Principles of Mathematics 12

Logarithms Practice Exam

Principles of Math 12 - Logarithms Practice Exam

Use this sheet to record your answers

1.	10.	19.	30.
2.	11.	20.	31.
3.	12.	22.	32.
4.	NR 3.	23.	33.
5.	13.	24.	
6.	14.	NR 7.	
NR 1.	NR 4.	25.	
7.	15.	26.	
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NR 2.	17.	28.	
9.	18.	29.	

Logarithms Practice Exam

1. The graph of $f(x) = b^x$ and the graph of $g(x) = \left(\frac{1}{b}\right)^x$, where $b > 0$, are reflections of each other about the line

A. $y = x$
B. $y = b$
C. $x = 0$
D. $y = 0$

Use the following information to answer the next question.

Equation I	$y = \frac{\log x}{\log 3}$
Equation II	$y = x^3$
Equation III	$y = x - 6$
Equation IV	$y = (x - 6)^3$

2. A solution to the equation $\log_3 x = x - 6$ could be approximated using technology by graphing equations

A. I and III
B. I and IV
C. II and III
D. II and IV

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3. The expression $\log_{\frac{1}{5}}\left(\frac{1}{x}\right)$ is equivalent to

A. $\log_5\left(\frac{1}{x}\right)$
B. $\log_{\frac{1}{x}} 5$
C. $\log(5x)$
D. $\log_5 x$

Use the following information to answer the next question.

The power rating of a particular dynamic electronic circuit is given by the equation

$$P = 1 - w^{-0.246t}$$

where P is the power rating, t is amount of time since the circuit is switched on, and w is a constant.

4. After the circuit has been operational for 43 seconds, the power rating is 0.83. The value of w, to the nearest hundredth, is

A. 0.09
B. 0.25
C. 1.18
D. 10.58

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5. The expression $\log_x\left(y^3z\right) - \log_x\left(yz^2\right)$ is equivalent to

A. $\log_x\left(y^2z^3\right)$
B. $\log_x\left(\frac{y^2}{z}\right)$
C. $3\log_x y + \log_x z - \log_x y + 2\log_x z$
D. 1

6. The value of b in the equation $7 = (3+b)^4$ is equivalent to

A. $\frac{\log 7}{3^4}$
B. $\frac{\log_4 7}{\log_4 3}$
C. $7^4 - 3$
D. $\sqrt[4]{7} - 3$

Numerical Response

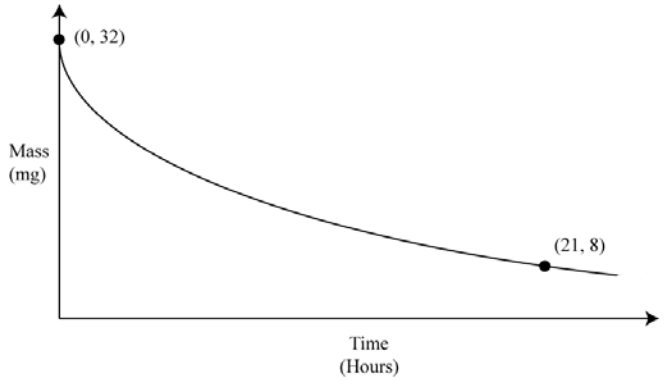
1. If $xy = 8$, then to the nearest tenth, the value of $5\log_2 x + 5\log_2 y$ is _____ .

7. The solution to the equation $2^{3x} = 5^{-x-1}$, correct to the nearest hundredth, is

A. -0.081
B. -0.436
C. 0.413
D. 1.455

Use the following information to answer the next question.

The mass of a radioactive sample is represented in the graph below.
The initial mass of 32 mg decays to 8 mg after 21 hours.



8. The half-life of the radioactive sample, in minutes, is

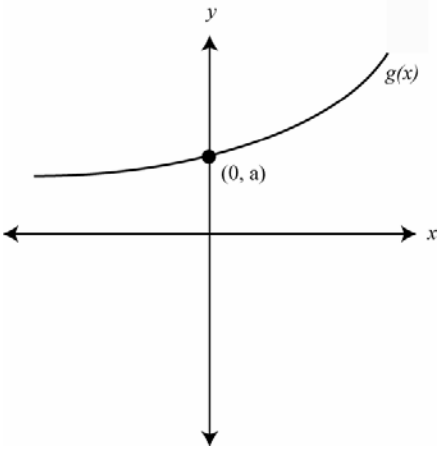
A. 60
B. 420
C. 630
D. 1260

Numerical Response

2. Given $a^{5x} = \left(\log_c c^a\right)^{3x+8}$, the value of *x*, to the nearest hundredth is _____.

Use the following information to answer the next question.

The graph of a function *g(x)* is shown below



9. If the graph of *g(x)* is transformed to a new graph *h(x)*, and the point (0, *a*) becomes (*a*, 0), then a possible transformation is

A. $h(x) = g^{-1}(x)$
B. $h(x) = ag(x)$
C. $h(x) = g(x) + a$
D. $h(x) = g^{-1}(x) + a$

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10. A skilled player at the video game "*Dot – Gobbler*" has an average high score of 50000 points. For every day the player is on vacation, she can expect to lose 2.7% of her gaming ability. An equation that may be used to predict the average score *S* of the player after *d* days is

A. $S = 50000(2.7)^{\frac{1}{d}}$
B. $S = 50000(0.027)^{d}$
C. $S = 50000(0.973)^{\frac{1}{d}}$
D. $S = 50000(0.973)^{d}$

Use the following information to answer the next two questions.

The decibel level of a sound may be calculated using the formula

$$L = 10\log\left(10^{12} \bullet I\right)$$

where L is the loudness of the sound (dB) and I is the intensity of the sound.

11. An equation that can be used to solve for the value of I is

A. $I = \dfrac{L}{120 \times \log 10}$

B. $I = \log\left(\dfrac{L}{10}\right) \times 10^{12}$

C. $I = 10^{\frac{L-120}{10}}$

D. $I = \dfrac{L}{10^{13}}$

12. The loudness of a jet engine is 150 dB. The magnitude of the sound intensity is

A. 1.25
B. 1.18×10^{12}
C. 1000
D. 1.5×10^{-11}

Numerical Response

3. The expression $\log_b\left(\dfrac{1}{b^{-100}}\right)$ is equivalent to a numerical value of _____.

13. The inverse of $f(x) = 3^x + 4$ is

A. $f^{-1}(x) = 3^{-x} + 4$

B. $f^{-1}(x) = \log_3(x - 4)$

C. $f^{-1}(x) = 4 - 3^x$

D. $f^{-1}(x) = \log_{x-4}(3)$

14. The graph of $x = (b)^{-y}$, where $b < 0$, is the same as the graph of

A. $y = \log_x b$ reflected in the line y = x

B. $y = \log_b x$ reflected in the line y = x

C. $y = \log_b x$ reflected in the line y = 0

D. $y = b^{-x}$

Use the following information to answer the next question.

Newton's Law of cooling can be represented by the equation

$$T(t) = T_0 e^{-kt}$$

where *T(t)* is the final temperature in degrees Celsius, T_0 is the initial temperature in degrees Celsius, t is the elapsed time in minutes, and both *e* & *k* are constants.

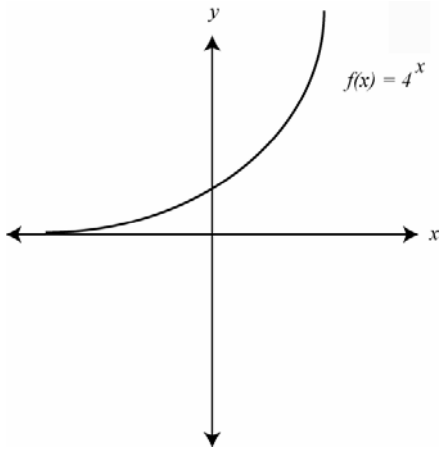
$e = 2.718$
$k = 0.043$

Numerical Response

4. The length of time, in minutes, required for a cup of coffee to cool from 82 ˚C to 65˚C is _____.

Use the following information to answer the next four questions.

The graph of $f(x) = 4^x$ is shown below



15. The graph of $f(x) = 4^x$ and the graph of $g(x) = \log_4 x$ are symmetrical with respect to the line

A. $x = 0$
B. $y = 0$
C. $y = x$
D. $y = -x$

16. If the graph of $g(x) = \log_4 x$ undergoes the transformation $y = g(3x - 12) + 2$, the new domain of the graph is

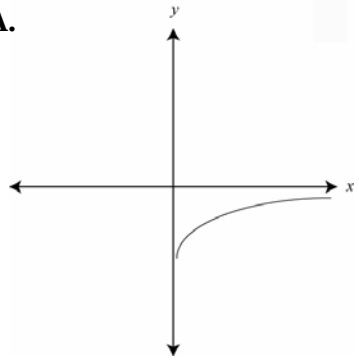
A. $x > 2$
B. $x > 3$
C. $x > 4$
D. $x > 12$

17. A student wishes to solve the equation $4^x = 8$. An **incorrect** procedure to determine the solution is

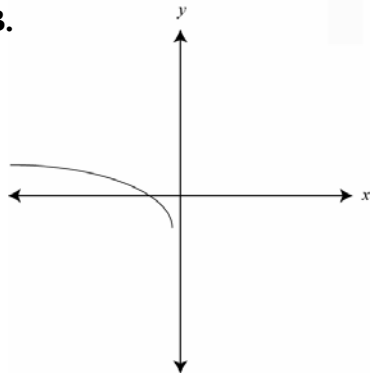
A. Take the logarithm of both sides, use the power rule of logarithms, then isolate the variable by dividing both sides of the equation by log 4.
B. Graph $y_1 = 4^x$ and $y_2 = 8$ in a graphing calculator, find the point of intersection, then state the y-value of this point as the solution.
C. Draw $y_1 = 4^x$ and $y_2 = 8$ carefully on graph paper, then approximate the coordinates of the point of intersection.
D. Find a common base for each side of the equation, then simplify and solve.

18. The equation $4^{-2y} = x$ is represented by graph

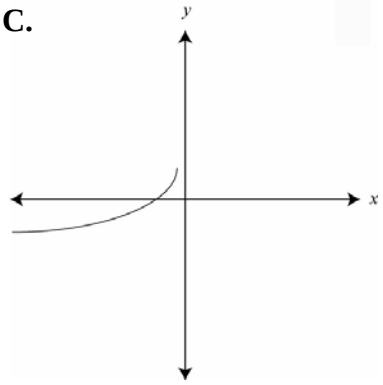
A.



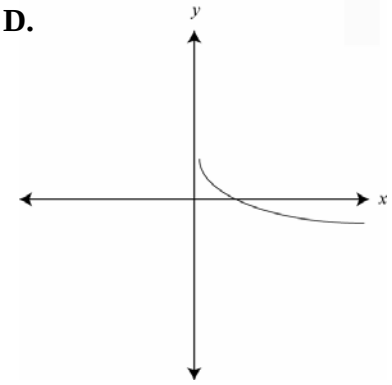
B.



C.



D.



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19. The equation $f(x) = 7a^{2+x} - b$, has an x – intercept equivalent to

A. $x = \dfrac{\log b - \log 7}{\log a} - 2$

B. $x = 7a^2 - b$

C. $x = \dfrac{y + b}{7a^2}$

D. $x = 0$

20. A student solves for a in the equation $\log_{27}(81a) = b$. The student determines a is equivalent to the expression

A. $a = \dfrac{\log 81}{b \log 27}$

B. $a = 3^{3b-4}$

C. $a = 27^{b} - 81$

D. $a = 3$

21. Given the equation $a^{\frac{5}{4}} = 2b$, an expression for a is

A. $2b^{\frac{4}{5}}$

B. $(2b)^{\frac{4}{5}}$

C. $2b^{-\frac{4}{5}}$

D. $\dfrac{1}{(2b)^{\frac{4}{5}}}$

Use the following information to answer the next question.

A student analyzes the following graph:

$$f(x) = \log_{x}(6 - x)$$

22. The domain of this graph is

A. $x < 0$

B. $x < 6$

C. $0 < x < 6,\ x \neq 1$

D. $1 < x < 6$

23. The x-intercept of the graph $y = b \log_{c} ax$ is

A. a

B. $\left(\dfrac{1}{a}\right)$

C. $x = 0$

D. $2b$

Numerical Response

5. Given the equation $2\log x + 3\log x = 8$, a student determines the value of x to be _____.

24. One third of 3^{234} is

A. 3^{78}
B. 1^{234}
C. 3^{233}
D. 1×10^{234}

25. Given the equation $\log_a x + y = \log_a z$, an expression for y is

A. $y = \log_a \left(\frac{x}{z} \right)$
B. $y = \log_a \left(\frac{z}{x} \right)$
C. $y = \log_a (z - x)$
D. $y = z - x$

26. The price of a vintage video game with the box and instructions doubles every 20 years. If the video game initially cost $60.00, the value of the game in 33 years will be

A. 159.59
B. 163.28
C. 188.30
D. 200.00

27. The population of a city can be determined using the equation $P = 100000(1.03)^t$ where P is the future population, and t is the time in years.
An equation representing t as a function of P is

A. $t = \dfrac{P}{103000}$
B. $t = \log P - 5 - \log 1.03$
C. $t = \dfrac{\log P}{5 \log 1.03}$
D. $t = \dfrac{\log P - 5}{\log 1.03}$

28. The value of x in the equation $\log(2-x) + \log(2+x) = \log 3$ is

A. $x = -1$
B. $x = 1$
C. $x = \pm 1$
D. No Solution

29. If $\log_6 x = 120$, then $\log_6 \left(\dfrac{1}{36} x \right)$ is

A. 0.52
B. 3.33
C. 84
D. 118

30. An expression equivalent to $\left(a^{\log_b c}\right)\left(a^{\log_b c}\right)$ is

A. $a^2 + a^{\log_b c}$
B. $\left(a^2\right)^{\log_b c}$
C. $2a^{\log_b c}$
D. $2^{\log_c a^b}$

31. The graph of $y = b^x$, where $b < 1$, undergoes the transformation $y + 3 = f(x - 2)$. The range of the transformed graph is

A. $y < -3$
B. $y > -3$
C. $y \leq -3$
D. $y \geq -3$

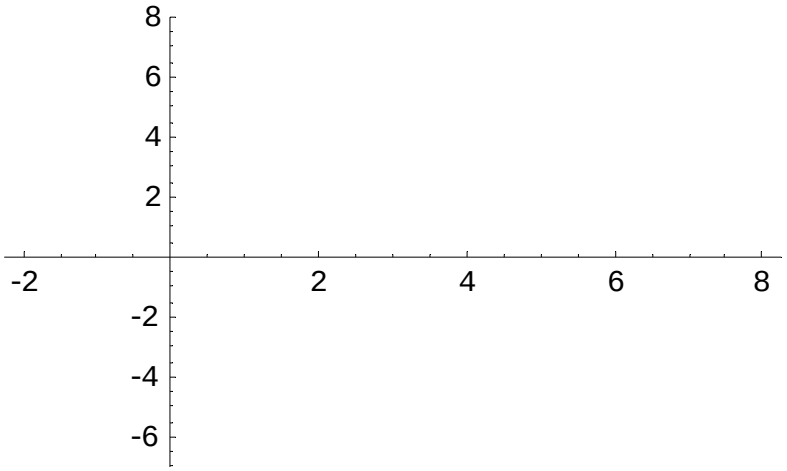
32. The solution of $\log(x + 2) + \log(x - 1) = 1$ is

A. -4
B. 3
C. -4, 3
D. No Solution

Written Response – 10%

1.

- Draw the graph of $f(x)=\log(x+2)$ in the space provided below



- Complete the following chart to describe the graph above

Domain	
Range	
Equation of Asymptote	
***x*-intercept**	
***y*-intercept**	
***y*-value when $x = 2$**	

- Describe the transformations applied to the graph of $y = \log x$ in order to obtain the graph of $f(x)=\log(x+2)$

- The domain of the general expression $f(x)=a\log(bx+c)+d$ is

Use the following information to answer the next question.

A student is asked to solve the equation $27 \bullet 81^{x-2} = 243^{-2x}$ using different techniques learned in Principles of Math 12.

Written Response – 10%

2.

- Explain how to solve the equation graphically. Indicate appropriate window settings and state the solution.

- **Algebraically** show how to solve this equation using a common base.

- **Algebraically** show how to solve this equation by taking the logarithm of both sides and solving for *x*.

- The student is now asked to solve the equation $\log_3 x = 4$. Explain how this can be done with a graphing calculator.

Use the following information to answer the next question.

A useful equation for solving application questions is

$$A = A_0 (b)^{\frac{t}{P}}$$

where A is the future amount, A_0 is the initial amount, b is the rate of growth or decay, P is the period, and t is the elapsed time.

Written Response – 10%

3.

- **Algebraically** solve for P

- A particular bacteria doubles every P hours. If a bacterial culture starts with 60000 bacteria and has 93000 bacteria after 3 hours, determine the doubling period.

- The population of a town triples every 8 years. Determine the number of years it will take for the population to double.

- Light passing through dirty water retains only ¾ of its intensity for every metre of water. Determine the depth at which the light will have 64% of its surface intensity.

- A particular painting goes down in value by 4.3% each year due to improper storage. Determine the number of years it will take for the value of the painting be half the initial worth.

You have now completed the examination. Please check over your answers carefully before self-marking. Good luck on your real exam!