

# CHAPTER P REVIEW EXERCISES

Determine whether each statement is true or false and explain your answer.

1. Every real number is a rational number.
2. Zero is neither rational nor irrational.
3. There are no negative integers.
4. Every repeating decimal number is a rational number.
5. The terminating decimal numbers are irrational numbers.
6. The number  $\sqrt{289}$  is a rational number.
7. Zero is a natural number.
8. The multiplicative inverse of 8 is 0.125.
9. The reciprocal of 0.333 is 3.
10. The real number  $\pi$  is irrational.
11. The additive inverse of 0.5 is 0.
12. The distributive property is used in adding like terms.

Simplify each expression.

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| 13. $-3x - 4(3 - 5x)$                | 14. $x - 0.02(x - 9)$                 |
| 15. $\frac{x}{5} + \frac{x}{10}$     | 16. $\frac{1}{3}x - \frac{1}{8}x$     |
| 17. $\frac{3x - 6}{9}$               | 18. $\frac{1}{2}(4x - 6)$             |
| 19. $\frac{-7 - (-1)}{3 - (-5)}$     | 20. $\frac{6 - (3 - x)}{2 - (-1)}$    |
| 21. $ -3  -  -5 $                    | 22. $ 5 - (-2) $                      |
| 23. $ 3 - 7 $                        | 24. $ -3 - (-4) $                     |
| 25. $8 - 9 \cdot 2 \div 3 + 5$       | 26. $3 - 4(2 - 3 \cdot 5^2)$          |
| 27. $12 \div 4 \cdot 3 \div 6 + 3^3$ | 28. $8 \cdot 3^2 - 3\sqrt{3^2 + 4^2}$ |

Simplify each expression. Assume that all variables represent positive real numbers.

- |                                 |                           |
|---------------------------------|---------------------------|
| 29. $5^4$                       | 30. $2^{-4}$              |
| 31. $(-2)^2 - 4(-2)(5)$         | 32. $6^2 - 4(-1)(-3)$     |
| 33. $2^{-1} + 2^0$              | 34. $\frac{3^{-1}}{-3^2}$ |
| 35. $\frac{-3^{-1}2^3}{2^{-1}}$ | 36. $\frac{-1}{-1^{-1}}$  |

- |   |   |
|---|---|
| 37. $8^{-2/3}$                              | 38. $-16^{-3/4}$                              |
| 39. $(125x^6)^{1/3}$                        | 40. $\frac{1}{(27t^{12})^{-1/3}}$             |
| 41. $\sqrt{121}$                            | 42. $\sqrt[3]{-1000}$                         |
| 43. $\sqrt{28s^3}$                          | 44. $\sqrt{75a^2b^9}$                         |
| 45. $\sqrt[3]{-2000}$                       | 46. $\sqrt[3]{56w^4}$                         |
| 47. $\sqrt{\frac{5}{2a}}$                   | 48. $\sqrt{\frac{1}{18z^3}}$                  |
| 49. $\sqrt[3]{\frac{2}{5}}$                 | 50. $\sqrt[3]{\frac{3}{4y}}$                  |
| 51. $\sqrt{18n^3} + \sqrt{50n^3}$           | 52. $\sqrt[3]{24} - \sqrt[3]{81}$             |
| 53. $\frac{2\sqrt{3}}{\sqrt{3} - 1}$        | 54. $\frac{2}{\sqrt{6} - 2}$                  |
| 55. $\frac{\sqrt{6}}{\sqrt{8} + \sqrt{18}}$ | 56. $\frac{\sqrt{15}}{\sqrt{75} + \sqrt{20}}$ |

Convert each number given in scientific notation to standard notation and each number given in standard notation to scientific notation.

- |                            |                           |
|----------------------------|---------------------------|
| 57. $3.2 \times 10^8$      | 58. $-4.543 \times 10^9$  |
| 59. $-1.85 \times 10^{-4}$ | 60. $9.44 \times 10^{-5}$ |
| 61. 0.000056               | 62. -0.000341             |
| 63. -2,340,000             | 64. 88,300,000,000        |

Perform the indicated operations. Write the answer in scientific notation.

- |   |  |
|---|--|
| 65. $(5 \times 10^6)^3$   | 66. $\frac{(0.00000046)(3000)}{2,300,000}$ |
| 67. $\frac{(800)^2(0.00001)^{-3}}{(2,000,000)^3(0.00002)}$            |  |
| 68. $\frac{(5.1 \times 10^8)(-2 \times 10^{-3})}{1.7 \times 10^{-6}}$ |  |

Perform the indicated operations.

69.  $(3x^2 - x - 2) + (-x^2 + 2x - 5)$
70.  $(4y^3 - y^2 + 5y - 9) - (y^3 - 6y^2 + 3y - 2)$
71.  $(-4x^4 - 3x^3 + x) - (x^4 - 6x^3 - 2x)$
72.  $(3y^4 - 4y^2 - 6) + (-y^4 - 8y + 7)$

## Chapter P Review Exercises

- |                              |                     |                          |                          |                             |                   |                |
|------------------------------|---------------------|--------------------------|--------------------------|-----------------------------|-------------------|----------------|
| 1. F                         | 3. F                | 5. F                     | 7. F                     | 9. F                        | 11. F             | 13. $17x - 12$ |
| 15. $\frac{3x}{10}$          | 17. $\frac{x-2}{3}$ | 19. $-\frac{3}{4}$       | 21. -2                   | 23. 4                       | 25. 7             |                |
| 27. 28.5                     | 29. 625             | 31. 44                   | 33. $\frac{3}{2}$        | 35. $-\frac{16}{3}$         | 37. $\frac{1}{4}$ |                |
| 39. $5x^2$                   | 41. 11              | 43. $2s\sqrt{7s}$        | 45. $-10\sqrt[3]{2}$     | 47. $\frac{\sqrt{10a}}{2a}$ |                   |                |
| 49. $\frac{\sqrt[3]{50}}{5}$ | 51. $8n\sqrt{2n}$   | 53. $3 + \sqrt{3}$       | 55. $\frac{\sqrt{3}}{5}$ |                             |                   |                |
| 57. 320,000,000              | 59. -0.000185       | 61. $5.6 \times 10^{-5}$ |                          |                             |                   |                |

73.  $(3a^2 - 2a + 5)(a - 2)$       74.  $(w - 5)(w^2 + 5w + 25)$   
 75.  $(b - 3y)^2$       76.  $(x - 1)^3$   
 77.  $(t - 3)(3t + 2)$       78.  $(5y - 9)(5y + 9)$   
 79.  $-35y^5 \div (7y^2)$       80.  $(3x^3 - 6x^2) \div (3x)$   
 81.  $(3 + \sqrt{2})(3 - \sqrt{2})$       82.  $(2\sqrt{3} - 1)(3\sqrt{3} + 2)$   
 83.  $(2\sqrt{5} + \sqrt{3})^2$       84.  $(2\sqrt{x} + 3)^2$   
 85.  $(1 + \sqrt{2x - 1})^2$       86.  $(3 + \sqrt{y - 4})^2$

Find the quotient and remainder when the first polynomial is divided by the second.

87.  $x^3 + 2x^2 - 9x + 3, x - 2$   
 88.  $x^3 - 6x^2 + 3x - 9, x + 3$   
 89.  $6x^2 + x + 2, 2x - 1$   
 90.  $12x^2 - x - 21, 3x - 4$

Use division to express each fraction in the form

$$\text{quotient} + \frac{\text{remainder}}{\text{divisor}}$$

91.  $\frac{x^2 - 3}{x + 2}$       92.  $\frac{a^2 + 5a + 2}{a}$   
 93.  $\frac{2x + 3}{x - 5}$       94.  $\frac{-3x + 2}{5x - 4}$

Factor each polynomial completely.

95.  $6x^3 - 6x$       96.  $4u^2 - 9v^2$   
 97.  $9h^2 + 24ht + 16t^2$       98.  $b^2 + 6b - 16$   
 99.  $t^3 + y^3$       100.  $8a^3 - 27$   
 101.  $x^3 + 3x^2 - 9x - 27$       102.  $3x - by + bx - 3y$   
 103.  $t^6 - 1$       104.  $y^4 - 625$   
 105.  $18x^2 - 9x - 20$       106.  $(x - 1)^2 - (x - 1) - 2$   
 107.  $a^3b + 3a^2b - 18ab$       108.  $x^3y^4 + 4x^2y^2 - 12x$   
 109.  $2x^3 + x^2y - y - 2x$       110.  $12x^3 - 2x^2y - 24xy^2$

Perform the indicated operations with the rational expressions.

111.  $\frac{x - 2}{x + 3} + \frac{x + 8}{x + 3}$       112.  $\frac{3x - 5}{x^2 - 4} - \frac{3 - x}{x^2 - 4}$   
 113.  $\frac{x - 1}{x - 2} - \frac{x + 3}{x + 4}$       114.  $\frac{1 - x}{x} + \frac{3 - x}{x - 2}$   
 115.  $\frac{x^2 - 9}{x + 3} \cdot \frac{1}{6 - 2x}$       116.  $\frac{x^3 - 8}{6} \cdot \frac{3x + 6}{x^2 - 4}$

117.  $\frac{a^3bc^8 \cdot (ab^3c^5)^2}{a^9b^3c \cdot a^4b^3}$       118.  $\frac{(x^3z^2)^5 \cdot (xz^2)^2}{xz^4 \cdot (x^3)^2}$   
 119.  $\frac{1}{x^2 - 4} + \frac{3}{x - 2}$       120.  $\frac{3}{2x - 4} + \frac{5}{3x - 6}$   
 121.  $\frac{1}{6x} - \frac{7}{10x^2}$       122.  $\frac{1}{3y^2} - \frac{2}{9y}$   
 123.  $\frac{a^2 - 25}{a^2 - 4a - 5} \div \frac{2a + 10}{a^2 - 1}$   
 124.  $\frac{y^4 - 16}{y^2 + y - 2} \div \frac{y^3 + 4y}{y^3 - y}$   
 125.  $\frac{x^2 - 16}{x^2 + 5x + 4} \div \frac{8 - 2x}{x^3 + 1}$   
 126.  $\frac{x^2 + ax + bx + ab}{x^2 + 2bx + b^2} \div \frac{x^2 + 2ax + a^2}{x^3 + b^3}$   
 127.  $\frac{a - 2}{a^2 + 6a + 5} + \frac{2a + 1}{a^2 - 1}$   
 128.  $\frac{y - 1}{y^2 - 2y - 24} - \frac{y - 3}{y^2 + 2y - 8}$

Simplify.

129.  $\frac{5 - 3}{2x - 4x} - \frac{1 - 2}{2 - x}$       130.  $\frac{4}{4 - y^2} - \frac{5}{y - 2}$   
 131.  $\frac{1}{y^2 - 2} - 3$       132.  $\frac{1}{6a^2b^3}$   
 133.  $\frac{a^{-2} - b^{-3}}{a^{-1}b^{-1}}$       134.  $\frac{x^{-1} - y^{-1}}{x^{-3} - y^{-3}}$   
 135.  $p^{-1} + pq^{-3}$       136.  $a^{-1} + x^{-1}$

Given that

$$P(x) = x^3 - 3x^2 + x - 9 \quad \text{and} \quad R(x) = \frac{3x - 1}{2x - 9}$$

find each of the following.

137.  $P(2)$       138.  $P(-1)$       139.  $P(0)$   
 140.  $P\left(\frac{1}{2}\right)$       141.  $R(-1)$       142.  $R(3)$   
 143.  $R(50)$       144.  $R(-40)$

63.  $-2.34 \times 10^6$     65.  $1.25 \times 10^{20}$     67.  $4 \times 10^6$   
 69.  $2x^2 + x - 7$     71.  $-5x^4 + 3x^3 + 3x$   
 73.  $3a^3 - 8a^2 + 9a - 10$     75.  $b^2 - 6by + 9y^2$     77.  $3t^2 - 7t - 6$   
 79.  $-5y^3$     81. 7    83.  $23 + 4\sqrt{15}$     85.  $2x + 2\sqrt{2x - 1}$   
 87.  $x^2 + 4x - 1, 1$     89.  $3x + 2, 4$     91.  $x - 2 + \frac{1}{x + 2}$   
 93.  $2 + \frac{13}{x - 5}$     95.  $6x(x - 1)(x + 1)$     97.  $(3h + 4)^2$   
 99.  $(t + y)(t^2 - ty + y^2)$     101.  $(x - 3)(x + 3)^2$   
 103.  $(t - 1)(t^2 + t + 1)(t + 1)(t^2 - t + 1)$

109.  $(x - 1)(x + 1)(2x + y)$     111. 2    113.  $\frac{2x + 2}{(x - 2)(x + 4)}$   
 115.  $-\frac{1}{2}$     117.  $\frac{bc^{17}}{a^8}$     119.  $\frac{3x + 7}{x^2 - 4}$     121.  $\frac{5x - 21}{30x^2}$     123.  $\frac{a - 1}{2}$   
 125.  $\frac{-x^2 + x - 1}{2}$     127.  $\frac{3a^2 + 8a + 7}{(a + 1)(a - 1)(a + 5)}$     129.  $\frac{7}{2x - 8}$   
 131.  $\frac{-3y^2 + 7}{4y^2 - 3}$     133.  $\frac{b^3 - a^2}{ab^2}$     135.  $\frac{q^3 + p^2}{pq^3}$     137. -11  
 139. -9    141. 4/11    143. 149/91    145. 496.125 ft  
 147.  $5.9 \times 10^{26}$     149. 11.12    151. 5/6