# 1.5 Intro to logs\_P\_2

**1a.** *[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 .



**1b.** *[3 marks]*

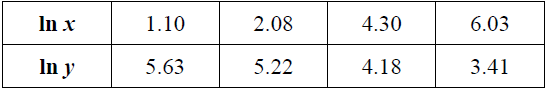
The values , , and  are consecutive terms in a geometric sequence.

Show that one of the real roots is equal to 1.



**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*.

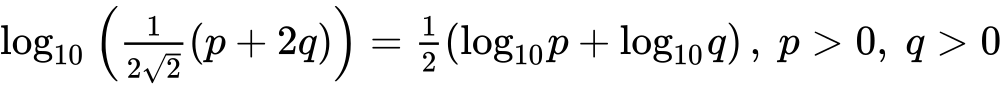


**2b.** *[3 marks]*

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



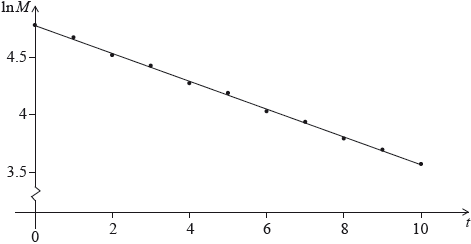
**3.** *[5 marks]*

Given that , find  in terms of .



**4a.** *[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 .



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

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

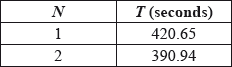


**5a.** *[4 marks]*

It has been suggested that in rowing competitions the time,  seconds taken to complete a 2000 m race can be modelled by an equation of the form , where  is the number of rowers in the boat and  and  are constants for rowers of a similar standard.

To test this model the times for the finalists in all the 2000 m men’s races at a recent Olympic games were recorded and the mean calculated.

The results are shown in the following table for  and .



Use these results to find estimates for the value of  and the value of . Give your answers to five significant figures.



**5b.** *[1 mark]*

Use this model to estimate the mean time for the finalists in an Olympic race for boats with 8 rowers. Give your answer correct to two decimal places.



**5c.** *[1 mark]*

It is now given that the mean time in the final for boats with 8 rowers was 342.08 seconds.

Calculate the error in your estimate as a percentage of the actual value.



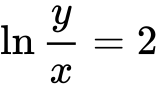
**5d.** *[2 marks]*

Comment on the likely validity of the model as  increases beyond 8.



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

Solve the simultaneous equations







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