

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 $y = \frac{1^x}{2}$. (1 mark)

$$y = \log_{\frac{1}{2}} x$$

2. Express $3^x = \frac{1}{2}$ in logarithmic form. (1 mark)

$$\log_3 \frac{1}{2} = x$$

3. Evaluate. (1 mark each)

a) $\log 8$

$$0.90$$

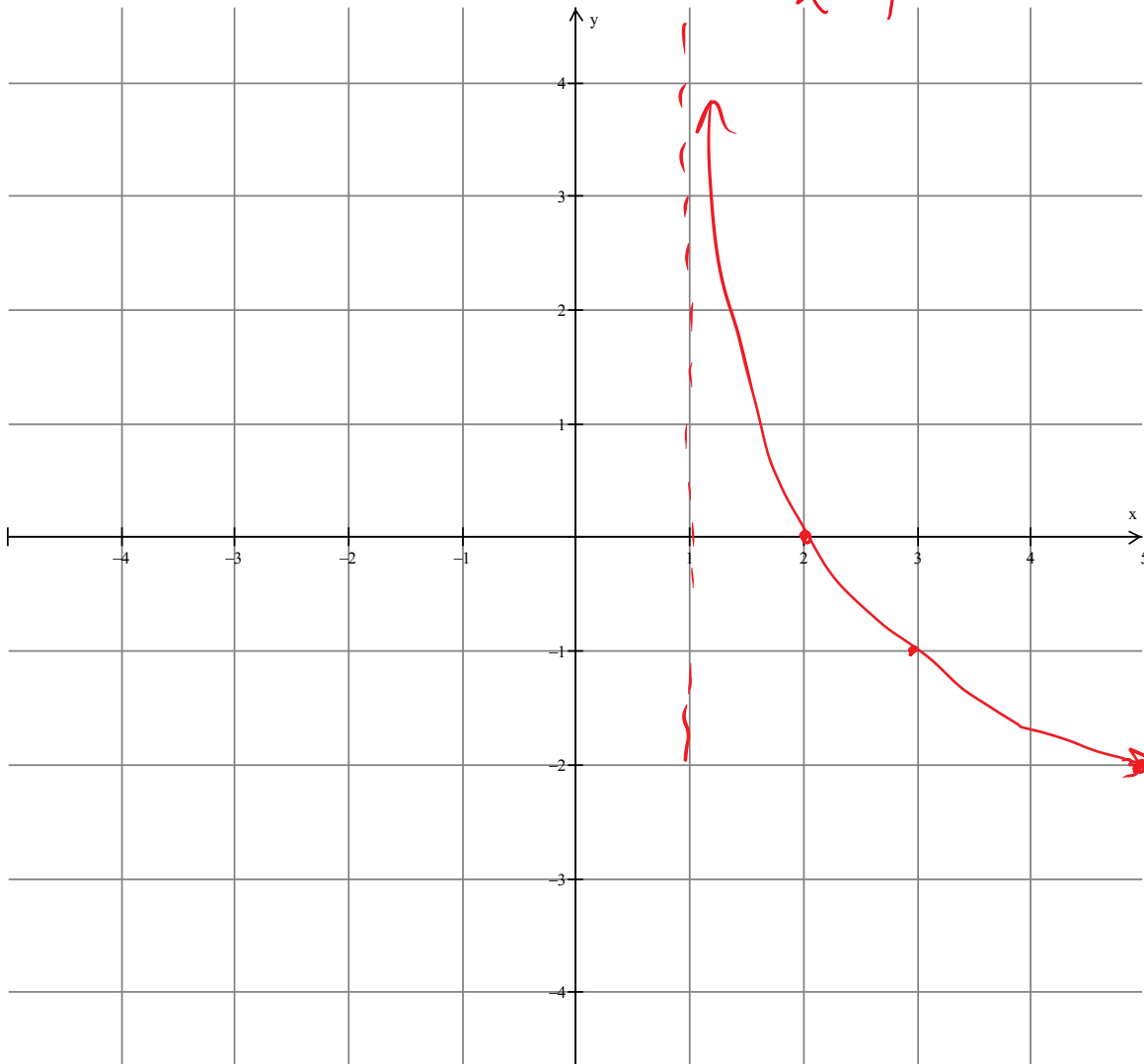
b) $\log_3 7$

$$1.77$$

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

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



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 $\log_2 \sqrt{8}$. (1 mark)

$$\log_2 2^{\frac{3}{2}} = \frac{3}{2}$$

7. Write as a single logarithm: $\log 10 - \log 5 + \log 3$. (1 mark)

$$\log \frac{10 \times 3}{5} = \log 6$$

8. Write $2 \log_3 2 + \log_3 5 - \frac{1}{2} \log_3 16$ as a single logarithm. (1 mark)

$$\log_3 \frac{2^2 \times 5}{16^{\frac{1}{2}}} = \log_3 \frac{20}{4} = \log_3 5$$

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

$$\begin{aligned} & \log 8 + \log 7^{\frac{1}{2}} \\ &= \log 8 + \frac{1}{2} \log 7 \\ &= a + \frac{1}{2} b \end{aligned}$$

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

a) $\log x = 0.5$

$$x = 10^{0.5} = 3.16$$

b) $\log_x 4 = 2$

$$4 = x^2 \quad (x = 2)$$

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

a) $7^x = 2^{x-1}$

$$x \log 7 = (x-1) \log 2$$

$$x \log 7 = x \log 2 - \log 2$$

$$x \log 7 - x \log 2 = -\log 2$$

$$x = \frac{-\log 2}{\log 7 - \log 2} = -0.55$$

b) $2(8)^x = 5^{x+1}$

$$\log 2 + x \log 8 = (x+1) \log 5$$

$$\log 2 + x \log 8 = x \log 5 + \log 5$$

$$x (\log 8 - \log 5) = \log 5 - \log 2$$

$$x = \frac{\log 5 - \log 2}{\log 8 - \log 5} = 1.95$$

12. Solve algebraically (2 marks each)

a) $\log_3(x-6) + \log_3(x-8) = \log_3 24$

$$\log_3 (x-6)(x-8) = \log_3 24$$

$$x^2 - 14x + 48 = 24$$

$$x^2 - 14x + 24 = 0$$

$$(x-12)(x-2) = 0$$

$$x = 12, 2$$

↑
reject

$$x = 12$$

b) $2 \log_4(x+4) - \log_4(x+12) = 1$

$$\log_4 \frac{(x+4)^2}{x+12} = 1$$

$$\frac{x^2 + 8x + 16}{x+12} = 4$$

$$x^2 + 8x + 16 = 4x + 48$$

$$x^2 + 4x - 32 = 0$$

$$(x+8)(x-4) = 0$$

$$x = -8, 4$$

reject

$$x = 4$$

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