

Name: _____

Student #: _____

Date: _____

T.A. #: _____

Mathematics 12 Pre-Calculus
LEARNING GUIDE 14 TEST – LOGARITHMS

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GRAPHING CALCULATORS ARE NOT PERMITTED ON THIS TEST.

***Full marks will NOT be given for the final answer only.**

When using a calculator, you should provide a decimal answer that is correct **to at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

1. Determine the equation of the inverse of the function $y = 2^x$. (1 mark)

$$y = \log_2 x$$

2. Express $\log_2(1/8) = -3$ in exponential form. (1 mark)

$$\frac{1}{8} = 2^{-3}$$

3. Evaluate. (1 mark each)

a) $\log 100$

$$2$$

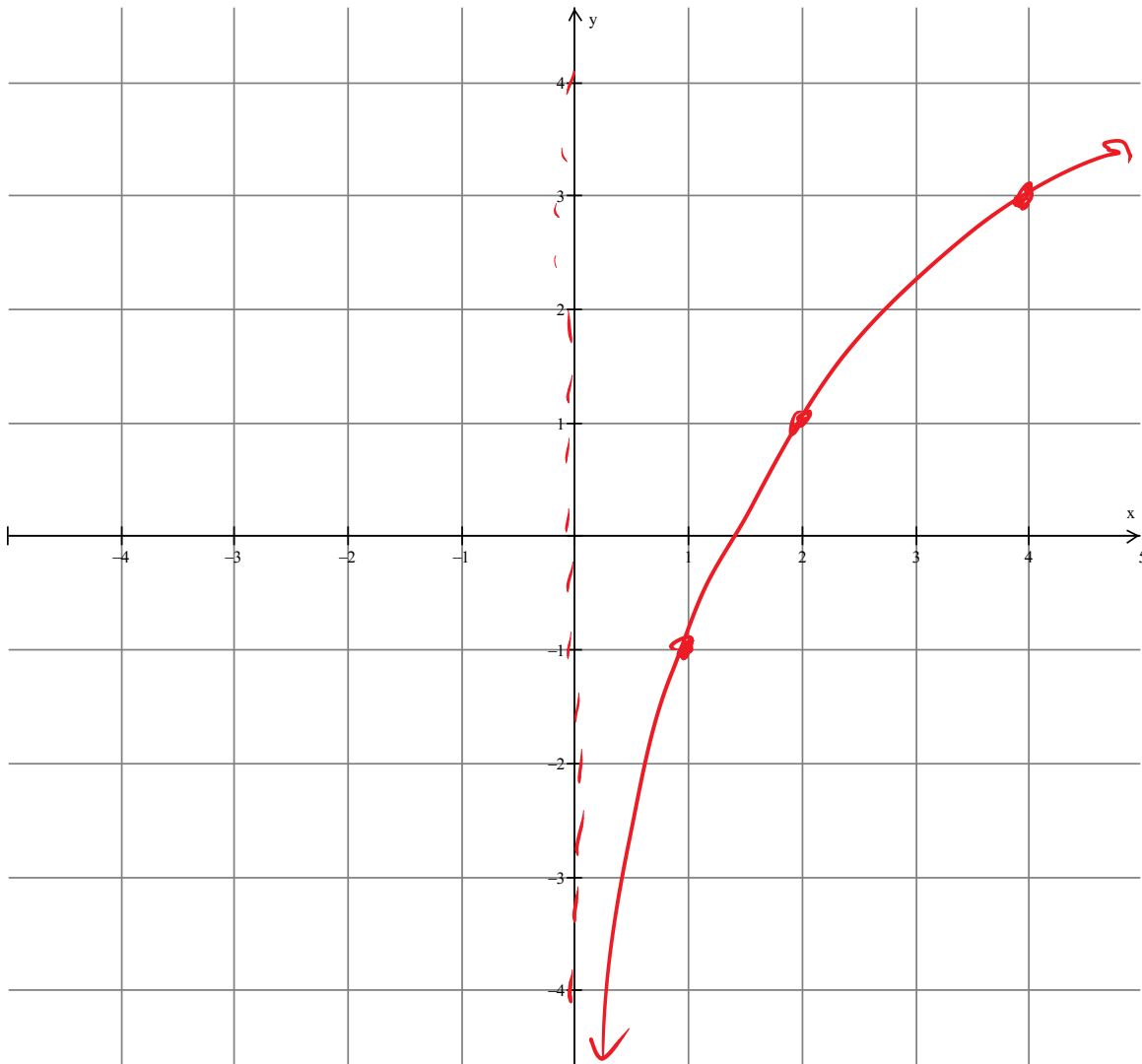
b) $\log_2 \frac{1}{4}$

$$-2$$

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4. Given the function $f(x) = 2 \log_2 x - 1$.

- a) Sketch the graph of $f(x)$. (2 marks)
- b) Determine the domain and range of the function. (1 mark) $x > 0$ $y \in \mathbb{R}$
- c) Determine the equation of the asymptote. (1 mark) $x = 0$



5. Determine the equation of the asymptote of the function $f(x) = a \log_b x - d$ if a , b , d are positive real numbers. (1 mark)

$$x = 0$$

6. Simplify $\log_3 \sqrt{27}$. (1 mark)

$$\log_3 3^{\frac{3}{2}} = \frac{3}{2}$$

7. Write as a single logarithm: $\log 8 + \log 3 - \log 6$. (1 mark)

$$\log \frac{24}{6} = \log 4$$

8. Write $\frac{1}{2} \log c - 2 \log d + 3 \log f$ as a single logarithm. (1 mark)

$$\log \frac{c^{\frac{1}{2}} f^3}{d^2}$$

9. If $\log 8 = a$ and $\log 7 = b$, write $\log \frac{8}{49}$ as an expression in terms of a and b . (2 marks)

$$\log 8 - \log 49$$

$$a - \log 7^2$$

$$a - 2b$$

10. Solve each equation algebraically. (1 mark each)

a) $\log x = 0.8$

$$x = 10^{0.8} = 6.31$$

b) $\log_4 x = -3$

$$x = \frac{1}{64} \quad (0.02)$$

11. Solve each equation algebraically. (2 marks each)

a) $4^x = 3^{x+1}$

$$\begin{aligned}
 x \log 4 &= (x+1) \log 3 \\
 x \log 4 &= x \log 3 + \log 3 \\
 x \log 4 - x \log 3 &= \log 3
 \end{aligned}
 \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{aligned}
 x &= \frac{\log 3}{\log 4 - \log 3} \\
 &= 3.82
 \end{aligned}$$

b) $2(18)^x = 3^{x+1}$

$$\log 2 + x \log 18 = x \log 3 + \log 3$$

$$x \log 18 - x \log 3 = \log 3 - \log 2$$

$$x = \frac{\log 3 - \log 2}{\log 18 - \log 3} = 0.23$$

12. Solve algebraically (2 marks each)

a) $\log_4(x-4) + \log_4 x = \log_4 5$

$$\log_4 (x-4)(x) = \log_4 5$$

$$(x-4)(x) = 5$$

$$x^2 - 4x = 5$$

$$x^2 - 4x - 5 = 0$$

$$(x-5)(x+1) = 0$$

$$x = 5, -1 \leftarrow \text{Result}$$

$$\boxed{x = 5}$$

b) $2 \log_3(x+4) - \log_3(-x) = 2$

$$\log_3 \frac{(x+4)^2}{-x} = 2$$

$$\frac{(x+4)^2}{-x} = 3^2$$

$$x^2 + 8x + 16 = -9x$$

$$x^2 + 17x + 16 = 0$$

$$(x+16)(x+1) = 0$$

$$x = -16 \quad x = -1$$

Result.

$$\boxed{x = -1}$$