Logarithms - Test

Name:_____ **Date:**_____

Multiple Choice

For #1 to 6, select the best answer.

1. The graph of $f(x) = \log_b x$, $b > 1$, is translated such that the equation of the new graph is expressed as $y - 2 = f(x - 1)$. The domain of the new function is

A $\{x \mid x > 0, x \in \mathrm{R}\}$

B $\{x \mid x > 1, x \in \mathrm{R}\}$

C $\{x \mid x > 2, x \in \mathrm{R}\}$

D $\{x \mid x > 3, x \in \mathrm{R}\}$

2. The x-intercept of the function $f(x) = \log_5 x + 3$ is

A 5^{-3} **B** 0

C 1 **D** 5^3

3. The equation $y = \frac{1}{3}\log_2 x$ can also be written as

A $y = 2^{\frac{x}{3}}$ **B** $x = 2^{\frac{y}{3}}$

C $2^{3x} = y$ **D** $2^{3y} = x$

4. The range of the inverse function, f^{-1}, of $f(x) = \log_4 x$, is

A $\{y \mid y > 0, y \in \mathrm{R}\}$

B $\{y \mid y < 0, y \in \mathrm{R}\}$

C $\{y \mid y \geq 0, y \in \mathrm{R}\}$

D $\{y \mid y \in \mathrm{R}\}$

5. A graph of the function $y = \log_3 x$ is transformed. The image of the point (3, 1) is (6, 3). The equation of the transformed function is

A $y = 3\log_3 (x - 3)$

B $y = 3\log_3 (x + 3)$

C $y - 3 = \log_3 (x - 3)$

D $y + 3 = \log_3 (x + 3)$

6. If $\log_{27} x = y$, then $\log_9 x$ equals

A $\frac{3y}{2}$ **B** $\frac{2y}{3}$

C $3y$ **D** 4^y

Short Answer

7. If $\log_3 5 = x$, express $2\log_3 45 - \frac{1}{2}\log_3 225$ in terms of x.

8. Determine the value of x algebraically.

a) $\log_4 x = -3$

b) $\log_x 64 = \frac{2}{3}$

c) $5^{\log_5 25} = x$

d) $\log_3 (x+1)^2 = 2$

e) $\log_2 (\log_x 256) = 3$

9. Solve for x. **CHECK YOUR ANSWERS.** Clearly identify all valid answers.

a) $\log (2x-3) + \log (x-2) = \log (2x-1)$

b) $\log (x-7) - \log (x-3) = \log (2x+1)$

c) $2 \log_2 (x - 4) - \log_2 x = 1$

10. The point $(6, -4)$ lies on the graph of $y = \log_b x$. Determine the value of b to the nearest tenth.

Extended Response

11. Solve the equation $5^x = 104$, **graphically and algebraically**. Round your answer to the nearest hundredth.

12. Given $f(x) = \log_3 x$ and $g(x) = \log_3 9x$.

a) Describe the transformation of $f(x)$ required to obtain $g(x)$ as a stretch.

b) Describe the transformation of $f(x)$ required to obtain $g(x)$ as a translation.

c) Determine the x-intercept of $f(x)$. How can the x-intercept of $g(x)$ be determined using your answer to parts a) or b)?

13. Explain how the graph of $y = \frac{\log_4 (3x-1)}{2} + 1$ can be generated by transforming the graph of $y = \log_4 x$.

14. Identify the following characteristics of the graph of the function $y = 2 \log_4 (x + 1) + 3$.

a) the equation of the asymptote

b) the domain and range

c) the x-intercept and the y-intercept

15. An investment of \$2000 pays interest at a rate of 3.5% per year. Determine the number of months required for the investment to grow to at least \$3000 if interest is compounded monthly.

16. Radioactive iodine-131 has a half-life of 8.1 days. How long does it take for the level of radiation to reduce to 1% of the original level? Express your answer to the nearest tenth.