Logarithmic and Exponential Functions

Math 12 Unit 2A Review Name_____

1. Determine the domain of $y = \log_a(-x)$. $-x > 0$ $x < 0$

A. $x < 0$ B. $x > 0$ C. $x \le 0$ D. $x \ge 0$

2. Express as a single logarithm: $\log A - 3\log B + \log C$ $\frac{AC}{B^3}$

A. $\log \frac{AC}{3B}$ B. $\log \frac{AC}{B^3}$ C. $\log \frac{A}{B^3C}$ D. $\log(A - 3B + C)$

3. If the point (2, 9) is on the graph of $y = a^x$, what point must be on the graph of $y = \log_a x$?

A. $\left(2, \frac{1}{9}\right)$ B. $(2, 9)$ C. $(9, -2)$ D. $(9, 2)$

4. Solve: $\log_2(3-2x) - \log_2(2-x) = \log_2 3$ $\frac{3-2x}{2-x} = 3$ $3 - 2x = 6 - 3x$ $x = 3$

A. -2 B. $\frac{1}{2}$ C. 3 D. no solution

5. Change $a = \log_3 b$ to exponential form $3^a = b$

A. $a = b^3$ B. $a = 3^b$ C. $b = a^3$ D. $b = 3^a$

6. If a radioactive substance decays from 100 g to 30 g in 12 years, which equation below could be used to determine the half-life, *N* years, of the substance?

A. $100 = 30\left(\frac{1}{2}\right)^{\frac{N}{12}}$ B. $100 = 30\left(\frac{1}{2}\right)^{\frac{12}{N}}$ C. $30 = 100\left(\frac{1}{2}\right)^{\frac{N}{12}}$ D. $30 = 100\left(\frac{1}{2}\right)^{\frac{12}{N}}$

7. Evaluate: $\log_3 59.2$ $3^3 = 27$

A. 0.27 B. 1.30 C. 3.71 D. 19.73

30 weeks = $4\frac{2}{7}$

8. The number of insects in a colony can triple in 7 weeks. After 50 weeks, how many times greater will the number of insects be than after 20 weeks?

A. 81 B. 110.87 C. 243 D. 2.06×10^{14}

9. A radioactive substance decays from 600 g to 105 g in twelve days. Determine the half-life for this substance.

600 300 150 75 $2.x$ $12 = 2.5x$

A. 4.77 d B. 5.27 d C. 7.43 d D. 30.17 d

10. Solve for x: $32^{x-1} = 8^{3x-1}$ $(x-1)(5) = (3x-1)(3)$ $5x-5 = 9x-3$ $4x = -2$ $x = -1/2$

A. -2 B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. 2

11. An earthquake in Vancouver measured 3.2 on the Richter scale and an earthquake in San Francisco measured 5.1. How many times as intense was the earthquake in San Francisco compared to the earthquake in Vancouver?

1.9

A. 1.59 B. 1.90 C. 38.90 D. 79.43

12. If $\log_5 x = 25$, determine the value of $\log_5\left(\frac{x}{25}\right)$. $\log_5 x - \log_5 25$ $25 - 2$

A. 0 B. 1 C. 20 D. 23

13. Solve for x: $\log(3-x)+\log(3+x)=\log 5$. $3^2 - x^2 = 5$ $x^2 = 4$ $x = 2, -2$

A. $x=-2$ B. $x=2$ C. $x=\pm2$ D. no solution $2, -2$

14. Determine the domain of the function $y=\log_x(8-x)$ $x>0$ $x\neq1$ $8-x>0$ $8>x$ $0<x<8$

A. $x<8$ B. $x<8, x\neq1$ C. $0<x<8$ D. $0<x<8, x\neq1$

15. The formula $A=P(1.09)^t$ is an example of exponential growth with base 1.09. Determine an equivalent continuous growth formula using base e, $A=Pe^{kt}$.

A. $A=Pe^{0.086t}$ B. $A=Pe^{1.086t}$ C. $A=Pe^{0.86t}$ D. $A=Pe^{1.86t}$

$Pe^{kt} = P(1.09)^t$

$e^k = 1.09$ $\log_e(1.09) = k$

$\ln(1.09) = k.$ $k = 0.086$

16. Express $\log_5 30$ using logarithms in base 4.

A. $\log_4 30 - \log_4 5$ B. $\frac{\log_4 5}{\log_4 30}$ C. $\frac{\log_4 30}{\log_4 5}$ D. $\frac{\log_{30} 4}{\log_5 30}$

A new well produces 48 000 L of water in the first month. If the volume of water pumped decreases

17. In Chemistry, the pH scale measures the acidity (0-& or alkalinity (7-14) of a solution. It is a logarithmic scale in base 10. Thus a pH of 5 is 10 times more **acidic** than a pH of 6.

Solution A has a pH of 5.7. Solution B is 1260 times more acidic than Solution A. Find the pH of solution B.

$1260 = 10^x$

A. 2.6 B. 4.4 $\log 1260 = x$ C. 7.0 D. 8.8

$x = 3.1$ B has PH 3.1 units lower-

18. A population grows according to the formula $P = P_o e^{kt}$, where P is the final population in t years, P_o is the initial population and k is the continuous growth rate. What will be the population in 7 years if the initial population is 25 000 and the continuous rate is 1.2%

A. 27 191 B. 57 909 C. 177 113 D. 197 312

$P = 25000(e)^{(.012)(7)}$

B. Written Response

1. Solve algebraically: $2\log_4 x - \log_4(x+3) = 1$

$\log_4 \frac{x^2}{x+3} = 1$ $4 = \frac{x^2}{x+3}$

$(x-6)(x+2)$ $x^2 = 4x+12$

$x = 6$ $x^2 - 4x - 12 = 0$

2. Solve algebraically using logarithms: $2^x = 5^{x+1}$ (Answer accurate to at least 2 decimal places.)

$x\log 2 = (x+1)\log 5$ $x = \frac{\log 5}{\log 2 - \log 5}$

$x\log 2 - x\log 5 = \log 5$

3. A radioactive substance has a half-life of 17 d. How long will it take for 300 g of this substance to decay to 95 g? Solve algebraically using logarithms. Answer accurate to at least 2 decimal places.

$95 = 300(0.5)^{t/17}$ $\log_{.5} \frac{95}{300} = \frac{t}{17}$

4. The population of a nest of ants can multiply three fold (triple) in 8 weeks. If the population is now 12 000, how many week s will it take for the population to reach 300 000 ants? Solve algebraically using logarithms. Answer accurate to at least 2 decimal places.

$30\,000 = 12000(3)^{n/8}$