11.5 Exercises [07-11-03-L-11]

A calculator with a log key can be used to work the exercises in this section.

Solve the following equations. Round solutions to the nearest hundredth. See Examples 1 and 2.

1. $25^x = 125$ **2.** $16^x = 64$ **3.** $2^{-x} = 27$ **4.** $8^{-p} = 12$

5. $6^{y+1} = 8$ **6.** $2^{-3+y} = 4.5$ **7.** $\left(\frac{1}{2}\right)^x = 10$ **8.** $3^{y+1} = 2$

9. $5^{1-n} = 8$ **10.** $7^{2x+1} = 3$ **11.** $4^{x^2} = 17$ **12.** $3^{-x^2} = .09$

Solve the following equations. See Examples 3–5.

13. $\log (x + 2) = \log (3x - 6)$

14. $\log x = \log (1 - x)$

15. $\log_5 (3x + 2) - \log_5 x = \log_5 4$

16. $\log_2 (x + 5) - \log_2 (x - 1) = \log_2 3$

17. $\log 4x = \log 2 + \log (x - 3)$

18. $\log (-x) + \log 3 = \log (2x - 15)$

19. $\log x + \log (3x - 5) = \log 2$

20. $\log (6x - 7) + \log x = \log 5$

21. $\log_2 x = 3$

22. $\log_x 10 = 3$

23. $\log_y 11 = 2$

24. $\log_m 4 = \frac{3}{2}$

25. $\log_a 5 = -\frac{3}{4}$

26. $2 + \log x = 0$

Solve the following problems. See Examples 6 and 7.

27. Find the amount of money in an account after 12 years if \$5000 is deposited at 7% compounded annually.

28. How much money will be in an account at the end of 8 years if \$4500 is deposited at 6% compounded annually?

29. How much money must be deposited today to amount to \$1000 in 10 years at 5% compounded annually?

30. How much money must be deposited today to become \$1850 in 40 years at 6.5% compounded annually?

31. How long would it take for the average price level to double if the average rate of inflation annually is: (a) 3%; (b) 5%; (c) 6%; (d) 8%. (Check your answers by using the *rule of 70:* The time for prices to double is given by $70/x$, where x is the percent of annual inflation.)

32. A machine purchased for business use *depreciates,* or wears out, over a period of years. The value of the machine at the end of its useful life is called its scrap value. By one method of depreciation (where it is assumed a constant percentage of the value depreciates annually), the scrap value, S, is given by

$$S = C(1 - r)^n,$$

where C is the original cost, n is the useful life in years, and r is the constant percent of depreciation.

(a) Find the scrap value of a machine costing \$30,000, having a useful life of 12 years and a constant annual rate of depreciation of 15%.

(b) A machine has its value cut in half in 6 years. Find the constant annual rate of depreciation.

Solve each equation.

33. $7^{2y-1} = 1$ **34.** $8^m = 3^{m+1}$ **35.** $9^{2k} = 5^{3k-1}$ **36.** $7^{x^2+2x} = \frac{1}{7}$

37. $2^{2x^2+1} = 8^x$ **38.** $25^{2-x} = 5^{2x^2}$ **39.** $(1 + .03)^n = 90$ **40.** $100(1 + .02)^{3+n} = 150$

41. $\log_3 x + \log_3 (2x + 5) = 1$

42. $\log_2 x + \log_2 (x - 7) = 3$

43. $\log x + \log (3x - 7) = 1$

44. $\log x = 1 - \log (x - 3)$

Review Exercises *Evaluate each expression. See Section 11.2.*

45. $\frac{\log_2 4}{\log_2 8}$ **46.** $\frac{\log_3 27}{\log_3 1/3}$ **47.** $\frac{\log .1}{\log 100}$ **48.** $\frac{\log 10{,}000}{\log .001}$

Section 11.5 (page 471)

1. {3/2} **3.** {−4.75} **5.** {.16} **7.** {−3.32} **9.** {−.29} **11.** {−1.43, 1.43} **13.** {4} **15.** {2} **17.** ∅ **19.** {2} **21.** {8} **23.** {3.317} **25.** {.117} **27.** Exact answer (using a calculator) is $11,260.95 **29.** $613.91 **31.** (a) 23.4 years (b) 14.2 years (c) 11.9 years (d) 9.0 years **33.** {1/2} **35.** {3.71} **37.** {1/2, 1} **39.** {152} **41.** {1/2} **43.** {10/3} **45.** 2/3 **47.** −1/2