Exponentials and Logarithms Worked Examples

Skill:	Reduction to Linear Form

Objective: Rearranging a nonlinear equation into the form $y = mx + c$

Note Space

Worked Example 1

Rearrange the following to the form $Y = mX + c$ where Y and X are functions of the coordinate variables y and x, respectively, using natural logarithms. State the values of the gradient and the y-intercept in each case.

a. $y = 3x^2$

b. $y = ab^x$

Objective: Determining unknown constants using experimental data

Worked Example 2

A colony of bats is increasing. The population, P, is modelled by $P = a \times 10^{bt}$, where t is the time in years after 2000.

(i) Show that, according to this model, the graph of $\log_{10} P$ against t should be a straight line of gradient b. State, in terms of a, the intercept on the vertical axis. [3]
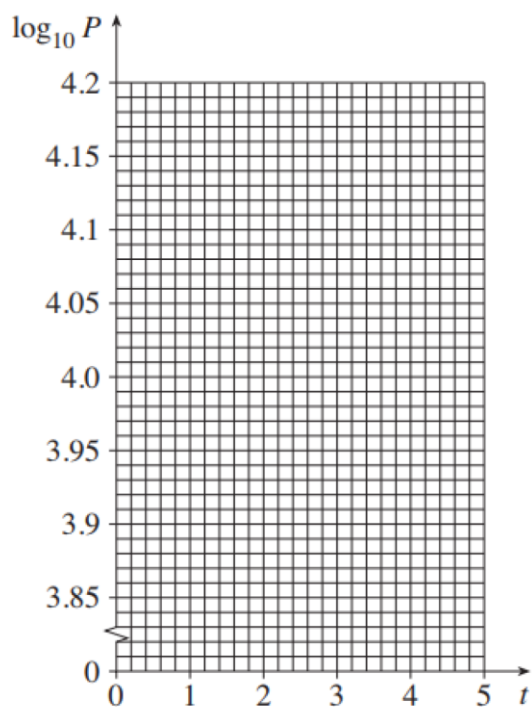
(ii) The table gives the data for the population from 2001 to 2005.

Year	2001	2002	2003	2004	2005
t	1	2	3	4	5
P	7900	8800	10000	11300	12800

Complete the table of values on the insert, and plot $\log_{10} P$ against t. Draw a line of best fit for the data. [3]

Year	2001	2002	2003	2004	2005
t	1	2	3	4	5
P	7900	8800	10000	11300	12800
$\log_{10} P$					

(iii) Use your graph to find the equation for P in terms of t. [4]