PreCalc Problem Set 3

Name: _____ **Date:** _____

1. The expression $\log \frac{\sqrt[3]{a}}{b}$ is equivalent to

   A. $\frac{1}{3}\log a - \log b$ B. $\frac{1}{3}\log(a-b)$

   C. $3\log a - \log b$ D. $3\log(a-b)$

2. If $\log a = x$ and $\log b = y$, then $\log \sqrt{ab}$ is equivalent to

   A. $\frac{1}{2}x + y$ B. $\frac{1}{2}(x+y)$

   C. $\frac{1}{2}xy$ D. $\frac{1}{4}xy$

3. If $A = \pi r^2$, then $\log A$ is equivalent to

   A. $2(\log \pi + \log r)$ B. $\log \pi + 2\log r$

   C. $\log \pi + \frac{1}{2}\log r$ D. $(\log \pi)(\log r^2)$

4. The expression $\frac{1}{3}\log m - 2\log n$ is equivalent to

   A. $\log\left(\frac{1}{3}m - 2n\right)$ B. $\log\left(\frac{m^3}{\sqrt{n}}\right)$

   C. $\log\left(\sqrt[3]{m} - n^2\right)$ D. $\log\left(\frac{\sqrt[3]{m}}{n^2}\right)$

5. The expression $\log \frac{\sqrt{x^2y^3}}{z}$ is equivalent to

   A. $\frac{1}{2}(2\log x + 3\log y - \log z)$

   B. $\frac{1}{2}(2\log x + 3\log y) - \log z$

   C. $2\log x + 3\log y - \log z$

   D. $\frac{x^2y^3}{z}$

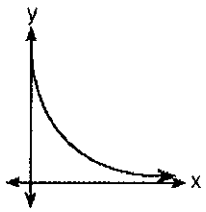
6. The volume of a soap bubble is represented by the equation $V = 0.094\sqrt{A^3}$, where A represents the surface area of the bubble. Which expression is also equivalent to V?

   A. $0.094A^{\frac{3}{2}}$ B. $0.094A^{\frac{2}{3}}$

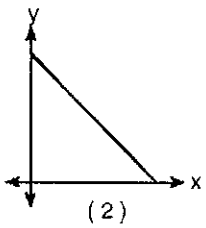
   C. $0.094A^6$ D. $(0.094A^3)^{\frac{1}{2}}$

7. The strength of a medication over time is represented by the equation $y = 200(1.5)^{-x}$, where x represents the number of hours since the medication was taken and y represents the number of micrograms per millimeter left in the blood. Which graph best represents this relationship?

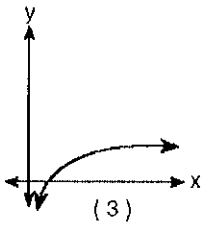
A.



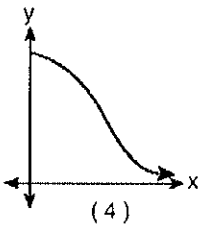
B.



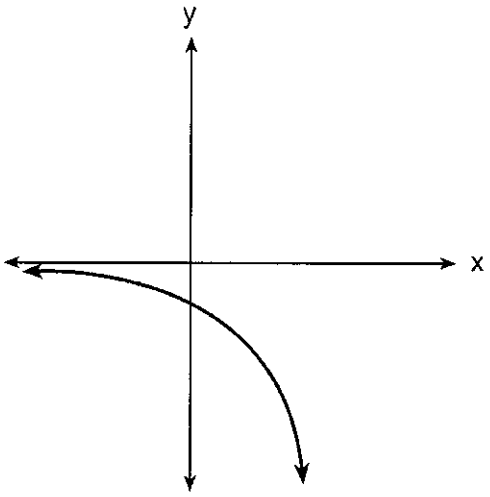
C.



D.



8. Which equation is represented by the accompanying graph?



A. $y = 2^x$ B. $y = -2^x$

C. $y = 2^{-x}$ D. $y = x^2 - 2$

9. If $\log 28 = \log 4 + \log x$, what is the value of x?

A. 7 B. 14 C. 24 D. 32

10. If $\log_2(x^2 - 1) = \log_2 8$, the the solution set for x is

A. $\{3, -3\}$ B. $\{-3\}$

C. $\{3\}$ D. $\{\ \}$

11. Solve for x: $\log_4(x^2 + 3x) - \log_4(x + 5) = 1$

12. In the equation $\log_x 4 + \log_x 9 = 2$, x is equal to

A. $\sqrt{13}$ B. 6 C. 6.5 D. 18

13. Solve for x: $\log_3(x^2 - 4) - \log_3(x + 2) = 2$

14. If $r = \sqrt[3]{\frac{A^2B}{C}}$, then $\log r$ can be represented by

A. $\frac{1}{6}\log A + \frac{1}{3}\log B - \log C$

B. $3(\log A^2 + \log B - \log C)$

C. $\frac{1}{3}\log(A^2 + B) - C$

D. $\frac{2}{3}\log A + \frac{1}{3}\log B - \frac{1}{3}\log C$

15. Solve algebraically for x:

$$\log_{5x-1} 4 = \frac{1}{3}$$

16. Solve algebraically for all values of x:

$$\log_{(x+3)}(2x + 3) + \log_{(x+3)}(x + 5) = 2$$

17. Growth of a certain strain of bacteria is modeled by the equation $G = A(2.7)^{0.584t}$, where:

G = final number of bacteria
A = initial number of bacteria
t = time (in hours)

In approximately how many hours will 4 bacteria first increase to 2,500 bacteria? Round your answer to the *nearest hour.*

18. The equation for radioactive decay is $p = (0.5)^{\frac{t}{H}}$, where p is the part of a substance with half-life H remaining radioactive after a period of time, t.

A given substance has a half-life of 6,000 years. After t years, one-fifth of the original sample remains radioactive. Find t, to the *nearest thousand years.*

19. The Franklins inherited $3,500, which they want to invest for their child's future college expenses. If they invest it at 8.25% with interest compounded monthly, determine the value of the account, in dollars, after 5 years. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where A = value of the investment after t years, P = principal invested, r = annual interest rate, and n = number of times compounded per year.

20. A population of wolves in a county is represented by the equation $P(t) = 80(0.98)^t$, where t is the number of years since 1998. Predict the number of wolves in the population in the year 2008.

21. A radioactive substance has an initial mass of 100 grams and its mass halves every 4 years. Which expression shows the number of grams remaining after t years?

A. $100(4)^{\frac{t}{4}}$ B. $100(4)^{-2t}$

C. $100(\frac{1}{2})^{\frac{t}{4}}$ D. $100(\frac{1}{2})^{4t}$

22. Is the equation $A = 21000(1 - 0.12)^t$ a model of exponential growth or exponential decay, and what is the rate (percent) of change per time period?

A. exponential growth and 12%

B. exponential growth and 88%

C. exponential decay and 12%

D. exponential decay and 88%

23. The number of bacteria present in a Petri dish can be modeled by the function $N = 50e^{3t}$, where N is the number of bacteria present in the Petri dish after t hours. Using this model, determine, to the *nearest hundredth*, the number of hours it will take for N to reach 30,700.

24. If \$5000 is invested at a rate of 3% interest compounded quarterly, what is the value of the investment in 5 years? (Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where A is the amount accrued, P is the principal, r is the interest rate, n is the number of times per year the money is compounded, and t is the length of time, in years.)

A. \$5190.33

B. \$5796.37

C. \$5805.92

D. \$5808.08

25. An archaeologist can determine the approximate age of certain ancient specimens by measuring the amount of carbon-14, a radioactive substance, contained in the specimen. The formula used to determine the age of a specimen is $A = A_0 2^{\frac{-t}{5760}}$, where A is the amount of carbon-14 that a specimen contains, A_0 is the original amount of carbon-14, t is time, in years, and 5760 is the half-life of carbon-14.

A specimen that originally contained 120 milligrams of carbon-14 now contains 100 milligrams of this substance. What is the age of the specimen, to the *nearest hundred years*?