1.1) Exponential models

Worked example

The table shows some data collected on the temperature, in °C, of a colony of bacteria (t) and its growth rate (g).

Temperature, t (°C)	3	5	6	8	9	11
Growth rate, g	1.40	1.94	1.97	2.85	3.2	4.64

The data are coded using the changes of variable $x = t$ and $y = \log g$. The regression line of y on x is found to be $y = -0.0536 + 0.0637x$.

a) Find the initial growth rate
b) Given that the data can be modelled by an equation of the form $g = kb^t$ where k and b are constants, find the values of k and b.

Your turn

The table shows some data collected on the temperature, in °C, of a colony of bacteria (t) and its growth rate (g).

Temperature, t (°C)	3	5	6	8	9	11
Growth rate, g	1.04	1.49	1.79	2.58	3.1	4.46

The data are coded using the changes of variable $x = t$ and $y = \log g$. The regression line of y on x is found to be $y = -0.2215 + 0.0792x$.

a) Find the initial growth rate
b) Given that the data can be modelled by an equation of the form $g = kb^t$ where k and b are constants, find the values of k and b.

a) 0.6
b) $k = 0.6, b = 1.20$ (3 sf)

Worked example

A rabbit population, P, is modelled with respect to time in years, t. An exponential model is proposed:

$$P = kb^t$$

The data is coded using $x = t$ and $y = \log P$.

The regression line of y on x is found to be $y = 3 + 0.2x$.

Determine the values of k and b.

Your turn

A rabbit population, P, is modelled with respect to time in years, t. An exponential model is proposed:

$$P = kb^t$$

The data is coded using $x = t$ and $y = \log P$.

The regression line of y on x is found to be $y = 2 + 0.3x$.

Determine the values of k and b.

$k = 100, b = 2.00$ (3 sf)