

**College Prep Algebra**  
**Chapter 4 Test**

*Indicate the answer choice that best completes the statement or answers the question.*

1. Use the change-of-base formula to approximate  $\log_4\left(\frac{4}{9}\right)$ . Round your answer to four decimal places.

- A. -0.2027
- B. -0.5850
- C. -0.8109
- D. 0.6309

2. Write the equation  $\ln(x) = -8$  in its exponential form.

- A.  $x = -e^8$
- B.  $x = -8e$
- C.  $x = -e^{-8}$
- D.  $x = e^{-8}$

3. Find the inverse of the function:  $\{(-1, -5), (3, -9), (7, -2), (8, 4), (9, 5)\}$ .

- A.  $\{(-9, 3), (-5, -1), (-2, 7), (4, 8), (5, 9)\}$
- B.  $\{(-9, -5), (-8, -4), (-7, 2), (-3, 9), (1, 5)\}$
- C.  $\{(-5, 9), (-4, 8), (2, 7), (5, -1), (9, 3)\}$
- D. no inverse exists

4. The monthly earnings in dollars, of a software sales executive is given by  $E(x) = 0.05x - 5,000$  where  $x$  is the value, in dollars, of the software sold by the executive during the month. Find  $E^{-1}(x)$ .

- A.  $E^{-1}(x) = 20x - 100,000$
- B.  $E^{-1}(x) = 20x + 100,000$
- C.  $E^{-1}(x) = -0.05x + 5,000$
- D.  $E^{-1}(x) = -20x + 100,000$

5. Use algebraic procedures to find the exact solution(s) of the equation  $5^{9x-1} = \frac{1}{25}$ .

- A.  $x = \frac{3}{5}$
- B.  $x = -\frac{1}{5}$
- C.  $x = -\frac{1}{9}$
- D.  $x = \frac{1}{3}$

6. Write the logarithmic equation  $4 = \log_5 625$  in its exponential form.

- A.  $4^{625} = 5$
- B.  $4^5 = 625$
- C.  $625^4 = 5$
- D.  $5^4 = 625$

7. If \$6000 is invested at an annual interest rate of 2.5% and compounded **annually**, find the balance after 5 years, using the formula  $A = P \left(1 + \frac{r}{n}\right)^{nt}$ .

- A. \$7,310.42
- B. \$6,150.00
- C. \$7,872.52
- D. \$6,788.45

8. Evaluate the exponential function  $J(x) = \left(\frac{1}{2}\right)^x$  for  $x = 4$ .

- A.  $x = 2$
- B.  $x = 16$
- C.  $x = \frac{1}{16}$
- D.  $x = \frac{1}{2}$

9. Evaluate the logarithm  $\log 1000$  without using a calculator.

- A. 2
- B. -2
- C. 3
- D. -3

10. The function  $A(t) = 150e^{-0.044t}$  gives the amount of medication, in milligrams, in a patient's bloodstream  $t$  minutes after the medication has been injected into the patient's bloodstream. Find the amount of medication, to the nearest milligram, in the patient's bloodstream after 75 minutes.

- A. 119 mg
- B. 6 mg
- C. 142 mg
- D. 8 mg

11. Use the formula  $A = Pe^{rt}$  to find the balance if \$44,000.00 is invested at an annual rate of 3.5% for 6 years, compounded continuously.

- A. \$273,403.60
- B. \$45,562.63
- C. \$35,665.71
- D. \$54,281.83

12. Evaluate the exponential function  $f(x) = 4^x$  for  $x = 1$ .

- A.  $f(1) = 5$
- B.  $f(1) = 1$
- C.  $f(1) = 16$
- D.  $f(1) = 4$

13. Expand the logarithmic expression  $\ln\left(\frac{z^6}{\sqrt[3]{xy^5}}\right)$ . Assume all variable expressions represent positive real numbers.

- A.  $\ln\left(6z - \frac{1}{5}x - \frac{5}{3}y\right)$
- B.  $6\ln(z) - 3\ln(x) - 15\ln(y)$
- C.  $6\ln(z) - \frac{1}{3}\ln(x) - \frac{5}{3}\ln(y)$
- D.  $6\ln(z) - \left(\frac{1}{3}\ln(x) + \frac{5}{3}\ln(y)\right)$

14. Using the formula  $A = Pe^{rt}$ . How long will it take \$4500 to triple if it is invested at an annual interest rate of 6.5% compounded continuously? Round to the nearest year.

- A. 31 years
- B. 11 years
- C. 48 years
- D. 17 years

15. Find the domain of the function  $P(x) = \ln(x^2 - 4)$ . Write the domain using interval notation.

- A.  $(-\infty, -2)$
- B.  $(-2, \infty)$
- C.  $(2, \infty)$
- D.  $(-\infty, -2) \cup (2, \infty)$

16. The population  $P$  of a city grows exponentially according to the function  $P(t) = 8000(1.15)^t$ ,  $0 \leq t \leq 12$  where  $t$  is measured in years. When, to the nearest year, will the population reach 36,000?

- A. 10.8 years
- B. 12 years
- C. 4 years
- D. 11 years

17. Expand the logarithmic expression  $\ln\left(x^{\frac{5}{2}}y^{\frac{1}{9}}\right)$ . Assume all variable expressions represent positive real numbers.

- A.  $\frac{5}{18}\ln(x)\ln(y)$
- B.  $\frac{1}{9}\ln(x) + \frac{5}{2}\ln(y)$
- C.  $x\ln\left(\frac{5}{2}\right) + y\ln\left(\frac{1}{9}\right)$
- D.  $\frac{5}{2}\ln(x) + \frac{1}{9}\ln(y)$

18. Evaluate the logarithm  $\log_4 \frac{1}{1024}$  without using a calculator.

- A. -5
- B. 4
- C. 256
- D. -4

19. A chemical solution has a hydronium-ion concentration of  $5.12 \times 10^{-4}$  mole per liter. Use the formula  $pH = -\log[H^+]$  to determine the pH of the solution.

- A. 4.7
- B. 2.2
- C. 7.6
- D. 3.3

20. Write the exponential equation  $4^3 = 64$  in its logarithmic form.

- A.  $\log_3 64 = 4$
- B.  $\log_4 3 = 64$
- C.  $\log_4 64 = 3$
- D.  $\log_3 4 = 64$

21. Find the domain of the function  $k(x) = \log_3(-6 - x)$ .

- A.  $(3, \infty)$
- B.  $(6, \infty)$
- C.  $(-\infty, 3)$
- D.  $(-\infty, -6)$

22. Use algebraic procedures to find the exact solution of the equation  $6^x = 7776$ .

- A. 6
- B. 1
- C. 216
- D. 5

23. Use composition of functions to determine whether  $f(x) = -\frac{1}{8}x - 3$  and  $g(x) = 8x + 24$  are inverses of one another.

- A. Yes
- B. No
- C. Maybe
- D. IDK

24. A cup of coffee is heated to  $160^\circ\text{F}$  and placed in a room that maintains a temperature of  $50^\circ\text{F}$ . The temperature of the coffee after  $t$  minutes is given by  $T(t) = 50 + 110e^{-0.033t}$ . Find the temperature, to the nearest degree, of the coffee 45 minutes after it is placed in the room.

- A.  $75^\circ\text{F}$
- B.  $119^\circ\text{F}$
- C.  $115^\circ\text{F}$
- D.  $35^\circ\text{F}$

25. The population of a mid-sized city is growing exponentially. The population of the city was 247,500 in the year 2000 and 262,000 in 2004. Find the exponential growth function that models the population growth of the city. Use  $t = 0$  to represent the year 2000.

- A.  $N^t = 247,500e^{0.0142t}$
- B.  $N^t = 262,000e^{-0.7235t}$
- C.  $N^t = 262,000e^{-0.0142t}$
- D.  $N^t = 247,500e^{3.1190t}$

26. The population  $P$  of a city grows exponentially according to the function  $P(t) = 7500(1.15)^t$ ,  $0 \leq t \leq 12$  where  $t$  is measured in years. Find the population at time  $t = 12$ .

- A. 11,407 people
- B. 40,127 people
- C. 15,085 people
- D. 8,625 people

27. Find the domain of the function  $s(x) = \log_4(x^2 + 8x - 9)$ .

- A.  $(-\infty, -9) \cup (1, \infty)$
- B.  $(4, \infty)$
- C.  $(-\infty, -1) \cup (9, \infty)$
- D.  $(-\infty, -4) \cup (4, \infty)$

28. Use the formula  $M = \log\left(\frac{I}{I_0}\right)$  to determine how many times as great was the intensity of a South American earthquake, which measured 7 on the Richter scale, then a West Coast earthquake, which measured 5.6 on the Richter scale?

- A. 29 times as great
- B. 25 times as great
- C. 18 times as great
- D. 4 times as great

29. Use composition of functions to determine whether  $f(x) = 8x + 9$  and  $g(x) = \frac{1}{8}x - \frac{9}{8}$  are inverses of one another.

- A. Yes
- B. No
- C. Maybe
- D. IDK