Chapter 7 Review

Sections labeled at the start of the related problems

1.6   State whether the equation is an example of the product rule, the quotient rule, the power rule, raising a product to a power, or raising a quotient to a power.

1) $(x^5)^3 = x^{15}$

2) $m^2 \cdot m^9 = m^{11}$

Multiply and simplify. Leave your answer in exponential notation.

3) $x^6 \cdot x^0$

4) $(-4m^3z^4)(5m^2z^2)$

Divide and simplify.

5) $\dfrac{-8x^8y^7}{4x^2y^5}$

Evaluate.

6) Evaluate $-x^0$ for $x = -2$.

7) Evaluate $(-x)^0$ for $x = -4$.

Write an equivalent expression without a negative exponent.

8) $\dfrac{y^{-3}}{x^2}$

9) $\dfrac{x^{-2}y^5}{z^{-7}}$

10) $\dfrac{1}{3^{-5}}$

11) $3a^{-2}$

Write an equivalent expression with negative exponents.

12) $\dfrac{1}{7^5}$

13) $\dfrac{1}{(-7)^3}$

14) $9x^5$

Simplify using only positive exponents. Leave the answer in exponenetial notation.

15) $(5x^{-3}y^{-4})(4xy^{-3})$

16) $\dfrac{45a^{-3}b^3}{9a^{-7}b^7}$

Simplify. Write the answer using only positive exponents. Leave the answer in exponenetial notation.

17) $(7^3)^{-7}$

18) $(-3x^4y)^3$

19) $\left(\dfrac{-2w^7}{x}\right)^2$

Simplify. Write the answer using positive exponents only. Leave the answer in exponenetial notation.

20) $\left(\dfrac{2x^3y^{-3}}{x^{-2}y^4}\right)^{-3}$

21) $(r^3s)^2(r^2s^2)^5$

7.1   Simplify.

22) $\sqrt{\dfrac{361}{289}}$

23) $-\sqrt{400}$

Identify the radicand and index.

24) $2ab\sqrt[3]{b^2 - 3}$

For the given function, find the indicated function value, if it exists. If the value does not exist, answer "Does not exist".

25) For $g(x) = \sqrt{x^2 - 20}$, find $g(5)$.

26) For $g(x) = \sqrt{x^2 - 20}$, find $g(1)$.

Simplify. Assume that variables can represent any value.

27) $\sqrt{16y^2}$

28) $-\sqrt{x^{10}}$

Simplify. Unless otherwise specified, assume that variables can represent any number.

29) $\sqrt[3]{-512}$

30) $\sqrt[4]{\dfrac{81}{256}}$

31) $\sqrt[5]{(x-4)^5}$

32) $-\sqrt[3]{-125x^3}$

Simplify. Assume all variables represent nonnegative values.

33) $\sqrt{z^{10}}$

34) $\sqrt{9x^2 + 36x + 36}$

35) $\sqrt{(x-9)^{20}}$

For the given function, find the indicated function value, if it exists. If the value does not exist, answer "Does not exist".

36) For $f(x) = \sqrt[3]{x+1}$, find $f(-9)$.

37) For $f(x) = \sqrt[4]{x-3}$, find $f(-13)$.

Determine the domain of the function. Express your answer in interval notation.

38) $f(x) = \sqrt{x - 7}$

39) $f(x) = \sqrt[6]{x + 10}$

40) $f(x) = \sqrt[3]{x - 1}$

7.2   Write an equivalent expression using radical notation and, if possible, simplify. Assume that even roots are of nonnegative quantities.

41) $x^{1/6}$

42) $m^{4/3}$

Rewrite using exponential notation. Assume that even roots are of nonnegative quantities and that all denominators are nonzero.

43) $\sqrt[7]{17}$

44) $\sqrt[7]{mn}$

45) $\left(\sqrt[4]{5x^3y}\right)^5$

Rewrite with positive exponents. Assume that even roots are of nonnegative quantities and that all denominators are nonzero.

46) $x^{-4/5}$

47) $\dfrac{1}{9p^{-8/9}}$

Use the laws of exponents to simplify. Do not use negative exponents in the answer. Assume that even roots are of nonnegative quantities and that all denominators are nonzero.

48) $x^{1/5} \cdot x^{4/5}$

49) $\dfrac{6^{6/13}}{6^{-3/13}}$

50) $(x^{1/6})^{1/5}$

2

Use rational exponents to simplify. Do not use fraction exponents in the final answer. Assume that even roots are of nonnegative quantities.

51)

$$\sqrt[6]{a^2}$$

52)

$$\sqrt[6]{2x^{42}}$$

53)

$$\left(\dfrac{20}{\sqrt{3x}}\right)^4$$

54)

$$\sqrt[5]{\sqrt[7]{x}}$$

Solve the problem.

55) It was determined that the proper length L of the letters of a word printed on pavement is given by $L = \dfrac{0.000169d^{2.27}}{h}$, where d is the distance of a car from the lettering and h is the height of the eye above the surface of the road. All units are in meters. Find L to the nearest tenth of a meter when h = 1.3 m and d = 38 m.

7.3   Multiply.

56) $\sqrt{2}\ \sqrt{5}$

57) $\sqrt[3]{18p}\,\sqrt[3]{15q}$

58) $\sqrt{\dfrac{x}{14}}\sqrt{\dfrac{y}{11}}$

Simplify by factoring.

59) $-\sqrt{28}$

60) $\sqrt[3]{750}$

61) $\sqrt[3]{216x^4y^5}$

Find a simplified form of f(x). Assume that x can be any real number.

62) $f(x) = \sqrt[3]{216x^{10}}$

63) $f(x) = \sqrt{32(x-4)^2}$

Simplify. Assume that no radicands were formed by raising negative numbers to even powers.

64) $\sqrt[3]{512x^4y^5}$

65) $\sqrt[3]{343\,x^4y^5}$

Multiply and simplify. Assume all variables represent nonnegative real numbers. Write your answer in radical notation.

66) $\sqrt{15}\sqrt{27}$

67) $\sqrt[3]{xy^5}\,\sqrt[3]{x^{13}y^{14}}$

7.4   Simplify by taking the roots of the numerator and the denominator. Assume all variables represent positive numbers.

68) $\sqrt{\dfrac{4}{81}}$

69) $\sqrt[3]{-\dfrac{8}{125}}$

70) $\sqrt[4]{\dfrac{256x^5}{y^{18}z^8}}$

Divide and, if possible, simplify. Assume all variables represent positive real numbers.

71)

$$\dfrac{\sqrt{14y}}{\sqrt{7y}}$$

72)

$$\dfrac{\sqrt[3]{80x^4y^2}}{\sqrt[3]{10x^2y}}$$

3

73)

$$\dfrac{\sqrt[5]{486x^{16}y^{13}}}{\sqrt[5]{2xy^{-2}}}$$

74)

$$\dfrac{\sqrt{360mn}}{3\sqrt{5}}$$

Rationalize the denominator. Assume all variables represent positive numbers.

75)

$$\sqrt[3]{\dfrac{4}{5}}$$

76) $\sqrt{\dfrac{50}{x}}$

77) $\sqrt{\dfrac{7}{54xy^2}}$

7.5   Add or subtract. Simplify by combining like radical terms, if possible. Assume all variables and radicands represent nonnegative numbers.

78) $4\sqrt{7} + 5\sqrt{7}$

    A) 63   B) $20\sqrt{7}$

    C) $9\sqrt{7}$ D) $9\sqrt{14}$

79) $5\sqrt{200} - 2\sqrt{8}$

80) $\sqrt{6a} - 4\sqrt{54a} - 4\sqrt{216a}$

81) $13\sqrt[3]{2} - 3\sqrt[3]{54}$

82) $4\sqrt[3]{4} - 7\sqrt{6} + 3\sqrt[3]{4} + 5\sqrt{6}$

Multiply. Assume that all variables represent nonnegative real numbers.

83) $6\sqrt{5}\left(\sqrt{11} + \sqrt{5}\right)$

84) $\left(\sqrt{11} + 2\right)\left(\sqrt{11} - 2\right)$

85) $\left(\sqrt{5} + 4\right)\left(\sqrt{6} - 7\right)$

86) $\left(\sqrt[3]{9} + 4\right)\left(\sqrt[3]{3} - 6\right)$

87) $\left(2 + \sqrt{7}\right)^2$

88) $\sqrt[3]{xy^2}\left(\sqrt{xy} - \sqrt[5]{x^3y}\right)$

Rationalize the denominator. Assume all variables represent positive numbers.

89) $\dfrac{2}{8 - \sqrt{5}}$

90) $\dfrac{10 - \sqrt{7}}{10 + \sqrt{7}}$

91) $\dfrac{3\sqrt{x}}{\sqrt{x} + 3\sqrt{y}}$

Multiply and simplify. Assume all variables represent nonnegative real numbers. Write your answer in radical notation.

92) $\sqrt{x^2y^3}\ \sqrt[3]{xy^4}$

Divide and, if possible, simplify. Assume all variables represent positive real numbers.

93) $\dfrac{\sqrt[3]{y^2}}{\sqrt[4]{y}}$

94) $\dfrac{\sqrt[5]{a^4b^2}}{\sqrt[3]{ab^2}}$

Solve the problem. Assume all variables represent nonnegative real numbers.

95) For $f(x) = \sqrt[4]{x^2}$ and $g(x) = \sqrt[4]{6x^{11}} - \sqrt[4]{x^{30}}$, find $(f \cdot g)(x)$.

Solve the problem.

96) For $f(x) = x^2$, find $f(7 - \sqrt{11})$.

7.6   Solve.

97) $\sqrt{8q - 7} = 7$

98) $\sqrt{4x} + 5 = 9$

99) $\sqrt[3]{x + 2} = 5$

100) $3\sqrt{y} = y$

101) $x = \sqrt{x + 13} + 7$

102) $\sqrt[4]{y - 4} + 8 = 0$

103) $\sqrt{5a - 7} = \sqrt{2a + 9}$

104) $\sqrt{2x + 3} - \sqrt{x + 1} = 1$

105) $\sqrt{x + 6} + \sqrt{2 - x} = 4$

106) $(x - 6)^{1/2} = -2$

Solve the problem.

107) If $f(x) = \sqrt[3]{5x + 4} + 2$, find a such that $f(a) = 5$

    A) $23\dfrac{4}{5}$ B) 1

    C) $\sqrt[3]{29}$ D) $4\dfrac{3}{5}$

108) The distance d in miles that can be seen on the surface of the ocean is given by $d = 1.6\sqrt{h}$, where h is the height in feet above the surface. How high (to the nearest foot) would a platform have to be to see a distance of 19.5 miles?

7.7   Find the length of the missing side of the right triangle. Round to three decimal places, if necessary. The legs of the right triangle are represented by a and b, and the hypotenuse is represented by c.

109) $a = 2, b = 7$

110) $b = 1, c = \sqrt{22}$

Solve the problem. If necessary, round to the nearest tenth.

111) On a sunny day, a tree and its shadow form the sides of a right triangle. If the hypotenuse is 35 m long and the tree is 28 m tall, how long is the shadow?

112) A car dealer advertised a big sale by stretching a string of banners from the top of the building to the edge of the driveway. If the building is 29 m high and the driveway is 44 m from the building, how long is the string of banners?

Find the distance between the pair of points. Give your answer in exact form and where appropriate find an approximation to three decimal places.

113) (5, –3) and (7, –7)

114) $\left(\dfrac{9}{11}, \dfrac{1}{22}\right)$ and $\left(\dfrac{1}{9}, \dfrac{19}{22}\right)$

115) $(-\sqrt{6}, \sqrt{23})$ and $(\sqrt{26}, -\sqrt{13})$

Find the midpoint of the segment with the given endpoints.

116) (3, –9) and (–1, 8)

117) $\left(-\dfrac{5}{2}, -\dfrac{3}{2}\right)$ and $\left(\dfrac{3}{2}, \dfrac{5}{2}\right)$

118) $(\sqrt{7}, 7)$ and $(\sqrt{10}, 6)$

7.8   Express in terms of i.

119) $\sqrt{-9}$

120) $\sqrt{-189}$

121) $-\sqrt{-216}$

Perform the indicated operation and simplify. Write the answer in the form a + bi.

122) (6 – 6i) + (4 + 3i)

123) (14 – 9i) – (1 – 4i)

124) 2i(5 – 9i)

125) $\sqrt{-14} \cdot \sqrt{-19}$

126) $(14 + 18i)(14 - 18i)$

127) $(-9 + 2i)^2$

128) $\dfrac{2}{5 + i}$

129) $\dfrac{7}{5i}$

130) $\dfrac{8 + 9i}{9 - 3i}$

Find the power of i.

131) i^4

132) i^{15}

133) $(-i)^{10}$

134) $i^{64} + i^{945}$

1) The power rule
2) The product rule
3) x^6
4) $-20m^5z^6$
5) $-2x^6y^2$
6) -1
7) 1
8) $\dfrac{1}{x^2y^3}$
9) $\dfrac{y^5z^7}{x^2}$
10) 3^5
11) $\dfrac{3}{a^2}$
12) 7^{-5}
13) $(-7)^{-3}$
14) $\dfrac{9}{x^{-5}}$
15) $\dfrac{20}{x^2y^7}$
16) $\dfrac{5a^4}{b^4}$
17) $\dfrac{1}{7^{21}}$
18) $-27x^{12}y^3$
19) $\dfrac{4w^{14}}{x^2}$
20) $\dfrac{y^{21}}{8x^{15}}$
21) $r^{16}s^{12}$
22) $\dfrac{19}{17}$
23) -20
24) $b^2 - 3; 3$
25) $\sqrt{5}$
26) Does not exist
27) $4|y|$
28) $-|x^5|$
29) -8
30) $\dfrac{3}{4}$
31) $x - 4$

32) $5x$

33) z^5

34) $3x + 6$

35) $(x - 9)^{10}$

36) -2

37) Does not exist

38) $[7, \infty)$

39) $[-10, \infty)$

40) $(-\infty, \infty)$

41) $\sqrt[6]{x}$

42) $\sqrt[3]{m^4}$

43) $17^{1/7}$

44) $(mn)^{1/7}$

45) $(5x^3y)^{5/4}$

46) $\dfrac{1}{x^{4/5}}$

47) $\dfrac{p^{8/9}}{9}$

48) x

49) $6^{9/13}$

50) $x^{1/30}$

51) $\sqrt[3]{a}$

52) $x^7 \sqrt[6]{2}$

53) $\sqrt[5]{3x}$

54) $\sqrt[35]{x}$

55) $0.5\ m$

56) $\sqrt{10}$

57) $\sqrt[3]{270pq}$

58) $\sqrt{\dfrac{xy}{154}}$

59) $-2\sqrt{7}$

60) $5\sqrt[3]{6}$

61) $6xy(\sqrt[3]{xy^2})$

62) $f(x) = 6x^3\sqrt[3]{x}$

63) $f(x) = 4|x - 4|\sqrt{2}$

64) $8xy(\sqrt[3]{xy^2})$

65) $7xy(\sqrt[3]{xy^2})$

66) $9\sqrt{5}$

67) $x^4y^6\sqrt[3]{x^2y}$

68) $\dfrac{2}{9}$

69) $-\dfrac{2}{5}$

70) $\dfrac{4x}{y^4z^2}\sqrt[4]{\dfrac{x}{y^2}}$

71) $\sqrt{2}$

72) $2\sqrt[3]{x^2y}$

73) $3x^3y^3$

74) $2\sqrt{2mn}$

75) $\dfrac{\sqrt[3]{100}}{5}$

76) $\dfrac{5\sqrt{2x}}{x}$

77) $\dfrac{\sqrt{42x}}{18xy}$

78) C

79) $46\sqrt{2}$

80) $-35\sqrt{6a}$

81) $4\sqrt[3]{2}$

82) $7\sqrt[3]{4} - 2\sqrt{6}$

83) $6\sqrt{55} + 30$

84) 7

85) $\sqrt{30} - 7\sqrt{5} + 4\sqrt{6} - 28$

86) $-21 - 6\sqrt[3]{9} + 4\sqrt[3]{3}$

87) $11 + 4\sqrt{7}$

88) $y\sqrt[6]{x^5y} - \sqrt[15]{x^{14}y^{13}}$

89) $\dfrac{16 + 2\sqrt{5}}{59}$

90) $\dfrac{107 - 20\sqrt{7}}{93}$

91) $\dfrac{3\sqrt{x}(\sqrt{x} - 3\sqrt{y})}{x - 9y}$

92) $xy^2\sqrt[6]{x^2y^5}$

93) $\sqrt[12]{y^5}$

94) $\sqrt[15]{\dfrac{a^7}{b^4}}$

95) $(f \cdot g)(x) = x^3 \sqrt[4]{6x} - x^8$

96) $60 - 14\sqrt{11}$

97) 7

98) 4

99) 123

100) 0, 9

101) 12

102) No solution

103) $\dfrac{16}{3}$

104) 3, –1

105) –2

106) No solution

107) D

108) 149 ft

109) c = 7.28

110) a = 4.583

111) 21 m

112) 52.7 m

113) $2\sqrt{5} \approx 4.472$

114) $\dfrac{\sqrt{11,461}}{99} \approx 1.081$

115) 11.294

116) $\left(1, -\dfrac{1}{2}\right)$

117) $\left(-\dfrac{1}{2}, \dfrac{1}{2}\right)$

118) $\left(\dfrac{\sqrt{7} + \sqrt{10}}{2}, \dfrac{13}{2}\right)$

119) 3i

120) $3i\sqrt{21}$

121) $-6i\sqrt{6}$

122) 10 – 3i

123) 13 – 5i

124) 18 + 10i

125) $-\sqrt{266}$

126) 520

127) 77 – 36i

128) $\dfrac{5}{13} - \dfrac{1}{13}i$

129) $-\dfrac{7}{5}i$

130) $\dfrac{1}{2} + \dfrac{7}{6}i$

131) 1
132) $-i$
133) -1
134) $1 + 1i$