# 1.9 Log laws\_P\_2

**1.** *[5 marks]*

Consider the equation , where , , , .

The equation has three distinct real roots which can be written as ,  and .

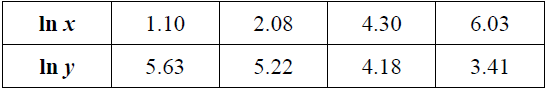
The equation also has two imaginary roots, one of which is  where .

Show that .



**2a.** *[3 marks]*

The following table shows values of ln *x* and ln *y*.



The relationship between ln *x* and ln *y* can be modelled by the regression equation ln *y* = *a* ln *x* + *b*.

Find the value of *a* and of *b*.



**2b.** *[3 marks]*

Use the regression equation to estimate the value of *y* when *x* = 3.57.



**2c.** *[7 marks]*

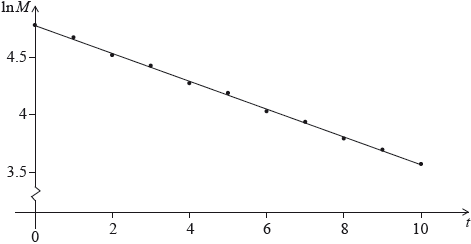
The relationship between *x* and *y* can be modelled using the formula *y* = *kx*, where *k* ≠ 0 , *n* ≠ 0 , *n* ≠ 1.

By expressing ln *y* in terms of ln *x*, find the value of *n* and of *k*.



**3a.** *[2 marks]*

The mass  of a decaying substance is measured at one minute intervals. The points  are plotted for , where  is in minutes. The line of best fit is drawn. This is shown in the following diagram.



The correlation coefficient for this linear model is .

State **two** words that describe the linear correlation between  and .



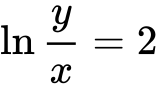
**3b.** *[4 marks]*

The equation of the line of best fit is . Given that , find the value of .



**4.** *[6 marks]*

Solve the simultaneous equations







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