Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Write the equation in its equivalent exponential form.

1) $\log_5 125 = 3$ 1) _____

A) $5^{125} = 3$

B) $125^3 = 5$

C) $3^5 = 125$

D) $5^3 = 125$

2) $\log_b 216 = 3$ 2) _____

A) $b^3 = 216$

B) $216^b = 3$

C) $216^3 = b$

D) $3^b = 216$

Write the equation in its equivalent logarithmic form.

3) $4^2 = 16$ 3) _____

A) $\log_4 16 = 2$

B) $\log_{16} 4 = 2$

C) $\log_4 2 = 16$

D) $\log_2 16 = 4$

4) $4^2 = x$ 4) _____

A) $\log_4 2 = x$

B) $\log_x 4 = 2$

C) $\log_2 x = 4$

D) $\log_4 x = 2$

5) $9^2 = y$ 5) _____

A) $\log_y 9 = 2$

B) $\log_2 y = 9$

C) $\log_9 y = 2$

D) $\log_y 2 = 9$

Evaluate the expression without using a calculator.

6) $\log_5 125$ 6) _____

A) 1

B) $\frac{1}{3}$

C) 3

D) 15

7) $\log_6 1$ 7) _____

A) $\frac{1}{6}$

B) 0

C) 1

D) 6

8) $\log_6 \sqrt{6}$ 8) _____

A) 6

B) $\frac{1}{6}$

C) $\frac{1}{2}$

D) 1

9) $\log_3 \frac{1}{9}$ 9) _____

A) -2

B) 2

C) $\frac{1}{2}$

D) 6

10) $5^{\log_5 10}$ 10) _____

A) 10

B) $\log_5 10$

C) 15

D) 5

11) $\log_3 3^{12}$ 11) _____

A) 3

B) $\log_3 12$

C) 12

D) 15

Solve.

12) Use the formula $R = \log\left(\frac{a}{T}\right) + B$ to find the intensity R on the Richter scale, given that amplitude a is 225 micrometers, time T between waves is 3.3 seconds, and B is 3. Round answer to one decimal place. 12) _____

A) 4.8
B) 7.2
C) 7.5
D) 1.9

Use properties of logarithms to expand the logarithmic expression as much as possible. Where possible, evaluate logarithmic expressions without using a calculator.

13) $\log_6 (7 * 11)$ 13) _____

A) $\log_6 77$
B) $(\log_6 7)(\log_6 11)$
C) $\log_6 7 + \log_6 11$
D) $\log_6 7 - \log_6 11$

14) $\log_2 4x$ 14) _____

A) $4 + \log_2 x$
B) $2 + \log_2 x$
C) $2 \log_2 x$
D) $2x$

15) $\log_3 \frac{7}{5}$ 15) _____

A) $\log_3 7 + \log_3 5$
B) $\log_3 7 - \log_3 5$
C) $\frac{\log_3 7}{\log_3 5}$
D) $\log_3 5 - \log_3 7$

16) $\log_{10} \frac{x}{10{,}000}$ 16) _____

A) $10{,}000x$
B) $\log_{10} x^{-4}$
C) $-40x$
D) $\log_{10} x + 4$

17) $\log_8 x^5$ 17) _____

A) $5 \log_8 x^5$
B) $8 \log_5 x$
C) $8 \log x$
D) $5 \log_8 x$

18) $\log_x y^z$ 18) _____

A) $z \log_y x$
B) $z \log_x y$
C) $x \log_y z$
D) $y \log_x z$

19) $\log_6 \frac{7 \cdot 11}{13}$ 19) _____

A) $\log_6 7 + \log_6 11 - \log_6 13$
B) $\log_6 5$
C) $\log_6 \frac{77}{13}$
D) $\log_6 77 - \log_6 13$

20) $\log_6 \frac{x-6}{x^5}$ 20) _____

A) $\log_6 (x-6) + 5 \log_6 x$
B) $5 \log_6 x - \log_6 (x-6)$
C) $\log_6 (x-6) - 5 \log_6 x$
D) $\log_6 (x-6) - \log_6 x$

21) $\log_3 \sqrt{5x}$ 21) _____

A) $\frac{1}{2} \log_3 5 + \frac{1}{2} \log_3 x$
B) $\log_3 5 + \frac{1}{2} \log_3 x$
C) $\frac{1}{2} \log_3 5x$
D) $\log_3 \sqrt{5} + \log_3 \sqrt{x}$

Use properties of logarithms to condense the logarithmic expression. Write the expression as a single logarithm whose coefficient is 1. Where possible, evaluate logarithmic expressions.

22) $\log_c q + \log_c r$ 22) _____

A) $\log_c (q + r)$

B) $\log_c q \cdot \log_c r$

C) $\log_c \frac{q}{r}$

D) $\log_c qr$

23) $\log_8 (x - 2) - \log_8 (x - 4)$ 23) _____

A) $\log_8 \frac{x - 2}{x + 4}$

B) $\log_8 \frac{x - 2}{x - 4}$

C) $\log_8 (x^2 - 6x + 8)$

D) $\log_8 2$

24) $\log_2 48 - \log_2 3$ 24) _____

A) $\log_2 45$

B) $\log_2 48^{1/3}$

C) 4

D) $\log_2 144$

Use common logarithms or natural logarithms and a calculator to evaluate to four decimal places

25) $\log_3 7$ 25) _____

A) 1.3222

B) 0.3680

C) 1.7712

D) 0.5646

26) $\log_{13} 62.8$ 26) _____

A) 1.6140

B) 2.9119

C) 0.6196

D) 0.6840

Solve the exponential equation. Express the solution set in terms of natural logarithms.

27) $2^{5x} = 2.1$ 27) _____

A) $\frac{2.1 \ln 5}{\ln 2}$

B) $\frac{5 \ln 2.1}{\ln 2}$

C) $\frac{\ln 2.1}{2 \ln 5}$

D) $\frac{\ln 2.1}{5 \ln 2}$

28) $e^{2x} = 6$ 28) _____

A) $\frac{\ln 6}{2}$

B) $\frac{\ln 2}{6}$

C) 2 ln 6

D) 3e

Solve the exponential equation. Use a calculator to obtain a decimal approximation, correct to two decimal places, for the solution.

29) $8^{4x} = 2.8$ 29) _____

A) 0.12

B) 1.87

C) 1.98

D) 0.09

30) $e^{2x} = 7$ 30) _____

A) 9.51

B) 0.10

C) 0.97

D) 3.89

Solve the equation.

31) $\log_3 x = 4$ 31) _____

A) 64

B) 81

C) 12

D) 1.26

32) $\log_2 (x-4) = -3$ 32) _____

A) $-\frac{31}{9}$

B) $\frac{33}{8}$

C) $\frac{11}{3}$

D) $-\frac{31}{8}$

33) $\log_2 (x+1) - \log_2 (x-4) = 3$ 33) _____

A) $\frac{5}{7}$

B) $\frac{33}{7}$

C) $-\frac{33}{7}$

D) $-\frac{5}{7}$

Solve the equation by isolating the natural logarithm and exponentiating both sides. Express the answer in terms of e.

34) $\ln x = 8$ 34) _____

A) e^8

B) $\frac{8}{\ln 1}$

C) $8e$

D) $\ln 8$

35) $9 + 9 \ln x = 7$ 35) _____

A) $\frac{e^{-2}}{9}$

B) $\frac{-2}{9 \ln 1}$

C) $e^{-2/9}$

D) $\ln\left(-\frac{2}{9}\right)$

36) $\ln \sqrt{x+9} = 2$ 36) _____

A) $e^2 - 9$

B) $e^4 - 9$

C) $e^4 + 9$

D) $\frac{e^2}{2} + 9$

Solve.

37) The value of a particular investment follows a pattern of exponential growth. In the year 2000, you invested money in a money market account. The value of your investment t years after 2000 is given by the exponential growth model $A = 4200e^{0.049t}$. How much did you initially invest in the account? 37) _____

A) $2100.00

B) $4200.00

C) $4410.93

D) $205.80

38) The value of a particular investment follows a pattern of exponential growth. In the year 2000, you invested money in a money market account. The value of your investment t years after 2000 is given by the exponential growth model $A = 10{,}000e^{0.062t}$. By what percentage is the account increasing each year? 38) _____

A) 6.4%

B) 6.6%

C) 6.9%

D) 6.8%

39) The population of a particular country was 21 million in 1980; in 1992, it was 27 million. The exponential growth function $A = 21e^{kt}$ describes the population of this country t years after 1980. Use the fact that 12 years after 1980 the population increased by 6 million to find k to three decimal places. 39) _____

A) 0.528

B) 0.149

C) 0.021

D) 0.031

40) The logistic growth function $f(t) = \frac{83{,}000}{1 + 2074.0e^{-1.8t}}$ models the number of people who have become ill with a particular infection t weeks after its initial outbreak in a particular community. What is the limiting size of the population that becomes ill?

40) _____

A) 2074 people

B) 2075 people

C) 166,000 people

D) 83,000 people