# Section Check In –

# EL: Exponentials and Logarithms

## Questions

1. Solve the equation . [EL6]

2. Evaluate . [EL2,3]

3. Solve the simultaneous equations

,   . [EL2,3,6]

4. Determine the value of *x* in the equation . [EL2,3,6]

5. Express  as a single logarithm. [EL3]

6. Simplify the following:

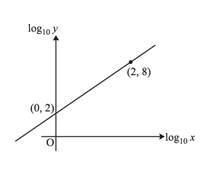
(i) 

(ii) 

(iii)  [EL3]

7. The graph of  against is a straight line passing through the points

(2, 8) and (0,2).



(i) Find the equation relating  against 

(ii) Hence, find the equation relating *y* and *x*. [EL4,5]

8. On the same axes, sketch the curves  and , clearly identifying each curve and any points where the curves cross the axis. [EL1]

9. The average number of visitors per month at a local museum between the year 2000 and 2005 is shown below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Average number of visitors per month | 350 | 455 | 585 | 761 | 989 | 1285 |

The average number of visitors per month can be modelled by an equation of the form , where is the number of years after 2000.

(i) Using base 10, show that this equation can be written as .

(ii) Fill in the table below and draw a graph to plot  against .

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 |
|  |  |  |  |  |  |  |

(iii) Draw a line of best fit on your graph and use it to estimate the values of  and .

(iv) Use your values of  and  to predict the average number of visitors per month in the year 2010. Comment on the reliability of this estimate. [EL4,5,7]

10. Solve the equation , giving your answer in the form . [EL3,7]

**Extension**

As a rule,  and .

Solve the equation , giving exact values for .

For each of these values of , find the value of  so that .

## Worked solutions

1. 





 (3 s.f.)

2. 





3.  EX (1)

 EX (2) 







4. 







5. 

6. (i) 1

(ii) 0

(iii) 1

7. (i)  , 

 , 



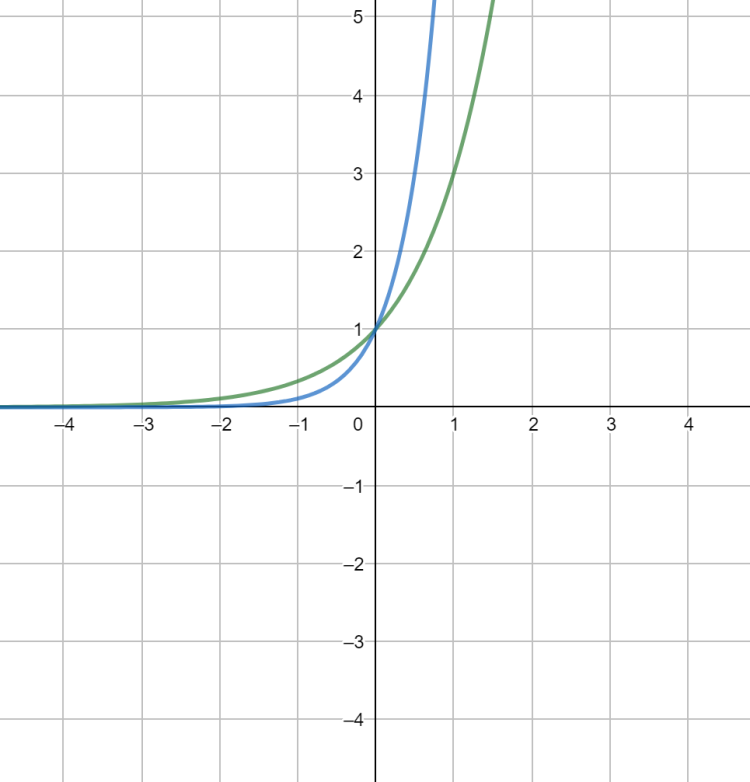
(ii) 





8.









9. (i) 







(ii)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 |
|  | 2.54 | 2.66 | 2.77 | 2.88 | 3.00 | 3.11 |

(ii) and (iii)

log *n*

*x*

Intercept is  so 

Gradient is  so 

(iv) In 2010,  and .

This is extrapolation. 2010 is 5 years after the data given. The museum may not have the capacity for 4825 visitors per month or it may close or change etc. The figure is not reliable.

10. 











**Extension**





Let 











So 



If 





This is not possible for any value of .

If 

















If 















 This is a negative value so is not a solution of the original equation.

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