

7-6**Practice**

Form G

Natural Logarithms**Write each expression as a single natural logarithm.**

1. $\ln 16 - \ln 8$

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

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

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

9. $2 \ln 4 - \ln 8$

Solve each equation. Check your answers. Round your answer to the nearest hundredth.

11. $2 \ln (3x - 4) = 7$

13. $-7 + \ln 2x = 4$

15. $\ln x + \ln 3x = 14$

17. $\ln x + \ln 4 = 2$

19. $\ln e^x = 3$

21. $\ln e^{x+5} = 17$

23. $5 \ln (3x - 2) = 15$

25. $\ln (3x + 4) = 5$

27. $\ln (2x - 1)^2 = 4$

Use natural logarithms to solve each equation. Round your answer to the nearest hundredth.

29. $4e^x = 10$

31. $4e^{3x+21} = 5$

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

35. $e^{\frac{x}{5}} = 32$

37. $7e^{5x+8} = 0.23$

39. $e^{\frac{x}{5}} = 25$

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

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

7-6

Practice (continued)

Form G

Natural Logarithms

The formula $P = 50e^{-\frac{t}{25}}$ gives the power output P , in watts, needed to run a certain satellite for t days. Find how long a satellite with the given power output will operate.

45. 12 W

The formula for the maximum velocity v of a rocket is $v = -0.0098t + c \ln R$, where c is the exhaust velocity in km/s, t is the firing time, and R is the mass ratio of the rocket. A rocket must reach 7.7 km/s to attain a stable orbit 300 km above Earth.

47. What is the maximum velocity of a rocket with a mass ratio of 18, an exhaust velocity of 2.2 km/s, and a firing time of 25 s?

49. What mass ratio would be needed to achieve a stable orbit for a rocket with an exhaust velocity of 2.5 km/s and a firing time of 29 s?

By measuring the amount of carbon-14 in an object, a paleontologist can determine its approximate age. The amount of carbon-14 in an object is given by $y = ae^{-0.00012t}$, where a is the amount of carbon-14 originally in the object, and t is the age of the object in years.

51. A fossil of a bone contains 32% of its original carbon-14. What is the approximate age of the bone?

Simplify each expression.

53. $\ln e^4$

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