad \text{——} (1) \quad [\because \log_a a = 1]$$

Take logs to base ... for $a^x = (ab)^{xy}$

$$x = \log_a (ab)^{xy} \quad [\text{using Law}]$$

$$x = xy \log_a (ab)$$

$$x = xy (\log_a a + \log_a b)$$

$$x = xy (1 + \log_a b)$$

$$1 = y (1 + \log_a b) \text{ —} (2)$$

But from (1), $\log_a b = \frac{x}{y}$, substitute in equation (2)

$$1 = y \left(1 + \frac{x}{y}\right) \Rightarrow 1 = y \left(\frac{x+y}{\ }\right)$$