

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

Use the properties of logarithms to find the exact value of the expression. Do not use a calculator.

- 1)  $\ln e^2$  1) \_\_\_\_\_  
A) 2 B) 4 C) e D) 16
- 2)  $\log_{70} 10 + \log_{70} 7$  2) \_\_\_\_\_  
A) 7 B) 1 C) 10 D) 70
- 3)  $\log_5 14 \cdot \log_{14} 125$  3) \_\_\_\_\_  
A) 14 B) 5 C) 125 D) 3
- 4)  $e^{\ln 8}$  4) \_\_\_\_\_  
A) 7 B)  $\ln 8$  C)  $e^8$  D) 8
- 5)  $e^{\log_e 2^{100}}$  5) \_\_\_\_\_  
A)  $e^{10}$  B)  $e^{100}$  C) 10 D) 100

Suppose that  $\ln 2 = a$  and  $\ln 5 = b$ . Use properties of logarithms to write each logarithm in terms of a and b.

- 6)  $\ln 32$  6) \_\_\_\_\_  
A)  $10a$  B)  $ab$  C)  $5a$  D)  $a^5$
- 7)  $\ln \sqrt[6]{20}$  7) \_\_\_\_\_  
A)  $\frac{1}{6}(2a + b)$  B)  $\frac{1}{3}(a - b)$  C)  $\frac{1}{3}(a + b)$  D)  $\frac{1}{6}(a^2 + b)$

Write as the sum and/or difference of logarithms. Express powers as factors.

- 8)  $\log_2 \frac{17\sqrt{m}}{n}$  8) \_\_\_\_\_  
A)  $\log_2 (17\sqrt{m}) - \log_2 n$  B)  $\log_2 17 + \frac{1}{2} \log_2 m - \log_2 n$   
C)  $\log_2 17 \cdot \frac{1}{2} \log_2 m \div \log_2 n$  D)  $\log_2 n - \log_2 17 - \frac{1}{2} \log_2 m$
- 9)  $\log_6 \left( \frac{x-4}{x^7} \right)$  9) \_\_\_\_\_  
A)  $7 \log_6 x - \log_6 (x-4)$  B)  $\log_6 (x-4) - 7 \log_6 x$   
C)  $\log_6 (x-4) - \log_6 x$  D)  $\log_6 (x-4) + 7 \log_6 x$

10)  $\ln \sqrt[5]{ey}$  10) \_\_\_\_\_  
 A)  $\frac{y}{5}$                       B)  $5 \ln y + 5$                       C)  $\frac{1}{5} \ln \sqrt[5]{ey} + \frac{1}{5}$                       D)  $\frac{1}{5} \ln y + \frac{1}{5}$

11)  $\log_{19} \frac{\sqrt[7]{20}}{y^2x}$  11) \_\_\_\_\_  
 A)  $\frac{1}{7} \log_{19} 20 - 2 \log_{19} y - \log_{19} x$                       B)  $7 \log_{19} 20 - 2 \log_{19} y - \log_{19} 7$   
 C)  $\log_{19} 20 - \log_{19} y - \log_{19} x$                       D)  $\frac{1}{7} \log_{19} 20 - 2 \log_{19} y - 2 \log_{19} x$

**Express as a single logarithm.**

12)  $2 \log_b t - \log_b s$  12) \_\_\_\_\_  
 A)  $\log_b t^2 \div \log_b s$                       B)  $\log_b \frac{2t}{s}$   
 C)  $\log_b \frac{t^2}{s}$                       D)  $\log_b (t^2 - s)$

13)  $6 \ln (x - 3) - 5 \ln x$  13) \_\_\_\_\_  
 A)  $\ln \frac{(x - 3)^6}{x^5}$                       B)  $\ln 30x(x - 3)$                       C)  $\ln \frac{6(x - 3)}{5x}$                       D)  $\ln x^5(x - 3)^6$

14)  $\log x + \log (x^2 - 16) - \log 5 - \log (x - 4)$  14) \_\_\_\_\_  
 A)  $\log \frac{x(x - 16)(x - 4)}{5}$                       B)  $\log \frac{x(x + 4)}{5}$   
 C)  $\log \frac{x(x - 16)}{5(x - 4)}$                       D)  $\log \frac{2x + 4}{9 - x}$

15)  $4 \log_5 4 + \frac{1}{5} \log_5 (x - 4) - \frac{1}{2} \log_5 x$  15) \_\_\_\_\_  
 A)  $\log_5 \sqrt{\frac{4x - 16}{10x}}$                       B)  $\log_5 \left( \frac{2}{5} \sqrt{\frac{x - 4}{x}} \right)$   
 C)  $\log_5 \frac{256 \sqrt[5]{x - 4}}{\sqrt{x}}$                       D)  $\log_5 \frac{256x - 4}{10x}$

**Use the Change-of-Base Formula and a calculator to evaluate the logarithm. Round your answer to three decimal places.**

16)  $\log_{5.8} 84$  16) \_\_\_\_\_  
 A) 1.924                      B) 2.521                      C) 0.397                      D) 14.483

17)  $\log_{\sqrt{5}} 188.5$  17) \_\_\_\_\_  
 A) 0.349                      B) 3.255                      C) 0.154                      D) 6.510

**Solve the equation.**

18)  $\log_4(x+1) = 3$  18) \_\_\_\_\_  
A) {82} B) {65} C) {80} D) {63}

19)  $\log(5+x) - \log(x-3) = \log 5$  19) \_\_\_\_\_  
A) {-5} B) {5} C)  $\left\{\frac{3}{2}\right\}$  D)  $\emptyset$

20)  $\log_4(x+4) = 4 + \log_4(x-1)$  20) \_\_\_\_\_  
A)  $\left\{-\frac{52}{51}\right\}$  B)  $\left\{\frac{1}{51}\right\}$  C)  $\left\{\frac{52}{51}\right\}$  D)  $\left\{-\frac{1}{51}\right\}$

**Solve the equation. Express irrational answers in exact form and as a decimal rounded to 3 decimal places.**

21)  $\ln x + \ln(x+5) = -4$  21) \_\_\_\_\_  
A)  $\frac{-5 + 2\sqrt{25 + e^{-4}}}{2} \approx 2.502$  B)  $\frac{-5 + \sqrt{25 + 4e^{-4}}}{2} \approx 0.004$   
C)  $-5 + \sqrt{25 + 4e^{-4}} \approx 0.007$  D)  $\frac{-5 - \sqrt{25 + 4e^{-4}}}{2} \approx -5.004$

**Solve the problem.**

22)  $f(x) = \log_2(x+3)$  and  $g(x) = \log_2(x-1)$ . 22) \_\_\_\_\_  
Solve  $f(x) = 13$ . What point is on the graph of  $f$ ?  
A) {16}, (4, 7) B) {16}, (4, 13) C) {4}, (4, 19) D) {4}, (4, 13)

23) The pH of a solution ranges from 0 to 14. An acid has a pH less than 7. Pure water is neutral and has a pH of 7. The pH of a solution is given by  $\text{pH} = -\log x$  where  $x$  represents the concentration of the hydrogen ions in the solution in moles per liter. Find the hydrogen ion concentration if the  $\text{pH} = 4$ . 23) \_\_\_\_\_  
A) 0.25 B)  $10^{-4}$  C) 1.39 D)  $10^4$

**Solve the equation.**

24)  $\log_3 x + \log_3(x-24) = 4$  24) \_\_\_\_\_  
A) {-3, 27} B) {27} C) {53} D)  $\emptyset$

25)  $4(1+2x) = 64$  25) \_\_\_\_\_  
A) {4} B) {1} C) {16} D) {-1}

26)  $2(7+3x) = \frac{1}{4}$  26) \_\_\_\_\_  
A) {1} B) {3} C) {-3} D)  $\left\{\frac{1}{2}\right\}$

27)  $3 \cdot 5^{2t-1} = 75$  27) \_\_\_\_\_  
A)  $\left\{\frac{3}{2}\right\}$  B)  $\left\{\frac{1}{2}\right\}$  C)  $\left\{\frac{13}{10}\right\}$  D) {3}

Use a graphing calculator to solve the equation. Round your answer to two decimal places.

- 28)  $\log_4(x + 2) - \log_5(x - 1) = 1$  28) \_\_\_\_\_  
A) {2.05}                      B) {-0.69}                      C) {1.75}                      D) {2.00}

Find the amount that results from the investment.

- 29) \$480 invested at 12% compounded quarterly after a period of 7 years 29) \_\_\_\_\_  
A) \$618.21                      B) \$1066.22                      C) \$1061.13                      D) \$1098.21
- 30) \$12,000 invested at 7% compounded quarterly after a period of 3 years 30) \_\_\_\_\_  
A) \$14,700.52                      B) \$14,777.27                      C) \$14,523.12                      D) \$2777.27

Find the effective rate of interest.

- 31) 8.75% compounded monthly 31) \_\_\_\_\_  
A) 9.11%                      B) 9.655%                      C) 8.955%                      D) 8.873%

Find the present value. Round to the nearest cent.

- 32) To get \$10,500 after 4 years at 9% compounded annually 32) \_\_\_\_\_  
A) \$7084.25                      B) \$3061.54                      C) \$7438.46                      D) \$8107.93
- 33) To get \$10,000 after 3 years at 6% compounded monthly 33) \_\_\_\_\_  
A) \$10,616.78                      B) \$9419.05                      C) \$8356.45                      D) \$3333.33

Solve the problem.

- 34) How much money needs to be invested now to get \$2000 after 4 years at 8% compounded quarterly? Express your answer to the nearest dollar. 34) \_\_\_\_\_  
A) \$1457                      B) \$584                      C) \$2746                      D) \$1848

Solve the problem. Round your answer to three decimals.

- 35) What annual rate of interest is required to triple an investment in 12 years? 35) \_\_\_\_\_  
A) 9.155%                      B) 4.794%                      C) 9.587%                      D) 5.946%
- 36) How long will it take for an investment to triple in value if it earns 7.25% compounded continuously? 36) \_\_\_\_\_  
A) 9.561 yr                      B) 7.577 yr                      C) 15.153 yr                      D) 16.362 yr

Solve the problem.

- 37) The population of a particular country was 25 million in 1981; in 1996, it was 31 million. The exponential growth function  $A = 25e^{kt}$  describes the population of this country  $t$  years after 1981. Use the fact that 15 years after 1981 the population increased by 6 million to find  $k$  to three decimal places. 37) \_\_\_\_\_  
A) 0.014                      B) 0.024                      C) 0.444                      D) 0.119
- 38) How long will it take for the population of a certain country to double if its annual growth rate is 3.5%? Round to the nearest year. 38) \_\_\_\_\_  
A) 57 yr                      B) 20 yr                      C) 9 yr                      D) 1 yr
- 39) The population of a small country increases according to the function  $B = 900,000e^{0.05t}$ , where  $t$  is measured in years. How many people will the country have after 4 years? 39) \_\_\_\_\_  
A) 1,448,494                      B) 1,426,404                      C) 629,073                      D) 1,099,262

40) The half-life of plutonium-234 is 9 hours. If 40 milligrams is present now, how much will be present in 5 days? (Round your answer to three decimal places.) 40) \_\_\_\_\_  
 A) 27.215                      B) 0.004                      C) 15.874                      D) 0.85

41) The function  $A = A_0e^{-0.01155x}$  models the amount in pounds of a particular radioactive material stored in a concrete vault, where  $x$  is the number of years since the material was put into the vault. If 800 pounds of the material are initially put into the vault, how many pounds will be left after 180 years? 41) \_\_\_\_\_  
 A) 133 lb                      B) 635 lb                      C) 100 lb                      D) 1200 lb

42) Sandy manages a ceramics shop and uses a 600°F kiln to fire ceramic greenware. After turning off her kiln, she must wait until its temperature gauge reaches 165°F before opening it and removing the ceramic pieces. If room temperature is 80°F and the gauge reads 450°F in 14 minutes, how long must she wait before opening the kiln? Assume the kiln cools according to Newton's Law of Cooling:  
 $U = T + (U_0 - T)e^{kt}$ .  
 (Round your answer to the nearest whole minute.) 42) \_\_\_\_\_  
 A) 111 min                      B) 175 min                      C) 57 min                      D) 75 min

43) The logistic growth model  $P(t) = \frac{1000}{1 + 19e^{-0.358t}}$  represents the population of a bacterium in a culture tube after  $t$  hours. When will the amount of bacteria be 620? 43) \_\_\_\_\_  
 A) 9.59 hr                      B) 1.3 hr                      C) 4.01 hr                      D) 6.89 hr

44) The logistic growth model  $P(t) = \frac{1}{1 + 4.88e^{-0.877t}}$  represents the proportion of the total market of a new product as it penetrates the market  $t$  years after introduction. When will the product have 65% of the market? 44) \_\_\_\_\_  
 A) 2.51 yr                      B) 1.32 yr                      C) 2.32 yr                      D) 3.51 yr

**Find the effective rate of interest.**

45) 6.25% compounded quarterly 45) \_\_\_\_\_  
 A) 6.455%                      B) 6.373%                      C) 7.155%                      D) 6.398%

**Solve the equation.**

46)  $4^5 - 3x = \frac{1}{256}$  46) \_\_\_\_\_  
 A) {-3}                      B) {128}                      C)  $\left\{\frac{1}{64}\right\}$                       D) {3}

47)  $3(3x - 6) = 27$  47) \_\_\_\_\_  
 A) {-3}                      B)  $\left\{\frac{1}{9}\right\}$                       C) {9}                      D) {3}

48)  $4^{-x} = \frac{1}{16}$

A) {2}

B)  $\left\{\frac{1}{2}\right\}$

C) {-2}

D)  $\left\{\frac{1}{4}\right\}$

48) \_\_\_\_\_

49)  $2x^2 - 3 = 64$

A) {3}

B) {6}

C) {3, -3}

D)  $\{\sqrt{35}, -\sqrt{35}\}$

49) \_\_\_\_\_

50)  $9^{2x} \cdot 27^{(3-x)} = \frac{1}{9}$

A) {-8}

B) {-11}

C) {10}

D)  $\left\{\frac{9+\sqrt{87}}{6}, \frac{9-\sqrt{87}}{6}\right\}$

50) \_\_\_\_\_

## Answer Key

Testname: MAC 1105 CHAPTER 6 (6.5 TO 6.8) PRACTICE FOR THE TEST

- 1) A
- 2) B
- 3) D
- 4) D
- 5) C
- 6) C
- 7) A
- 8) B
- 9) B
- 10) D
- 11) A
- 12) C
- 13) A
- 14) B
- 15) C
- 16) B
- 17) D
- 18) D
- 19) B
- 20) C
- 21) B
- 22) D
- 23) B
- 24) B
- 25) B
- 26) C
- 27) A
- 28) D
- 29) D
- 30) B
- 31) A
- 32) C
- 33) C
- 34) A
- 35) C
- 36) C
- 37) A
- 38) B
- 39) D
- 40) B
- 41) C
- 42) D
- 43) A
- 44) A
- 45) D
- 46) D
- 47) D
- 48) A
- 49) C
- 50) B