Logarithmic functions - Practice test 2

Name: _____ Date: _____

10 questions | 54 marks | 70 minutes

Emphasis on domains, reflected graphs, exact solutions and logarithmic rates.

A scientific calculator may be used.

1. Identify logarithmic bases and values. [4 marks]

(a) Find $b > 0$, $b \neq 1$, if $\log_b 16 = 4$. [2 marks]

(b) Evaluate $\log_{\frac{1}{3}} 27$. [2 marks]

2. Use an identity without losing its domain. [5 marks]

(a) State the real domain of $\ln(x^2)$ and simplify it using $|x|$. [3 marks]

(b) Explain why $\ln(x^2) = 2\ln x$ fails at $x = -2$. [2 marks]

3. For $g(x) = \ln(x+4) - \ln(x-1)$: [5 marks]

(a) State the domain. [2 marks]

(b) Solve $g(x) = \ln 2$. [3 marks]

4. Solve $4^x - 5 \cdot 2^x + 4 = 0$. [6 marks]

(a) Make a substitution and solve the resulting polynomial. [3 marks]

(b) Give all real values of x and check them in the original equation. [3 marks]

5. Simplify carefully. [5 marks]

(a) Write $\ln(e^3 + e)$ as $k + \ln A$ with k an integer and $A > 0$. [2 marks]

(b) Solve $\ln(e^{2x} + 1) = \ln 10$. [3 marks]

6. Consider $h(x) = 2 - \ln(5 - x)$. [6 marks]

(a) Find its domain, vertical asymptote and y-intercept. [3 marks]

(b) Find where $h(x) = 2$ and state whether h is increasing or decreasing. [3 marks]

7. Let $f(x) = x\ln x - 2x$ for $x > 0$. [6 marks]

(a) Find the stationary point. [3 marks]

(b) Classify it and determine the range. [3 marks]

8. Let $y = \log_2(x+3)$. [5 marks]

(a) Find its derivative and domain. [2 marks]

(b) Find the equation of the normal at $x = 1$. [3 marks]

9. A response model is $R(t) = a + b\ln(t+1)$, $t \geq 0$ hours. Its values are supplied. [6 marks]

Observed values

t (hours)	$R(t)$
0	12
2	30

(a) Find exact values of a and b. [3 marks]

(b) Predict $R(8)$ and give one limitation of the prediction. [3 marks]

10. A logarithm with base less than one reverses order. [6 marks]

(a) Solve $\log_{\frac{1}{2}} x > 2$ over the reals. [3 marks]

(b) Solve $\ln(x-2) < 0$. [3 marks]