

Practice 7-6

Example Exercises

Example 1

Use natural logarithms to solve each equation.

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|---------------------|------------------------|-------------------------|-----------------------------|
| 1. $e^x = 15$ | 2. $4e^x = 10$ | 3. $e^{x+2} = 50$ | 4. $4e^{3x-1} = 5$ |
| 5. $e^{x-4} = 2$ | 6. $5e^{6x+3} = 0.1$ | 7. $e^x = 1$ | 8. $e^{\frac{x}{5}} = 32$ |
| 9. $3e^{3x-5} = 49$ | 10. $7e^{5x+8} = 0.23$ | 11. $6 - e^{12x} = 5.2$ | 12. $e^{\frac{2x}{4}} = 25$ |
| 13. $\ln e^x = 3$ | 14. $3\ln e^{2x} = 12$ | 15. $e^{\ln x} = 21$ | 16. $e^x + 6 + 5 = 1$ |

Example 2

For Exercises 17–19, use the formula for the maximum velocity v of a rocket $v = c \ln R$, where c is the velocity of the exhaust and R is the mass ratio of the rocket.

- Find the velocity of a rocket when $R = 2$ and exhaust velocity is 2 km/s.
- The velocity needed to escape the earth's gravitational field is 11.2 km/s. The exhaust gas velocity of a rocket is 2 km/s. What value of R would the rocket need to achieve escape velocity?
- Find the velocity of a rocket when $R = 3.27 \times 10^6$ and exhaust velocity is 3.1 km/s.

Example 3

Solve each equation.

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|-------------------------------|---|--------------------------------|
| 20. $\ln x = 2$ | 21. $\ln(x + 3) = 1$ | 22. $\ln(2x - 3) = -1$ |
| 23. $4\ln x = -2$ | 24. $2\ln(3x - 4) = 7$ | 25. $5\ln(4x - 6) = -6$ |
| 26. $-7 + \ln 2x = 4$ | 27. $3 - 4\ln(8x + 1) = 12$ | 28. $\ln x + \ln 3x = 14$ |
| 29. $2\ln x + \ln x^2 = 3$ | 30. $\ln x + \ln 4 = 2$ | 31. $\ln x - \ln 5 = -1$ |
| 32. $\ln(2x + 1) + \ln x = 5$ | 33. $\ln 2x + \ln(x - 2) = 1$ | 34. $\ln(3x - 4) - \ln x = 11$ |
| 35. $\ln 3x + \ln 2x = 3$ | 36. $5\ln(3x - 2) = 15$ | 37. $7\ln(2x + 5) = 8$ |
| 38. $\ln(3x + 4) = 5$ | 39. $\ln\left(\frac{2x}{41}\right) = 2$ | 40. $e^{2x} = 25$ |