# 2.1 Logarithmic & Exponential Functions

## Question Paper

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| Course | CIE A Level Maths |
| Section | 2. Logs & Exponentials |
| Topic | 2.1 Logarithmic & Exponential Functions |
| Difficulty | Hard |

**Time allowed:** 50

**Score:** /40

**Percentage:** /100

**Question 1a**

(a) On the same axes, sketch the graphs of $y = 4^x$ and $y = 5^x$.
Label any points of intersection with the coordinate axes.
Write down the equations of any asymptotes.

**[4 marks]**

**Question 1b**

(b) Write down an equation for the graph that is a reflection of $y = 4^x$ in the $y$-axis.

**[1 mark]**

**Question 2a**

(a) (i) Sketch the graph of $y = 0.4^x$.
(ii) State whether this graph indicates exponential growth or exponential decay.

**[3 marks]**

**Question 2b**

(b) Find the value of $x$ when $y = 0.064$.

[1 mark]

**Question 3a**

(a) Find the value of $\log 1000 + \log 10\,000$.

[1 mark]

**Question 3b**

(b) Write down the value of $a$ in the statement $6^{\log_6 a} = 36$.

[1 mark]

**Question 3c**

(c) Evaluate $\frac{2\log_4 64 + 3^{\log_2 8} - \log_5 5}{\log 100}$.

[2 marks]

**Question 4a**

(a) Solve $2\log 1000 = x\log_{16} 4$.

[2 marks]

**Question 4b**

(b) Solve $3\log_4 x = \log_4 x + 3\log_5 25$.

**[2 marks]**

**Question 5**

Solve $2(2^{2x}) + 4 = 9(2^x)$.

**[3 marks]**

**Question 6a**

(a) Sketch the graph of $y = 12e^{-x}$ for $x \geq 0$.
Label any points of intersection with the coordinate axes.
Write down the equations of any asymptotes.

**[3 marks]**

**Question 6b**

(b) Write down the gradient of $y = 12e^{-x}$ at the point where $x = 0$.

[1 mark]

**Question 7a**

The function f$(x)$ is defined by f$(x) = 3e^{2x}$ for $x \in \mathbb{R}$.

(a) Find f$(2x)$.

[2 marks]

**Question 7b**

(b) Find f$'(2x)$.

[2 marks]

**Question 8**

Solve $2e^{2x} = e^{x} + 10$, giving your answer to 3 significant figures.

[3 marks]

**Question 9a**

(a) Find the gradient of the curve $y = ae^{bx}$, where $a$ and $b$ are constants.

**[1 mark]**

**Question 9b**

(b) At the point $(0, a)$ the gradient is 12, find $b$ in terms of $a$.

**[2 marks]**

**Question 9c**

(c) Hence write down y in terms of $a$ (and $x$) only.

**[1 mark]**

**Question 10a**

(a) Show that the equation $e^{x} - e^{-x} = 0$ has only one real solution.

**[3 marks]**

**Question 10b**

(b) Explain why the equation $e^x + e^{-x} = 0$ has no real solutions.

**[2 marks]**