Name: _____ Date: _____ Period: _____

7.5-7.6 Review

Solve each equation using same bases.

1. $8^{2x} = 32$

$2^{3 \cdot 2x} = 2^5$

$6x = 5$

$x = 5/6$

2. $25^{2n+1} = 625$

$5^{2(2n+1)} = 5^4$

$2(2n+1) = 4$

$4n + 2 = 4$

$4n = 2$

$n = 1/2$

3. $9^{2x} = 27$

$3^{2 \cdot 2x} = 3^3$

$2 \cdot 2x = 3$

$4x = 3$

$x = 3/4$

Solve each equation. Round answers to the nearest thousandth.

4. $15^{2n-3} = 245$

$\log 15^{2n-3} = \log 245$

$\frac{(2n-3)\log 15}{\log 15} = \frac{\log 245}{\log 15}$

$2n - 3 = 2.031$

$n = 2.516$

5. $8^{n+1} = 3$ $\log 8^{n+1} = \log 3$

$(n+1)\log 8 = \log 3$

$n + 1 = \frac{\log 3}{\log 8}$

$n + 1 = 0.528$

$n = -0.472$

6. $4^x - 5 = 12$

$4^x = 17$

$\log 4^x = \log 17$

$\frac{x \cdot \log 4}{\log 4} = \frac{\log 17}{\log 4}$

$x = 2.044$

7. The equation $y = 281(1.01)^x$ is a model for the population of the United States y, in millions of people, x years after the year 2000. Estimate when the United States population will reach 400 million people.

$\frac{400}{281} = \frac{281(1.01)^x}{281}$

$1.423 = 1.01^x$

$\log 1.423 = \log 1.01^x$

$\log 1.423 = x \cdot \log 1.01$

$\frac{\log 1.423}{\log 1.01} = x$

35.4 between 2035-2036

Solve each equation. Check your answers.

8. $\log(x - 25) = 2$

$10^2 = x - 25$

$100 = x - 25$

$125 = x$

9. $\frac{4 \log x}{4} = \frac{4}{4}$

$\log x = 1$

$10^1 = x$

$10 = x$

10. $\frac{8 \log x}{8} = \frac{16}{8}$

$\log x = 2$

$10^2 = x$

$100 = x$

11. $\frac{3 \log(1 - 2x)}{3} = \frac{6}{3}$

$\log(1 - 2x) = 2$

$10^2 = 1 - 2x$

$100 = 1 - 2x$

$99 = -2x$

$x = -\frac{99}{2}$

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

$10^3 = 2x + 5$

$1000 = 2x + 5$

$995 = 2x$

$\frac{995}{2} = x$

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

$10^3 = (3x - 2)^2$

$\sqrt{1000} = \sqrt{(3x - 2)^2}$

$31.623 = 3x - 2$

$11.208 = x$

Solve each equation.

14. $\log x - \log 4 = 3$

$\log \frac{x}{4} = 3$

$10^3 = \frac{x}{4}$

$4000 = x$

15. $2 \log x - \log 4 = 2$

$\log x^2 - \log 4 = 2$

$\log \frac{x^2}{4} = 2$

$10^2 = \frac{x^2}{4}$

$400 = x^2$

$x = \pm 20$

$x = 20$

16. $\log 3x - \log 5 = 1$

$\log \frac{3x}{5} = 1$

$10^1 = \frac{3x}{5}$

$50 = 3x$

$x = \frac{50}{3}$

17. $\log(x + 21) + \log x = 2$

$\log x(x + 21) = 2$

$10^2 = x^2 + 21x$

$x^2 + 21x - 100 = x$

$(x + 25)(x - 4)$

$x = -25$ ext $x = 4$

$x = 4$

18. The function $y = 1000(1.005)^x$ models the value of \$1000 deposited at an interest rate of 6% per year (0.005 per month) x months after the money is deposited.

a. Predict how many months it will be until the account is worth \$1100.

b. Predict how many years it will be until the account is worth \$5000.

a. $1100 = 1000(1.005)^x$

$1.1 = 1.005^x$

$\log 1.1 = \log 1.005^x$

$x = 19.1$ months

b. $5000 = 1000(1.005)^x$

$5 = 1.005^x$

$\log 5 = x \log 1.005$

$x = \frac{\log 5}{\log 1.005}$

$x = 322.7$ months

$= 26.9$ years

19. Suppose you deposit \$2500 in a savings account that pays you 5% interest per year.

a. How many years will it take you to double your money?

b. How many year will it take your account to reach \$8000?

a. $5000 = 2500(1.05)^x$

$2 = 1.05^x$

$\log 2 = \log 1.05^x$

$\frac{\log 2}{\log 1.05} = x$

$x = 14.2$ years

b. $8000 = 2500(1.05)^t$

$3.2 = 1.05^t$

$\log 3.2 = \log 1.05^t$

$\frac{\log 3.2}{\log 1.05} = x$

$x = 23.8$ years

Write each expression as a single natural logarithm.

20. $a \ln 4 - \ln b$

$\ln 4^a - \ln b$

$\ln \frac{4^a}{b}$

21. $\frac{1}{2}\ln 9 + \ln 3x$

$\ln 9^{1/2} + \ln 3x$

$\ln 3 \cdot 3x$

$\ln 9x$

22. $4\ln x + 3\ln y$

$\ln x^4 y^3$

23. $\frac{1}{3}\ln 8 + \ln x$

$\ln 8^{1/3} + \ln x$

$\ln 2x$

24. $3\ln 3 + \ln 9$

$\ln 3^3 + \ln 9$

$\ln 243$

25. $2\ln 4 - \ln 8$

$\ln 4^2 - \ln 8$

$\ln \frac{16}{8}$

$\ln 2$

Solve each equation. Check your answers. Round to the nearest thousandth.

26. $\frac{4\ln x}{4} = \frac{-2}{4}$

$\ln x = -\frac{1}{2}$

$e^{-1/2} = x$ $\quad x = 0.606$

27. $3 - 4\ln(8x+1) = 12$

$\ln(8x+1) = -9/4$

$e^{-9/4} = 8x + 1$

$0.105 = 8x + 1$ $\quad x = -0.112$

28. $7\ln(2x+5) = 8$

$\ln(2x+5) = 8/7$

$e^{8/7} = 2x + 5$

$3.136 = 2x + 5$

$x = -0.932$

29. $\ln e^x = 3$

$x \cdot \ln e = 3$

$x = 3$

30. $\ln \frac{2x}{41} = 2$

$e^2 = \frac{2x}{41}$

$7.389 = \frac{2x}{41}$ $\quad x = 151.476$

31. $3\ln e^{2x} = 12$

$\ln e^{2x} = 4$

$2x \ln e = 4$

$2x = 4$

$x = 2$

Use natural logarithms to solve each equation. Round to the nearest thousandth.

32. $e^{x-4} = 2$

$\ln e^{x-4} = \ln 2$

$(x-4)\ln e = \ln 2$

$x - 4 = 0.693$

$x = 4.693$

33. $5e^{6x+3} = 0.1$

$e^{6x+3} = .02$

$\ln e^{6x+3} = \ln .02$

$(6x+3)\ln e = \ln .02$

$6x + 3 = -3.912$ $\quad x = -1.152$

34. $e^{3} = 32$ (5)

$\ln e^{x/5} = \ln 32$

$\frac{x}{5}\ln e = \ln 32$

$\frac{x}{5} = \ln 32$ $\quad x = 10.397$

35. $e^{\ln 5x} = 20$

$\ln e^{\ln 5x} = \ln 20$

$\ln 5x \ln e = \ln 20$

$\ln 5x = 2.996$

$e^{2.996} = 5x$

$20 = 5x$

$x = 4$

36. $6 - e^{12x} = 5.2$

$e^{12x} = 0.8$

$\ln e^{12x} = \ln 0.8$

$12x \ln e = \ln 0.8$ $\quad x = -0.019$

37. $e^{x+6} + 5 = 1$

$e^{x+6} = -4$

$\ln e^{x+6} = \ln(-4)$

no solution

Simplify each expression.

38. $\ln e^4$

$4 \ln e$

4

39. $5\ln e^5$

$25 \ln e$

25

40. $\frac{\ln e^2}{2}$

$\frac{2 \ln e}{2}$

1

41. $\ln e^{100}$

$100 \ln e$

100