

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 π is irrational.
11. The additive inverse of 0.5 is 0.
12. The distributive property is used in adding like terms.

Simplify each expression.

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|--------------------------------------|---------------------------------------|
| 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.

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|---------------------------------|---------------------------|
| 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. $\frac{-1}{-1^{-1}}$ |

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|---|---|
| 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.

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|----------------------------|---------------------------|
| 57. 3.2×10^8 | 58. -4.543×10^9 |
| 59. -1.85×10^{-4} | 60. 9.44×10^{-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.

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|---|--|
| 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

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|------------------------------|---------------------|--------------------------|--------------------------|-----------------------------|-------------------|----------------|
| 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. 5.6×10^{-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. $\frac{a^3bc^8}{a^9b^3c} \cdot \frac{(ab^3c^5)^2}{a^4b^3}$ 118. $\frac{(x^3z^2)^5}{xz^4} \cdot \left(\frac{xz^2}{x^3}\right)^2$
 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. -2.34×10^6 65. 1.25×10^{20} 67. 4×10^6
 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. 5.9×10^{26} 149. 11.12 151. 5/6