Unit 7 Test Review

Evaluate the following logarithms:

1. $\log_3 27$

2. $\log_{10} 10{,}000$

3. $\log_5 \frac{1}{125}$

4. $\log_3 \sqrt{3}$

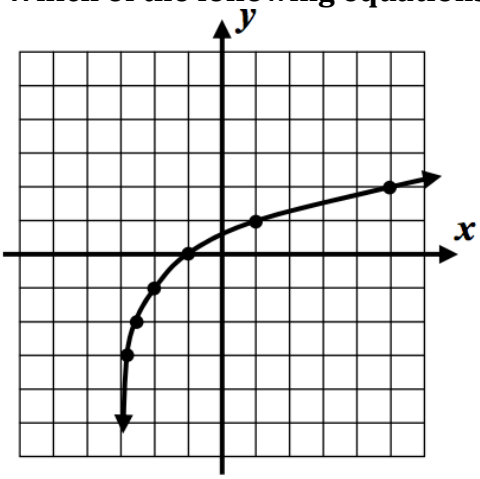
5. $\log_4 8$

6. $\log_3 \sqrt[5]{27}$

7. What is the *y* intercept of $y = \log(x + 100) - 9$?

8. What is the *y* intercept of $y = \ln(x + e) + 5$?

9. Which of the following equations describes the graph shown below?



(1) $y = \log_3(x+2) - 1$

(2) $y = \log_2(x-3) + 1$

(3) $y = \log_2(x+3) - 1$

(4) $y = \log_3(x+3) - 1$

10. Use the table of logarithms below to estimate the value of the logarithms in part (a)-(h)

a. log (25)
b. log(27)
c. log(33)
d. log (81)
e. log (99)

X	LOG(X)
2	0.30
3	0.48
5	0.70
7	0.85
11	1.04
13	1.11

11. Reduce each expression to a single logarithm of the form log(*x*)

a. log (5) + log (7)

b. log (8) + log (1/4)

c. log (15) – log (5)

d. 3 log (2) – 1/2log(4)

12. Use the properties of logarithms to rewrite each expression in an equivalent form containing a single logarithm

a. $\log(\sqrt{x})+\frac{1}{2}\log(\frac{1}{x})+2\log(x)$

b. $\log(\sqrt[5]{x})+\log(\sqrt[5]{x^4})$

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

d. $2(\log(x)-\log(y))+3(\log(z)-2\log(x))$

13. Use properties of logarithms to expand the following expressions in an equivalent form containing only log(x), log(y), log(z), and numbers.

a. $\log\left(\frac{x^2y^4}{\sqrt{z}}\right)$

b. $\log\left(\frac{1}{10x^2z}\right)$

c. $\log\left(\frac{100x^2}{y^3}\right)$

d. $\log\left(\sqrt{\frac{x^3y^2}{10z}}\right)$

14. Solve each equation, rounding to the nearest hundredth. If there is no solution explain why.

a. $3\cdot 5^x = 21$

b. $8-2^x = 10$

c. $10^x+10^{x+1} = 11$

d. $6^{x-3} = 25$

15. Compare the values of $\log_{\frac{1}{9}}(10)$ and $\log_9(\frac{1}{10})$ without using a calculator and show all work.

16. Solve the following for *x*:

a. $\log(x+2) = 3$

b. $\log_2(x+5) = 4$

c. $\log(x+2)+\log(x+5) = 1$

d. $\log((2x+5)^2) = 4$

e. $\log(x^2+7x+12)-\log(x+4) = 0$

f. $\ln(x+2) = \ln(12)-\ln(x+3)$

g. $2\ln(x+2)-\ln(-x) = 0$

17. A new car depreciates at a rate of about 20% per year, meaning that its resale value decreases by roughly 20% each year. After hearing this, Brett said that if you buy a new car this year, then after 5 years the car has a resale value of $0. Is his reasoning correct? Explain how you know.

18. Sean invests $10,000 at an annual rate of 5% compounded continuously, according to the formula $A = Pe^{rt}$, where A is the amount, P is the principal, $e = 2.718$, r is the rate of interest, and t is time, in years.

a) Determine, to the *nearest dollar*, the amount of money Sean will have after 2 years.

b) Determine how many years, to the *nearest year,* it will take for Sean's initial investment to double.

19. 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*.

20. A hotel finds that its total annual revenue and the number of rooms occupied daily by guests can best be modeled by the function $R = 3 \log (n^2 + 10n)$, $n > 0$, where R is the total annual revenue, in millions of dollars, and n is the number of rooms occupied daily by guests. The hotel needs an annual revenue of $12 million to be profitable.

Calculate the minimum number of rooms that must be occupied daily for the hotel to be profitable.

21. The temperature, T, of a given cup of hot chocolate after it has been cooling for t minutes can best be modeled by the function below, where T_0 is the temperature of the room and k is a constant.

$$\ln(T - T_0) = -kt + 4.718$$

a) A cup of hot chocolate is placed in a room that has a temperature of 68°. After 3 minutes, the temperature of the hot chocolate is 150°. Compute the value of k to the *nearest thousandth*

b) Using this value of k, find the temperature, T, of this cup of hot chocolate if it has been sitting in this room for a total of 10 minutes. Express your answer to the *nearest degree*.

22. If $2x^3 = y$, then $\log y$ equals

1. $\log (2x) + \log 3$
2. $3 \log (2x)$
3. $3 \log 2 + 3 \log x$
4. $\log 2 + 3 \log x$

23. If $\log x^2 - \log 2a = \log 3a$, then $\log x$ expressed in terms of $\log a$ is equivalent to

1. $\frac{1}{2} \log 5a$
2. $\frac{1}{2} \log 6 + \log a$
3. $\log 6 + \log a$
4. $\log 6 + 2 \log a$

24. If $\log_b x = y$, then $\log_b x^2$ is

1. $y + 2$
2. $2y$
3. $y - 2$
4. y

25. If log 28 = log 4 + log *x*, what is the value of *x*?

1. 7
2. 14
3. 24
4. 32

26. If log 7 = *x* and log 3 = *y*, then $\log \sqrt{\frac{3}{7}}$ is equal to

1. $x - y$
2. $y - x$
3. $\frac{1}{2}y - x$
4. $\frac{1}{2}(y - x)$

27. If log 5 = *a*, then log 0.0005 is

1. $3 - a$
2. $a - 3$
3. $4 - a$
4. $a - 4$

28. If log 5 = *a*, then log 250 can be expressed as

1. $50a$
2. $2a + 1$
3. $10 + 2a$
4. $25a$

29. If $\log_2 a = \log_3 a$, what is the value of *a*?

1. 1
2. 2
3. 3
4. 4

30. Solve the equation for *x*.

$$\frac{\log_4 64 + \log_2 2}{\log_3 81} = x$$

31. $\log_7 49 \times \log_{27} 3 \div \log_8 16 = x$

32. Evaluate the expression below. Round your answer to the *nearest hundredth*.

$$\frac{\ln 144}{\ln 12 + \ln 11}$$